CBSE • CUET • NEET

www.mtg.in
March 2024
Pages 100 | ₹ 75

MT

BIOLOGY today

India's #1 MONTHLY FOR CBSE, CUET & NEET

PRACTICE PAPER 2024
NEET

Class XI-XII
CBSE warm up!

CELEBRATING 42 YEARS OF EXCELLENCE

mtG
Trust of more than 1 Crore Readers Since 1982

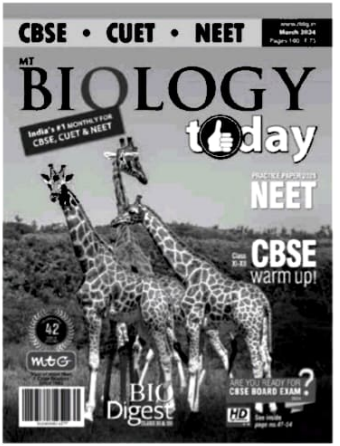
20240300|4277

BIO Digest
CLASS XI & XII

ARE YOU READY FOR CBSE BOARD EXAM 2024?

HD with Explanation

See inside page no. 47-54



MT BIOLOGY today

VOLUME 26 No. 3 March 2024

Managing Editor
Mahabir Singh

Editor
Anil Ahlawat

Corporate Office:
Plot 99, Sector 44 Institutional area, Gurugram -122 003 (HR).
Tel : 0124-6601200 e-mail : info@mtg.in website : www.mtg.in

Regd. Office:
406, Taj Apartment, Near Safdarjung Hospital, New Delhi - 110029.

Contents

Competition Edge

NEET Practice Paper 2024 73
Word Grid 86
Unique Career in Demand 87
GK Corner 90
Quiz Club 92

Class 11

Biodigest 9
Neural Control and Coordination/ Chemical Coordination and Integration
NCERT Xtract 18
Human Physiology-I
Check Your Vitals 24
Human Physiology-II
CBSE warm-up! 33
Practice Paper 2023-24
Monthly Test Drive 41
Complete Syllabus

Class 12

Are you ready for CBSE Board Exam 2024? 47
Biodigest 56
Biodiversity and Conservation
CBSE warm-up! 60
Practice Paper 2023-24
Monthly Test Drive 69
Complete Syllabus

Printed and Published by Mahabir Singh on behalf of MTG Learning Media Pvt. Ltd. Printed at HT Media Ltd., B-2, Sector-63, Noida, UP-201307 and published at 406, Taj Apartment, Ring Road, Near Safdarjung Hospital, New Delhi - 110029.
Editor : Anil Ahlawat

BIO Digest

This article covers high yield facts of the given topic.

Neural Control and Coordination

- Neural (Nervous) system is a system of highly specialised nerve cells, nerve fibres and organs (called receptors), that coordinate and control the activities of different parts of the body. This is done by converting the internal and external stimuli of environmental changes into the form of electrical impulses (a process called transduction) and transmit them to other specialised cells called effectors (muscles and glands) to react accordingly. Between the receptors and effectors are present, the conducting cells of the nervous system, the neurons.
- Overall function of nervous system is to collect information about the external conditions in relation to the body's internal state, to analyse this information and to initiate appropriate responses to satisfy certain needs (maintain homeostasis) *i.e.*, coordination. The most important need is survival. The nerves do not form one single system, rather they form several systems, which are interrelated *i.e.*, integration. Some of these are physically separate, others are different in function only. Thus, nervous system performs two functions, coordination and integration.

NEURAL SYSTEM

- The neural system provides an organised network of point-to-point connections for a quick coordination between various body functions.
- It is categorised as :
  - (i) **Central neural system (CNS) :** Hollow, dorsally placed structure lying along the mid-dorsal axis of the body. It comprises of :
    - (a) Brain (b) Spinal cord
  - (ii) **Peripheral neural system (PNS) :** The nerves arising from CNS constitute PNS.

    The nerve fibres of the PNS are of two types : (a) afferent fibres (b) efferent fibres. The afferent nerve fibres transmit impulses from tissues/organs to the CNS and the efferent fibres transmit regulatory impulses from the CNS to the concerned peripheral tissues/organs.

    The PNS is divided into two divisions - **somatic neural system** and **autonomic neural system.**
    - (a) Somatic neural system : This system relays impulses from the CNS to skeletal muscles
    - (b) Autonomic neural system : This system transmits impulses from the CNS to the involuntary organs and smooth muscles of the body.

  The autonomic neural system is further classified into
  - Parasympathetic neural system
  - Sympathetic neural system

Neurons

- The basic unit of the neural system is the individual nerve cell, or neuron.
- Neurons operate by generating electrical signals that move from one part of the cell to another part of the same cell or to neighbouring cells.
- Certain neurons may almost equal the length of the body itself. Thus, neurons with longer processes (projections) are the **longest cells** in the body. Human neural system has about 100 billion neurons. Majority of the neurons occur in the brain.
- The neurons detect and receive information from different sense organs (receptors) in the form of stimuli and transmit the stimuli to the central nervous system through sensory nerve fibres.

Table: Various structural parts of neuron and their functions

	Description	Functions
Cell Body/ Cyton/Soma	It varies in size and form. It has abundant cytoplasm, called **neuroplasm** and a relatively large spherical central nucleus with a distinct nucleolus. The **neurofibrils**, **neurotubules** and **Nissl's granules** are present in neuroplasm.	Neurofibrils play a role in the transmission of impulses. Neurotubules are microtubules which maintain the shape of the neuron. The Nissl's granules probably synthesise proteins for the cell.
Dend-rites	Shorter, tapering and much branched processes.	Conduct nerve impulse towards the cell body and are called **afferent processes**.
Axon	Axon is a single, usually very long process of uniform thickness. The part of cyton from where the axon arises is called **axon hillock**. The axon contains neurofibrils and neurotubules but does not have Nissl's granules and thus, the axon depends on the cell body for the supply of proteins.	Axon conducts nerve impulses away from the cell body. It is also known as **efferent process**.
Myelin sheath	A complex material formed of protein and phospholipid (fat) that is laid down as a sheath around the axons of certain neurons is called myelin sheath. Such neurons are called medullated or myelinated.	• Protection of the nerve fibre. • Insulation of the nerve fibre. • Increases the rate of transmission of nerve impulses.
Schwann cells	Schwann cells are the cells that lay down the protective myelin sheath around the axon of medullated nerve fibres.	Each Schwann cell protects one length of axon around which it twists as it grows - enveloping the axon.
Nodes of Ranvier	Gaps that occur at regular intervals in myelin sheath of medullated nerve fibres, between adjacent Schwann cells are the nodes of Ranvier. Medullated sheath is absent at these points.	• Allow nutrients and waste products to enter/leave the neuron. • Allow nerve impulses to move along the neuron through a process of depolarisation and repolarisation of the nerve membrane.

Types of neurons

- Neurons are classified :
- On the basis of structure : It is of five types:
  (a) **Unipolar neurons**
  – When neuron has only one process, *i.e.*, one axon extends from the cell body, *e.g.*, in embryonic stages.
  (b) **Multipolar neurons**
  – When the axon and several dendrites extend from the soma, *e.g.*, cerebral cortex.
  (c) **Bipolar neurons**
  – When one axon and one dendrite come out from the soma, e.g, retina of eye.

Intext Practice Questions

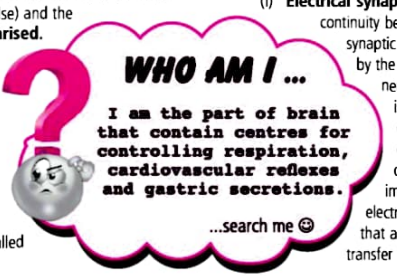
1. **Name the cell that forms myelin sheath around the axon.**
2. **Name the type of nerve fibres that carries impulses from receptors to CNS.**

NERVE IMPULSE

- Nerve impulse is a wave of bioelectric/electrochemical disturbance that passes along a neuron during conduction of an excitation. The nerve impulse travels along a neuron or across synapse between one neuron and another, or between neuron and an effector.
- Nature of nerve impulse or conduction of nerve impulse is an electrochemical process. It has been found that impulse conduction depends upon permeability of axon membrane (axolemma) and osmotic equilibrium and electrical equivalence between the axoplasm and extracellular fluid (ECF) present outside the axon.

Generation and Conduction of Nerve Impulse

- When a neuron is not conducting any impulse, *i.e.*, resting, the axonal membrane is comparatively more permeable to potassium ions (K^+) and nearly impermeable to sodium ions (Na^+). Similarly, the membrane is impermeable to negatively charged proteins present in the axoplasm. Consequently, the axoplasm inside the axon contains high concentration of K^+ and negatively charged proteins and low concentration of Na^+. In contrast, the fluid outside the axon contains a low concentration of K^+, a high concentration of Na^+ and thus forming a concentration gradient.
- The ionic gradients are maintained by sodium- potassium pump which transports 3 Na^+ outwards for 2 K^+ into the cell. As a result, the outer surface of the axonal membrane possesses a positive charge while its inner surface becomes negatively charged and therefore, is polarised. The electrical potential difference across the resting plasma membrane is called as the **resting potential.** The state of the resting membrane is called **polarised state**.
- When a stimulus is applied, the permeability of the membrane to Na^+ ions is greatly increased at the point of stimulation. It is due to the fact that the Na^+ channels open and the K^+ channels remain closed. Thus, sodium channels permit the influx of Na^+ ions by diffusion. This results in the positive charge inside and negative charge outside. The change in polarity across the plasma membrane is known as **action potential** (nerve impulse) and the membrane is said to be **depolarised**.
- With the increase of Na^+ ions inside the nerve fibre, the membrane becomes less permeable to Na^+ ions and more permeable to K^+ ions. Na^+ influx stops and K^+ outflow begins until the original resting state of ionic concentration is achieved. Thus, resting potential is restored which is called repolarisation of the membrane.



- The action potential jumps from node to node and passes along the myelinated axon faster than the series of smaller local currents in a non-myelinated axon. This type of conduction is called **saltatory conduction.**

Transmission Through Synapse

- The junction between two neurons, across which the impulse passes from one neuron to the next is called **synapse.**
- A typical (generalised) synapse consists of a bulbous expansion of a nerve terminal called a **pre-synaptic knob** lying close to the membrane of a dendrite. The cytoplasm of the synaptic knob contains numerous synaptic vesicles. Each vesicle contains neurotransmitter (chemical substance).
- The membrane of the synaptic knob nearest to the synapse forms the presynaptic membrane. The membrane of the dendrite is called the postsynaptic membrane. These membranes are separated by a gap, the **synaptic cleft**. The post synaptic membrane contains receptor sites for neurotransmitter. The two main neurotransmitters in vertebrate nervous system are **acetylcholine** (ACh) and **nor-adrenaline** although other neurotransmitters also exist.
- When an impulse arrives at a pre-synaptic knob, calcium ions from the synaptic cleft enter the cytoplasm of the pre-synaptic knob. The calcium ions cause the movement of synaptic vesicles to the surface of the knob. The synaptic vesicles are fused with the presynaptic membrane and get ruptured to discharge their contents (neurotransmitter) into the synaptic cleft.
- The neurotransmitter of the synaptic cleft binds with protein receptor molecules on the post synaptic membrane. This binding action changes the membrane potential of the post-synaptic membrane, opening channels in the membrane and allowing sodium ions to enter the cell. This causes the depolarisation and generation of action potential in the post-synaptic membrane. Thus, the impulse is transferred to the next neuron.

Types of synapse

- It is of two types:

(i) **Electrical synapse :** At electrical synapse there is continuity between the pre-synaptic and post-synaptic neurons. The continuity is provided by the **gap junctions** between the two neurons. In electrical synapse there is minimal synaptic delay because of the **direct flow** of electrical current from one neuron to the other through gap junctions. Thus, impulse transmission across an electrical synapse is always faster than that across a chemical synapse. Impulse transfer through electrical synapse does

not involve any neurotransmitter. Electrical synapses are rare. They are found in the cardiac muscle fibres, smooth muscle fibres of intestine and the epithelial cells of lens.

(ii) **Chemical synapse :** At a chemical synapse, when an impulse arrives at a pre-synaptic knob, calcium ions from the synaptic cleft enter the cytoplasm of the pre-synaptic knob. The calcium ions cause the movement of **synaptic vesicles** to the surface of the knob. The synaptic vesicles are fused with the pre-synaptic membrane and get ruptured to discharge their content (neurotransmitters) into the synaptic cleft.

The neurotransmitter of the synaptic cleft binds with **protein receptor molecules** on the post-synaptic membrane. This binding action changes the membrane potential of the post-synaptic membrane, opening channels in the membrane and allowing **sodium ions to enter the cell.** This causes the depolarisation and generation of action potential in the post-synaptic membrane. The new potential develop may be either excitatory or inhibitory. Thus, the impulse is transferred to the next neuron.

CENTRAL NEURAL SYSTEM (CNS)

- The brain and spinal cord are continuous structures, which together form the CNS. They are both protected by hard bony coverings-the brain by the **cranium** and the spinal cord by the **vertebral column** and by a continuous, tough, three layered membrane of connective tissue called the **meninges** surface.
- Both the brain and spinal cord are bathed in cerebrospinal fluid (CSF), which is continuously circulated through the cerebral ventricles, the cavity of the spinal cord and the sub-arachnoid space. It serves as a pad to cushion the CNS from shocks and mechanical injuries. The CSF also carries oxygen and nutrients from the blood to the neurons and neuroglia of the CNS.

Brain

- Brain is the central information processing organ of our body. Human brain weighs around 1.2- 1.4 kg. It lies in the **cranium** of skull. Brain and spinal cord are surrounded by connective tissue membranes called **meninges.** There are three meninges in humans, an outer layer called **duramater,** a middle layer called **arachnoid membrane** and an inner thin layer called **piamater.**
- **Human brain** is divided into three parts-forebrain **(prosencephalon),** midbrain **(mesencephalon)** and hindbrain **(rhombencephalon).**

Forebrain

- Forebrain consists of olfactory lobes, cerebrum and diencephalon.
  - **Olfactory lobes** are concerned with sense of smell.
  - **Cerebrum** forms the major part of the human brain. A deep cleft divides the cerebrum longitudinally into two halves, which are termed as the left and right **cerebral hemispheres.** The hemispheres are connected by a tract of nerve fibres called **corpus callosum.** The outer portion of cerebrum is called the **cerebral cortex** that makes up the grey matter of the cerebrum. Beneath the grey matter there are present millions of medullated nerve fibres which give an opaque white appearance, hence are collectively called **white matter.**
  - **Diencephalon** is completely covered by cerebral hemispheres. Its main parts are – epithalamus, thalamus and hypothalamus.
    - (i) Epithalamus is thin and its anterior part is folded to form anterior choroid plexus and just behind it, there is pineal stalk which has pineal body.
    - (ii) **Thalamus,** is major coordinating centre for sensory and motor signalling and is composed primarily of grey matter.
    - (iii) **Hypothalamus** lies at the base of the thalamus and contains a number of centres which control body temperature, urge for eating and drinking, growth and sexual behaviour, etc. Hypothalamus is an important link between neural and endocrine system **(neuroendocrine role).**
- The inner parts of cerebral hemispheres and a group of associated deep structures like amygdala, hippocampus, etc., form a complex structure called the limbic lobe or limbic system. Along with the hypothalamus, it is involved in the regulation of sexual behaviour, expression of emotional reactions (*e.g.*, excitement, pleasure, rage and fear), and motivation.

Midbrain

- **Midbrain** is located between the thalamus/hypothalamus of the forebrain and pons of the hindbrain. The upper or superior surface of the midbrain consists mainly of four round swellings (lobes) called **corpora quadrigemina.** Corpora quadrigemina control visual reflexes and auditory reflexes, and are equivalent to optic lobes of lower animals. The lower or inferior surface have two bundles of fibres called cerebral peduncles. They relay impulses back and forth between cerebrum, cerebellum, pons and medulla.

Hindbrain

- Hindbrain comprises of pons varolii, cerebellum and medulla oblongata.
  - **Pons** consists of fibre tracts that interconnect different regions of brain.
  - **Cerebellum** is the second largest part of human brain. Cerebellum has very convoluted surface in order to provide the additional space for many more neurons. The cerebellum controls rapid muscular activities, such as running, typing and even talking.
  - **Medulla oblongata** contains centres which control respiration, cardiovascular reflexes and gastric secretions.

- The study of the brain is called **encephalogy**.
- Brain stem forms the connections between the brain and spinal cord. It comprises of : midbrain, pons and medulla oblongata. Spinal Cord
- **Spinal cord** (42 to 45 cm long) extends from the medulla oblongata and is continuous to the level of second lumbar vertebra. It conducts impulses to and from the brain and controls most of the reflex activities and provides a means of communication between spinal nerves and the brain. It is formed of two types of neural tissue: internal **grey matter** and outer **white matter**.
- Functions
- Spinal cord performs two main functions:
  (i) The stimuli are passed from and to the brain through the spinal cord.
  (ii) It is the centre of spinal reflex action.

INTEXT PRACTICE QUESTIONS

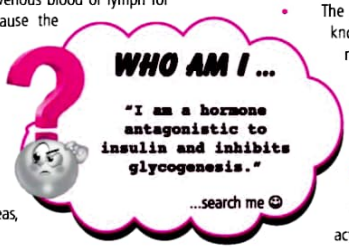
3. **What do grey and white matter in the brain represent?**
4. **How are the left and right cerebral hemispheres connected?**
5. **Briefly describe the thirst centre located in human brain.**

Chemical Coordination and Integration

- Chemical signalling by hormones is the function of the endocrine system, one of the two basic systems for communication and regulation in the animal body. The other major communication and control system is the nervous system, a network of specialised cells, that transmit signals along dedicated pathways. Signalling by neurons regulate the release of hormones, thus nervous and endocrine systems often overlap in functions.

TYPES OF GLANDS

- **Gland** is an organ, tissue or cell that secretes specific chemical substance for performing a particular function.
- On the basis of presence or absence of ducts, glands are classified into endocrine glands and exocrine glands.
- **Exocrine gland** is a gland that pours its secretion on the surface or into a particular region by means of ducts for performing a metabolic activity, *e.g.*, sebaceous glands, sweat glands, salivary glands, intestinal glands.
- **Endocrine gland** is an isolated gland which secretes hormones that are poured into venous blood or lymph for reaching the target organ because the gland is not connected with the target organ by any duct.
- **Heterocrine gland (mixed gland)** is a gland that has both exocrine and endocrine regions, the former pouring their secretion through ducts while the latter pouring their secretion directly into blood/lymph, *e.g.*, pancreas, testes, ovaries, etc.



ENDOCRINE SYSTEM AND HORMONES

- Endocrine glands lack ducts and are hence called **ductless glands**. Their secretions are called **hormones**.
- The classical definition of hormone is a chemical produced by endocrine glands and released into the blood and transported to a distantly located target organ.
- Hormones are non-nutrient chemicals which act as intercellular messengers and are produced in trace amounts.
- Invertebrates possess very simple endocrine systems with few hormones while in vertebrates, a large number of chemicals act as hormones and provides coordination.
- Hormones regulate metabolism, growth, secretion, digestion, excretion, reproduction, etc.

- When some hormones work together to control a process, this is called **synergism**, *e.g.*, FSH and LH.
- When two hormones work against each other to control a process, this is called **antagonism**, *e.g.*, insulin and glucagon; calcitonin and parathormone.
- The tissue on which the hormone acts is known as '**target tissue**'. A target cell responds to a hormone because it bears receptors for the hormone.
- The secretion of hormones is regulated by **feedback mechanisms**.
- Synthesis and release of some hormones is regulated by nerves and the hormones may also influence nerve activities.

Properties of Hormones

(i) They have low molecular weight.
(ii) They are soluble in water and blood.
(iii) They have no cumulative effect.
(iv) They can act in very low concentration.
(v) They are non-antigenic.
(vi) They may act slowly or quickly.
(vii) Hormone controlled reactions are not reversible.
(viii) Their excess or deficiency leads to disorders.
(ix) They do not provide energy or building materials.
(x) Many hormones are produced in inactive form called **prohormones**, *e.g.*, insulin is secreted as proinsulin.

ENDOCRINE GLANDS

- The endocrine system comprises of the endocrine glands and hormone producing diffused tissues or cells located in different parts of our body.
- The endocrine glands in our body are pituitary, pineal, thyroid, adrenal, pancreas, parathyroid, thymus and gonads (testis in males and ovary in females).
- There are some other organs that also produce hormones, *e.g.*, gastrointestinal tract, liver, kidney, heart.
- The study of endocrine glands and role of their secretions is called **endocrinology.** A person who specialises in endocrine glands is known as an **endocrinologist**.
- Human endocrine system consists of the following glands:

Hypothalamus and Pituitary Gland

- Hypothalamus is considered as **supreme commander** of endocrine system. It contains several groups of **neurosecretory cells** called nuclei which produce hormones. These hormones regulate the synthesis and secretion of pituitary hormones. Hypothalamus serves as an anatomical connection between neural system and endocrine system.
- However, the hormones produced by hypothalamus are of two types, the **releasing hormones** (which stimulate secretions of pituitary hormones) and the **inhibiting hormones** (which inhibit secretions of pituitary hormones).
- Pituitary gland is smallest endocrine gland having the weight of about half a gram. It is present in depression the **sella turcica** of sphenoid bone of the skull and attached to the brain by a stalk called **infundibulum** which is continuous with the hypothalamus.
- It is divided anatomically into an adenohypophysis and a neurohypophysis. Adenohypophysis consists of two portions, pars distalis and pars intermedia. in humans, the pars intermedia is almost merged with pars distalis. Neurohypophysis (pars nervosa) is also known as posterior pituitary.
- Neurohypophysis does not secrete any hormone, its hormones are secreted by hypothalamus and are released from posterior lobe of pituitary.

Table : Endocrine glands with their hormones, functions and disorders

	Hormones	Functions	Disorders
Hormones of Hypothalamus			
(i)	Growth hormone releasing hormone (GHRH)	Stimulates the anterior lobe of the pituitary gland to release GH	–
(ii)	Growth hormone inhibitory hormone (GHIH) or somatostatin	Inhibits the secretion of GH	–
(iii)	Gonadotropin releasing hormone (GnRH)	Stimulates the anterior lobe of the pituitary gland to secrete LH and FSH	–
Hormones from anterior lobe (adenohypophysis) of Pituitary			
(i)	Growth hormone (GH) or Somatotrophic hormone (STH)	Stimulates growth by stimulating protein synthesis	Hypersecretion : Gigantism and Acromegaly Hyposecretion : Dwarfism
(ii)	Thyroid stimulating hormone (TSH)	Controls secretion of thyroid hormones, thyroxine and tri-iodothyronine	–
(iii)	Adrenocorticotropic hormone (ACTH)	Stimulates the synthesis and secretion of steroids called glucocorticoids by adrenal cortex	–

(iv)	Gonadotropic hormones (i) Follicle stimulating hormone (FSH)	In male alongwith androgen regulate spermatogenesis In females development of ovarian follicles	–
	(ii) Interstitial cell-stimulating hormone (ICSH) or Luteinising hormone (LH)	Stimulates the Leydig cells of testis and induces secretion of testosterone in males. Maintains corpus luteum and induces ovulation in females	–
(v)	Luteotropic hormone (LTH) or Prolactin	Stimulates the growth of mammary glands and formation on milk.	–
Hormone from middle lobe (pars intermedia) of Pituitary			
(i)	Melanocyte stimulating hormone (MSH)	Acts on the melanocytes (melanin containing cells) and regulates pigmentation of the skin.	Hypersecretion: Hyperpigmentation
Hormones from posterior lobe (neurohypophysis) of Pituitary			
(i)	Oxytocin	Stimulates milk ejection from mammary glands; causes contraction of uterus at the time of child birth.	–
(ii)	Antidiuretic hormone or ADH (Vasopressin)	Stimulates the nephrons for reabsorption of water and electrolytes by distal tubules and thereby reduces water loss through urine (diuresis).	Hyposecretion: Diabetes insipidus
Hormones of Thyroid Gland			
(i)	Thyroxine (T_4) and tri-iodothyronine(T_3)	Regulates basal metabolic rate, support the process of red blood cell formation, control the metabolism of carbohydrates, proteins and fats and maintains water and electrolyte balance.	Hyposecretion: Cretinism in children; Myxoedema in adults, Goitre Hypersecretion: Graves's disease, Exophthalmic goitre
(ii)	Thyrocalcitonin (TCT)	Controls calcium (Ca^{++}) level in blood.	–
Hormones of Parathyroid Gland			
(i)	Parathormone	Maintains proper level of calcium and phosphorus by regulating renal action, thus, controlling calcium and phosphate amount in bones.	Hyposecretion: Muscular (Parathyroid) tetany Hypersecretion: Osteoporosis
Hormones of Pancreas (Islets of Langerhans)			
(i)	Insulin (from β cells)	Stimulates metabolism of carbohydrates. Influences the storage and utilisation of sugar, inhibits hepatic gluconeogenesis. Stimulates glycogenesis.	Hyposecretion: Diabetes mellitus in which sugar level in blood increases Hypersecretion: Drop in blood sugar level, resulting in severe condition, the "insulin shock"
(ii)	Glucagon (from α cells)	Stimulates glycogenolysis in the liver and muscles; increases the amount of sugar in blood. Antagonistic to insulin, inhibits glycogenesis.	Hyposecretion: Hypoglycemia
Hormones of Adrenal Gland (supra renal)			
(i)	Adrenaline (epinephrine) and Noradrenaline (nor-epinephrine)	Regulates heartbeat, blood pressure, sympathetic nervous system, contraction of involuntary muscles of lungs, eyes, gut, etc., production of blood, flow of saliva and sweat under emotional state. Stimulate the breakdown of glycogen, lipids ad proteins.	Hyposecretion: Low blood pressure and slow working of heart and lungs Hypersecretion: Rise in blood pressure, rapid heartbeat and breathing

(ii)	(a) Mineralocorticoids (*e.g.*, Aldosterone)	Regulate water and mineral balance in the body	–
	(b) Glucocorticoids (*e.g.*, Cortisol)	Stimulate glucose level by gluconeogenesis, lipolysis and proteolysis and inhibits cellular uptake and utilisation of amino acid	Hyposecretion: Addison's disease Hypersecretion: Cushing's syndrome
	(c) Gonadocorticoids (*e.g.*, Androgen)	Stimulate the development of secondary sexual characters in male	Hypersecretion : Adrenal virilism, Gynaecomastia
Hormones of Gonads			
(i)	Testosterone (Leydig's cells)	Affects the normal development and functions of secondary sexual organs and characters in male. Stimulates formation of sperms.	Hyposecretion: Poor development of sexual characters leading to feminism
(ii)	Estrogen (Graafian follicles)	Affects development and maintenance of secondary sexual characters in female; stimulates maturation of ova.	Hyposecretion: Failure of development of secondary sex characters in women
(iii)	Progesterone (ovary and corpus luteum)	Stimulates uterus for pregnancy, implantation and formation of placenta, also acts on mammary glands and stimulates formation of alveoli and milk section.	Hyposecretion: Abortion
Hormones of Pineal Gland			
(i)	Melatonin	Regulates 24-hour (diurnal) rhythm of our body. It helps in maintaining the normal rhythms of sleep-wake cycle, body temperature. It influences metabolism, pigmentation, the menstrual cycle as well as our defense capabilities.	–
Hormones of Thymus			
(i)	Thymosin	Promoter production of antibodies.	–

Intext Practice Questions

6. **Deficiency of which hormone causes hypoglycemia?**
7. **What is the function of melatonin?**

Hormones of Heart, Kidney and Gastrointestinal Tract

- The heart cells secrete **atrial natriuretic factor (ANF)** which decreases blood pressure by dilation of blood vessels. The kidneys secrete **erythropoietin** which stimulates the bone marrow to increase the production of **RBCs.**
- Endocrine cells present in different parts of the gastrointestinal tract secrete four major peptide hormones, namely **gastrin, secretin, cholecystokinin** (CCK) and **gastric inhibitory peptide** (GIP). Gastrin acts on the gastric glands and stimulates the secretion of hydrochloric acid and pepsinogen. Secretin acts on the exocrine pancreas and stimulates secretion of water and bicarbonate ions. CCK acts on both pancreas and gall bladder and stimulates the secretion of pancreatic enzymes and bile juice, respectively. GIP inhibits gastric secretion and motility.
- Several other non-endocrine tissues secrete hormones called **growth factors.** These factors are essential for the normal growth of tissues and their repairing/regeneration.

MECHANISM OF HORMONE ACTION

- Hormones are of mainly two types- **water soluble** (*e.g.*, amino acid derivatives, peptides and protein hormones) and **lipid soluble** (*e.g.*, steroid hormones). Water soluble hormones require extracellular receptors that generate second messengers (*e.g.*, cAMP) for carrying out their activity. Lipid soluble hormones can pass through cell membranes and directly enter the cells.

Classification of Hormones

- On the basis of chemical nature, hormones can be classified as :
  (i) **Amino acid derivative hormones -** The hormones epinephrine (adrenaline), norepinephrine

(noradrenaline) and thyroxine are derived from the amino acid tyrosine.

(ii) **Peptide hormones -** The hormones oxytocin and vasopressin (ADH) are composed of peptides.

(iii) **Protein (polypeptide) hormones -** The somatotropic, thyrotropic and gonadotropic hormones, insulin, glucagon, parathormone, human chorionic gonadotropin, human chorionic somatomammotropin (hCS) and relaxin are made up of proteins.

(iv) **Steroid hormones -** The hormones secreted by the adrenal cortex, testes and ovaries are composed of steroids. Placental estradiol and progesterone are also steroid hormones.

Two Mechanisms of Hormone Action

(i) **Protein hormone action through extra-cellular receptors (cAMP mediated hormone activity:** Most proteins and polypeptide hormones, many amino acid derivatives, specially catecholamines and some of prostaglandins (because of their large size, cannot enter the cells) binds to intracellular receptors. They acts as the **first messenger** and exert their effect by combining with specific fixed receptor site over the outer surface of the cell membrane, thereby activating the enzyme **adenylyl cyclase** on the inner surface of the membrane. This increases formation of intracellular cAMP from ATP. cAMP, the **second messenger**, is a basic regulator of cell metabolism, it acts by conversion of inactive protein kinases to their active form.

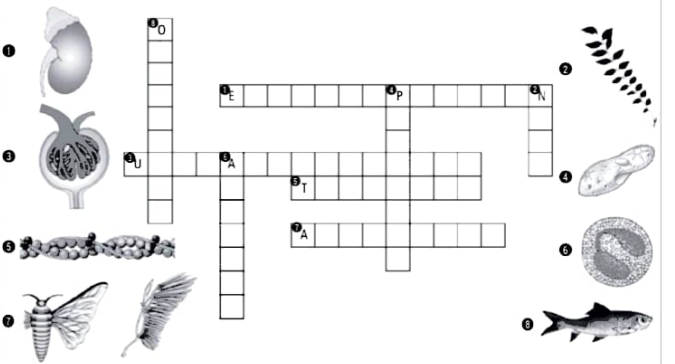
(ii) **Steroid hormone action through intracellular receptors :** Steroid hormones being lipid soluble can easily enter into the target cells and exert their effect by combining to a specific cytoplasmic receptor protein in a target cell, *i.e.*, cell that responds to the hormone. Each receptor molecule binds to hormone, forming a complex that enters the nucleus and becomes attached to the chromatin, the genetic material. The complex activates DNA, stimulates the transcription (*i.e.*, formation of *m*RNA) of a particular gene and specific messenger RNA (*m*RNA) synthesis increases. The specific *m*RNA enters the cytoplasm, where it directs the ribosomes to synthesise specific proteins (translation). These proteins may be enzymes, structural proteins, receptor proteins or secretory proteins.

Intext Practice Questions

8. **Which hormone stimulates production of RBCs?**
9. **Name any two hormones that have intracellular receptors.**
10. **Name any two protein hormones.**

Readers can send their responses at ***editor@mtg.in*** *or post us with complete address by 10th of every month. Winners' name and answers will be published in next issue.*

Across Fill the grid with terms related to given images. **Down**



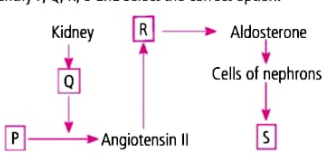
NCERT Xtract

This Section Covers Questions Extracted from Latest **NCERT Textbook** of Class XI

UNIT-V : HUMAN PHYSIOLOGY-I

- Breathing and Exchange of Gases
- Excretory Products and their Elimination
- Body Fluids and Circulation

1. Vasopressin released from the neurohypophysis is mainly responsible for
   (a) reabsorption of water through Henle's loop
   (b) reabsorption of water through Bowman's capsule
   (c) reabsorption of water through DCT
   (d) reabsorption of water through PCT.
2. The pacemaker of the heart is called
   (a) sinoatrial node (SAN)
   (b) atrioventricular node (AVN)
   (c) Purkinje fibres
   (d) papillary muscle.
3. The maximum amount of electrolytes and water (70 – 80 per cent) from the glomerular filtrate is reabsorbed in which part of the nephron?
   (a) Ascending limb of loop of Henle
   (b) Distal convoluted tubule
   (c) Proximal convoluted tubule
   (d) Descending limb of loop of Henle
4. Read the given statements and select the correct option.
   Statement I : The nasal chamber opens into pharynx.
   Statement II : Change in the volume of thoracic cavity does not affect the pulmonary cavity.
   (a) Both statement I and statement II are incorrect.
   (b) Statement I is correct but statement II is incorrect.
   (c) Statement I is incorrect but statement II is correct.
   (d) Both statement I and statement II are correct.
5. A notch present on the inner medial side of kidney is known as
   (a) ureter (b) pelvis
   (c) hilum (d) pyramid.
6. In terms of descending order of percentage proportions of leucocytes in human blood, which one is correct?
   (a) Neutrophils, lymphocytes, monocytes, eosinophils, basophils
   (b) Neutrophils, basophils, lymphocytes, eosinophils, monocytes
   (c) Neutrophils, monocytes, lymphocytes, eosinophils, basophils
   (d) Neutrophils, eosinophils, basophils, lymphocytes, monocytes
7. Select the correct order of the movement of fresh air into the lungs.
   (a) Nasal cavity → Pharynx → Larynx → Trachea → Bronchi → Bronchioles → Alveoli
   (b) Nasal cavity → Larynx → Pharynx → Trachea → Bronchioles → Bronchi → Alveoli
   (c) Nasal cavity → Pharynx → Trachea → Larynx → Bronchioles → Bronchi → Alveoli
   (d) Nasal cavity → Pharynx → Larynx → Bronchi → Trachea → Bronchioles → Alveoli
8. Identify P, Q, R, S and select the correct option.



	P	Q	R	S
(a)	Angiotensin I	Secretin	Adrenal medulla	Increased Na^+ reabsorption
(b)	Angiotensinogen	Renin	Adrenal cortex	Increased Na^+ reabsorption
(c)	Angiotensinogen	Secretin	Adrenal medulla	Decreased Na^+ reabsorption
(d)	Angiotensin I	Renin	Adrenal cortex	Decreased Na^+ reabsorption

9. Read the following statements and select the correct option.
Statement I : Prothrombin is required for blood clotting.
Statement II : Thrombin is formed from inactive substance prothrombin.
(a) Both statement I and statement II are correct.
(b) Both statement I and statement II are incorrect.
(c) Statement I is correct but statement II is incorrect.
(d) Statement I is incorrect but statement II is correct.

10. Match column I with column II. (There can be more than one match for items in column I.)

Column I	Column II
A. Tracheal respiration	(i) Birds
B. Branchial respiration	(ii) Insects
C. Pulmonary respiration	(iii) Gills
D. Cutaneous respiration	(iv) Skin
	(v) Spiracles
	(vi) Lungs
	(vii)Earthworm
	(viii) Fish

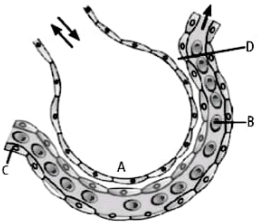
(a) A-(i, v, viii), B-(ii), C-(iii, vi), D-(iv, vii)
(b) A-(ii, v), B-(iii, viii), C-(i, vi), D-(iv, vii)
(c) A-(iv, v, vi), B-(iii, viii), C-(ii), D-(i, vii)
(d) A-(ii, v), B-(vi, viii), C-(i, iv), D-(iii, vii)

11. Which of the following structures help in the removal of nitrogenous waste as well as concerned with osmoregulation?
(a) Protonephridia (b) Nephridia
(c) Malpighian tubules (d) All of these

12. **Assertion (A) :** Rh factor is considered in blood transfusion.
Reason (R) : Rh –ve blood, if gets exposed to Rh +ve blood, will form specific antibodies against Rh antigens.
(a) Both (A) and (R) are correct and (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct but (R) is not the correct explanation of (A).
(c) (A) is correct but (R) is not correct.
(d) (A) is not correct but (R) is correct.

13. Which of the following substances are unable to filter through glomerular capillaries?
(a) Carbohydrates (b) Nucleic acids
(c) Proteins (d) Vitamins

14. In which one of the options given below, the one part A, B, C or D is correctly identified along with its function?



(a) A- Alveolar cavity- It is the main site of exchange of respiratory gases.
(b) B- Red blood cell- It transports mainly carbon dioxide.
(c) C- Arterial capillary- It passes oxygen to tissues.
(d) D- Basement substance. It involves of O_2 and CO_2 exchange.

15. "Columns of Bertin" in the kidney of mammals are formed as the extension of
(a) medulla into cortex (b) cortex into medulla
(c) medulla into pelvis (d) pelvis into ureter.

16. How much extra amount of air can be expired by a forcible expiration? (Hint : RV = 1150 mL, FRC - 2150 mL and TLC = 5500 mL)
(a) 1000 mL (b) 500 mL
(c) 1300 mL (d) 1800 mL

17. In human, excretory system consists of
I. one pair of kidney II. one pair of ureter
III. urinary bladder IV. urethra
V. one pair of urethra
(a) I, II and III only (b) I, II, III and V only
(c) I, II and IV (d) I, II, III and IV

18. Arrange the following events in the correct order as they occur during inspiration and select the correct option.
I. Air flows into the lungs
II. Pulmonary volume increases
III. Thoracic volume increases
IV. Intra pulmonary pressure decreases
V. Contraction of diaphragm and external intercostal muscles
(a) I – II – III – IV – V (b) V – III – II – IV – I
(c) II – I – V – III – IV (d) IV – II – I – III – V

19. Henle's loop of nephron plays a significant role in maintaining a high osmolarity in
(a) interstitial fluid of hilum
(b) medullary interstitial fluid
(c) cortex interstitial fluid
(d) all of these.

20. Lungs are made up of air-filled sacs, the alveoli. They do not collapse even after forceful expiration, because of
(a) inspiratory reserve volume
(b) tidal volume
(c) expiratory reserve volume
(d) residual volume.

21. Kidney stones may consist of
(a) calcium oxalate crystals
(b) calcium carbonate crystals
(c) sodium biphosphate crystals
(d) sodium chloride crystals.

22. A person was suffering from the following symptoms.
(i) Destruction of alveolar wall
(ii) Decreased respiratory surface area
The disease he is suffering from was most likely caused due to
(a) allergens (b) Influenza virus
(c) cigarette smoking (d) *Streptococcus pneumoniae*.

23. In juxtamedullary nephrons,
(a) vasa recta is prominent
(b) loop of Henle is long
(c) loop of Henle runs deep into medulla
(d) all of these.

24. Which one of the following is correct for 'atherosclerosis'?
(a) Constriction of arterial lumen reduces the blood flow.
(b) It is caused by deposition of calcium in the arteries.
(c) It is caused by cholesterol deposition in the arteries.
(d) All of these

25. Match the items listed under column-I with those given under column-II and choose the appropriate option.

	Column I		Column II
A.	Residual volume (RV)	p.	4000 mL - 4600 mL
B.	Inspiratory Reserve Volume (IRV)	q.	1100 mL - 1200 mL
C.	Vital capacity (VC)	r.	1000 mL - 1100 mL
D.	Expiratory Reserve Volume (ERV)	s.	3000 mL - 3500 mL
E.	Inspiratory capacity (IC)	t.	2500 mL - 3000 mL

	A	B	C	D	E
(a)	t	q	s	r	p
(b)	q	r	s	t	p
(c)	q	t	p	r	s
(d)	r	t	p	q	s

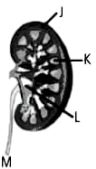
26. Epithelial cells of Bowman's capsule are called
(a) calyx (b) podocytes
(c) columns of Bertin (d) renal capsule.

27. Select the wrong statement.
(a) One complete heartbeat consists of one systole and one diastole and lasts for about 0.8 seconds.
(b) QRS complex represents the repolarisation of the ventricles.
(c) SAN can generate the maximum number of action potentials around 70-75 min^{-1}.
(d) The volume of blood pumped out by each ventricle per minute averages 5 litres in a healthy person.

28. Which one of the following is not correctly matched?
(a) Humans-Ureotelic (b) Birds-Uricotelic
(c) Lizards-Uricotelic (d) Whale-Ammonotelic

29. Fibrosis may be caused due to
(a) cigarette smoking (b) snorting
(c) inflammation of alveoli
(d) dust particles.

30. Refer to the following diagram and identify the parts of kidney indicated.



(a) J = nephron, K = pelvis, L = renal papilla, M = hilum
(b) J = medulla, K = nephron, L = pelvis, M = ureter
(c) J = cortex, K = medulla, L = calyx, M = pelvis
(d) J = cortex, K = medulla, L = pelvis, M = ureter

31. Identify the correct sequence of event in a cardiac cycle.
(a) Joint diastole, atrial systole, ventricular diastole
(b) Atrial systole, ventricular diastole, ventricular systole
(c) Atrial systole, ventricular systole, joint diastole
(d) Ventricular diastole, atrial diastole, ventricular systole, atrial systole.

32. Every 100 mL of deoxygenated blood delivers approximately
(a) 3 mL of CO_2 (b) 2 mL of CO_2
(c) 4 mL of CO_2 (d) 1 mL of CO_2.

33. Read the given statements and select the correct option.
Statement A : The right kidney is less functional than the left kidney.
Statement B : Liver present on the right side of the body suppresses the functions of right kidney.
(a) Both statements A and B are correct.
(b) Statement A is correct but statement B is incorrect.
(c) Statement A is incorrect but statement B is correct.
(d) Both statements A and B are incorrect.

34. **Assertion :** Blood circulation is incomplete in amphibians and reptiles.
Reason : Unlike in birds and mammals, in amphibians and reptiles, the left atrium receives oxygenated blood and right atrium receives deoxygenated blood.
(a) Both assertion and reason are true and reason is the correct explanation of assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Assertion is false but reason is true.

35. Functional residual capacity in humans is the amount of air
(a) can be filled in lungs by forceful inspiration
(b) can be breathed out after forceful expiration
(c) remains in the lungs after normal expiration
(d) remains in the lungs after forceful expiration.

36. Heart failure is
(a) inability of heart to pump blood effectively
(b) stopping of heart beat
(c) damaging of heart muscle
(d) inadequate supply of O_2 to heart muscle.

37. Which of the following is/are removed during haemodialysis?
(a) Urea (b) Glucose
(c) Amino acids (d) All of these

38. Which of the following hormones is secreted by atrial walls of heart?
(a) Aldosterone (b) Renin
(c) ANF (d) Angiotensin

39. During joint diastole,
(a) only atria undergo relaxation
(b) only ventricles undergo contraction
(c) both atria and ventricles undergo relaxation
(d) both atria and ventricles undergo contraction.

40. Which of the following sets of conditions promotes the dissociation of oxygen from haemoglobin?
(a) Low pO_2, high pCO_2, high H^+
(b) High pO_2, high pCO_2, low H^+
(c) High pO_2, low pCO_2, low H^+
(d) Low pO_2, low pCO_2, low H^+

41. Match the following columns and select the correct option.

	Column-I		Column-II
A.	Ascending limb of loop of Henle	(1)	Permeable to H_2O
B.	Descending limb of loop of Henle	(2)	Impermeable to H_2O
		(3)	Permeable to electrolytes
		(4)	Impermeable to electrolytes

	A	B
(a)	2,4	1,3
(b)	2,3	1,4
(c)	1,4	2,3
(d)	1,3	2,4

42. Given below are four statements (i-iv) regarding human blood circulatory system.
(i) Arteries are thick-walled and have narrow lumen as compared to veins.
(ii) Angina is characterised by acute chest pain when the blood circulation to the brain is reduced.
(iii) Persons with blood group AB can donate blood to any person.
(iv) Calcium ions play a very important role in blood clotting.
Which two of the above statements are correct?
(a) (i) and (iv) (b) (i) and (ii)
(c) (ii) and (iii) (d) (iii) and (iv)

43. Read the given statements and select the correct option.
Statement I : Respiratory rhythm centre is located in the pons region of the brain.
Statement II : Pneumotaxic centre cannot moderate the functions of respiratory rhythm.
(a) Both statement I and statement II are correct.
(b) Both statement I and statement II are incorrect.
(c) Statement I is correct but statement II is incorrect.
(d) Statement I is incorrect but statement II is correct.

44. A drop of each of the following is placed separately on four slides. Which of them will not coagulate?
(a) Blood serum
(b) Blood from hepatic portal vein
(c) Whole blood from pulmonary vein
(d) Blood plasma

45. In a cardiac output of 5250 mL per minute, with 75 heartbeats per minute, the stroke volume is
(a) 60 mL (b) 80 mL
(c) 55 mL (d) 70 mL.

46. From trachea, the left and right bronchi originate at the level of
(a) 5th thoracic vertebra (b) 7th thoracic vertebra
(c) last thoracic vertebra (d) last cervical vertebra.

47. The outline of principal events of urination is given below in random manner.
(i) Stretch receptors on the wall of urinary bladder send signals to the CNS.

EXAM ALERT 2024

Exam	Date
KARNATAKA CET Biology	18th April
NEET	5th May
CUET	Between 15th May and 31st May
CBSE Class 12th	
Physics	4th March
Mathematics	9th March
Biology	19th March

(ii) The bladder fills with urine and becomes distended.
(iii) Micturition
(iv) CNS passes on motor messages to initiate the contraction of smooth muscles of bladder and simultaneous relaxation of urethral sphincter.

The correct sequence of the events is

(a) (i) → (ii) → (iii) → (iv)

(b) (iv) → (iii) → (ii) → (i)

(c) (ii) → (i) → (iv) → (iii)

(d) (iii) → (ii) → (i) → (iv).

48. Match column I with column II and select the correct option from the given codes.

	Column I		Column II
A.	Bicuspid valve	(i)	Carries deoxygenated blood to lungs
B.	Tricuspid valve	(ii)	Carries oxygenated blood from lungs
C.	Pulmonary artery	(iii)	Guards opening between right atrium and right ventricle
D.	Pulmonary vein	(iv)	Guards opening between left atrium and left ventricle

(a) A - (ii), B - (iv), C - (iii), D - (i)
(b) A - (iv), B - (i), C - (ii), D - (iii)
(c) A - (iv), B - (iii), C - (i), D - (ii)
(d) A - (i), B - (iv), C - (iii), D - (ii)

49. Which of the following is incorrect?
(a) Serum = Plasma + Clotting factors
(b) Blood = Formed elements + Plasma
(c) Formed elements = RBC + WBC + Platelets
(d) Agranulocytes = Monocytes + Lymphocytes

50. What will be pO_2 and pCO_2 in atmospheric air as compared to those in alveolar air?
(a) Higher pO_2, lesser pCO_2
(b) Lesser pO_2, higher pCO_2
(c) Higher pO_2, higher pCO_2
(d) Lesser pO_2, lesser pCO_2

SOLUTIONS

1. (c) : Osmoreceptors in the body are activated by changes in the blood volume, body fluid volume and ionic concentration. An excessive loss of fluid from the body can activate these receptors, which stimulate the hypothalamus to release ADH (Antidiuretic Hormone) or vasopressin from neurohypophysis (posterior lobe of pituitary). ADH facilitate the water reabsorption from latter parts of the tubule thereby preventing diuresis.

2. (a)

3. (c) : During glomerular filtration in kidneys, ultrafiltration of blood occurs *i.e.*, almost all the constituents of plasma except proteins pass onto the Bowman's capsule. Then nearly 99% of the filtrate is reabsorbed by renal tubules. Proximal convoluted tubules shows maximum reabsorption and nearly all the essential nutrients and 70-80% of electrolytes and water are reabsorbed by this segment.

4. (b) : Change in the volume of thoracic cavity, affect the pulmonary cavity.

5. (c)

6. (a) : Percentage proportions of leucocytes in human blood are as follows:
Neutrophils (60-65%), Lymphocytes (20-25%), Monocytes (6-8%), Eosinophils (2-3%), Basophils (0.5-1%).

7. (a) **8. (b)**

9. (a)

10. (b) :

Tracheal respiration	–	Insects, Spiracles
Branchial respiration	–	Gills, Fish
Pulmonary respiration	–	Birds, Lungs
Cutaneous respiration	–	Skin, Earthworm

11. (d) : Protonephridia, nephridia and Malpighian tubules all are the structures which help in the removal of nitrogenous wastes as well as concerned with osmoregulation (*i.e.*, regulation of ionic and fluid volume). These structures are found in platyhelminths, annelids and insects, respectively.

12. (a) **13. (c)**

14. (a) : In the given figure, A–Alveolar cavity, B–RBCs, C–Capillary wall, D– Basement substance. Alveolar cavity is the main site of exchange of respiratory gases.

15. (b)

16. (a) : Expiratory reserve volume is additional amount of air a person can expire by forcible expiration.
FRC = ERV + RV; ERV = FRC – RV = 2150 – 1150 = 1000 mL

17. (d) : Human excretory system consists of : a pair of kidney, a pair of ureter, a urinary bladder and a urethra.

18. (b)

19. (b) : The proximity between Henle's loop and vasa recta as well as the counter-current mechanism helps in maintaining

WHO AM I ...

1. **Medulla oblongata** Pg. 11
2. **Glucagon** Pg. 13
3. **David Tilman** Pg. 58
4. ***Clarias gariepinus*** Pg. 59

an increasing osmolarity towards the inner medullary interstitium.

20. (d) : Residual volume is the volume of air which remains in the lungs after the most forceful expiration. This residual air enables the lungs to continue exchange of gases even after maximum exhalation. Due to this, lungs do not collapse even after forceful expiration.

21. (a) **22. (c)**

23. (d) : In some of the nephrons, the loop of Henle is very long and runs deep into the medulla. These nephrons are called juxtamedullary nephrons. Due to long Henle's loop, they have prominent vasa recta also.

24. (d) **25. (c)** **26. (b)**

27. (b) : The QRS complex represents the depolarisation of the ventricles, which initiates the ventricular contraction.

28. (d) : Whale is a mammal which excrete urea and are called ureotelic animals.

29. (d) : Long exposure to dust particles can give rise to inflammation leading to fibrosis.

30. (d)

31. (c) : The cardiac cycle consists of one heart beat or one cycle of contraction and relaxation of the cardiac muscle. The contraction phase is called the systole while the relaxation phase is called the diastole. The successive phases of cardiac cycle are –

(i) Atrial systole – contraction of auricles
(ii) Ventricular systole – contraction of ventricles
(iii) Complete cardiac diastole or joint diastole – relaxations of both auricles and ventricles.

32. (c) : Every 100 mL of deoxygenated blood delivers approximately 4 mL of CO_2 to alveoli under the normal physiological conditions.

33. (d) : The right kidney is slightly lower in position than the left kidney, but both the kidneys are equally functional.

34. (b)

35. (c) : Functional Residual Capacity (FRC) is the volume of air that will remain in the lungs after a normal expiration. This includes ERV + RV.

36. (a) : Heart failure is the result of progressive weakening of heart muscle and failure of the heart to pump blood effectively. Severe anaemia and hyperthyroidism leads to degeneration of heart muscle, thus resulting in heart failure.

37. (a) : Haemodialysis is a treatment for those patients whose kidneys cannot function anymore. Haemodialysis is the process of diffusion across a semi-permeable membrane to remove unwanted substances from the blood while adding desirable components. It helps in removal of waste products such as free water, urea, creatinine from blood.

38. (c) : An increase in blood flow to the heart atria causes release of Atrial Natriuetic Factor (ANF) that causes vasodilation and thereby decrease blood pressure.

39. (c) : During joint diastole, both atria and ventricles undergo relaxation.

40. (a)

41. (b) : The descending limb of Henle's loop is permeable to water but almost impermeable to electrolytes. This concentrates the filtrate as it moves down. The ascending limb is impermeable to water but allows transport of electrolytes actively or passively. Therefore, as the concentrated filtrate pass upward, it gets diluted due to passage of electrolytes to medullary fluid.

42. (a) : Angina is characterised by acute chest pain which occurs when enough oxygen does not reach the heart muscles.
AB blood group person have both antigens A and B. Due to the absence of both the antibodies against antigens A and B, the person can receive blood from any blood group. Thus, persons with AB blood group are universal recipients.

43. (b) : Respiratory rhythm centre present in the medulla region of brain is primarily responsible for regulating the demands of human body tissues. Pneumotaxic centre in the pons region of the brain can moderate functions of the respiratory rhythm centre. Neural signals from this centre can reduce the duration of inspiration and thereby alter the respiratory rate.

44. (a) : Blood serum is blood plasma from which the fibrin and clotting factors have been removed by centrifugation or vigorous stirring, thus it cannot clot.

45. (d) : Cardiac output = Stroke volume × Heartbeats per minute

$$\therefore \text{ Stroke volume} = \frac{\text{Cardiac output}}{\text{Heartbeats per minute}} = \frac{5250}{75} = 70\text{mL}$$

46. (a) : Trachea is a straight tube extending upto mid-thoracic cavity, which divides at level of 5^{th} thoracic vertebra into right and left primary bronchi.

47. (c) **48. (c)**

49. (a) : Plasma without clotting factors is called serum.

50. (a)

MONTHLY TEST DRIVE CLASS XI ANSWER KEY

1.	(a)	**2.**	(b)	**3.**	(a)	**4.**	(a)	**5.**	(c)
6.	(c)	**7.**	(c)	**8.**	(d)	**9.**	(c)	**10.**	(a)
11.	(d)	**12.**	(a)	**13.**	(d)	**14.**	(b)	**15.**	(b)
16.	(c)	**17.**	(d)	**18.**	(c)	**19.**	(d)	**20.**	(c)
21.	(d)	**22.**	(d)	**23.**	(c)	**24.**	(d)	**25.**	(b)
26.	(d)	**27.**	(b)	**28.**	(a)	**29.**	(b)	**30.**	(a)
31.	(b)	**32.**	(d)	**33.**	(c)	**34.**	(d)	**35.**	(a)
36.	(c)	**37.**	(a)	**38.**	(d)	**39.**	(d)	**40.**	(a)

Check Your Vitals for NEET

Maximise your chance of success in medical entrance exams by reading this article. This section is specially designed to optimise your preparation by practising more and more. It is a unitwise series having chapterwise question bank, allowing you to prepare systematically and become more competent.

- Recall question or single concept question – indicated by a single finger.
- Application question or question which requires 2 or 3 concepts - indicated by 2 fingers.
- Application question or question which requires 3 or more concepts - indicated by 3 fingers.

UNIT-V : HUMAN PHYSIOLOGY-II

CHAPTER : LOCOMOTION AND MOVEMENT

Multiple Choice Questions

1. Which types of muscle activities are not under the control of nervous system directly?
(a) Visceral (b) Cardiac
(c) Skeletal (d) Both (a) and (b)

2. Select the mismatched pair.
(a) Actomyosin – Contraction of muscles
(b) Ileum – Pelvic girdle
(c) Smooth muscles – Stomach
(d) Bone – Calcium salts

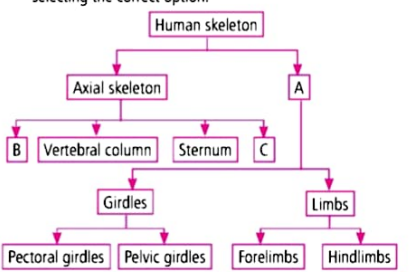
3. Select the incorrect statement.
(a) The part of the myofibril between two successive Z-lines is called sarcomere.
(b) Actin filaments are thinner as compared to myosin.
(c) At the centre of A-band, a comparatively less darker zone called Z-line is present.
(d) The sarcomere is the functional unit of myofibril.

4. Choose the correct set of examples of hinge joint.
(a) Metacarpals and phalanges of fingers
(b) Carpals and phalanges of fingers
(c) Acetabulum of pelvic girdle and head of femur
(d) Ankle and knee joints

5. The vertebral formula of human is
(a) $C_7T_{12}L_5S_{(5)}C_{(4)}$ (b) $C_8T_{12}L_6S_{(4)}C_{(4)}$
(c) $C_7T_{14}L_5S_{(3)}C_{(4)}$ (d) $C_8T_{14}L_6S_{(4)}C_{(4)}$.

6. In hurdle race, what is the major energy source of the leg muscle?
(a) Preformed ATP (b) Krebs cycle
(c) Lactate (d) Oxidative metabolism

7. Study the following flow chart and fill up the blanks by selecting the correct option.



	A	B	C
(a)	Thoracic skeleton	Limbs	Skull
(b)	Appendicular skeleton	Skull	Ribs
(c)	Appendicular skeleton	Ribs	Limbs
(d)	Lumbar skeleton	Limbs	Skull

8. Which of the following pairs of the human skeletal parts is not correctly matched with their respective inclusive skeletal?
(a) Sternum and ribs – Axial skeleton
(b) Clavicle and glenoid cavity – Pelvic girdle
(c) Humerus and ulna – Appendicular skeleton
(d) Malleus and stapes – Ear ossicles

9. Read the given statements regarding muscle proteins.
(i) Actin is a thin filament and is made up of two F-actins.
(ii) The complex protein, tropomyosin is distributed at regular intervals on the troponin.
(iii) Myosin is a thick filament which is a polymerised protein.
(iv) The globular head of meromyosin consists of light meromyosin (LMM) only.
Of the above statements,
(a) only (i), (ii) and (iii) are correct
(b) only (i) , (ii) and (iv) are correct
(c) only (i) and (iii) are correct
(d) only (ii) and (iv) are correct.

10. Select the correct statement.
(a) The vertebral column has 10 thoracic vertebrae.
(b) The joint between adjacent vertebrae is a fibrous joint.
(c) Atlas is the second cervical vertebra.
(d) Accumulation of uric acid crystals in joints causes their inflammation.

11. A cricket player is fast chasing a ball in the field. Which one of the following groups of bones is directly contributing in this movement?
(a) Femur, malleus, tibia, metatarsals
(b) Pelvis, ulna, patella, tarsals
(c) Sternum, femur, tibia, fibula
(d) Tarsals, femur, metatarsals, tibia

12. Which of the following statements about the mechanism of muscle contraction are correct?
I. Acetylcholine is released when the neural signal reaches the motor end plate.
II. Muscle contraction is initiated by a signal sent by CNS *via* a sensory neuron.
III. During muscle contraction, isotropic band gets elongated.
IV. Repeated activation of the muscles can lead to lactic acid accumulation.
(a) I and IV (b) I and III
(c) II and IV (d) I, II and III

13. The type of joint present between the humerus bone and the pectoral girdle is
(a) pivot joint (b) ellipsoid joint
(c) gliding joint (d) ball and socket joint.

14. Choose the correct order of muscle contraction from starting to completion.
(a) Stimuli → Cross bridge formation → Release of Ca^{2+} → Neurotransmitter release → Sliding of actin filament → H-band elongates
(b) Stimuli → Neurotransmitter release → Release of Ca^{2+} → Cross bridge formation → Sliding of actin filament → H-band diminishes
(c) Stimuli → Neurotransmitter release → Cross bridge formation → Release of Ca^{2+} → Sliding of actin filament → H-band diminishes
(d) Stimuli → Neurotransmitter release → Cross bridge formation → Sliding of actin filament → Ca^{2+} release → H-band elongates

15. Read the following statements.
I. The first eight pairs of the ribs are called true ribs.
II. Ulna of arm is shorter than phalanges.
III. Thoracic vertebrae, ribs and sternum together form the rib cage.
IV. Femur articulates with acetabulum of pelvic girdle.
Select the incorrect statement(s).
(a) I and IV only (b) II only
(c) I and II only (d) II, III and IV only

Match The Columns

16. Match column I with column II.

Column I	Column II
A. Knee joint	(i) Cartilaginous joint
B. Cranium	(ii) Pivot joint
C. Between atlas and axis	(iii) Fibrous joint
D. Vertebral column	(iv) Hinge joint

17. Match column I with column II. (There can be more than one match for items in column I).

Column I	Column II
A. Humerus	(i) Thigh
B. Pectoral girdle	(ii) Upper arm
C. Femur	(iii) Clavicle
	(iv) Acetabulum
	(v) Glenoid cavity
	(vi) Scapula

Passage Based Questions

18.(A) Complete the given passage with appropriate words or phrases.

The sarcomere, functional unit of myofibril is a bundle of thick and thin myofilaments. The thin filament is composed of three different proteins. (i) is a low molecular weight globular protein, which occurs in monomeric (ii) form and polymeric (iii) form. (iv) is double stranded α-helical rod, which attaches to (iii) in grooves between its filaments. A complex protein (v) is distributed at regular intervals on the (iv). In the resting state, a subunit of (v) masks the active binding sites for (vi) on the (vii) filaments. In presence of (viii) and energy, both (vi) and (vii) interact to form (ix) which causes muscle contraction.

(B) Read the given passage and correct the errors, wherever present.

Pectoral and pelvic girdle bones helps in the articulation of the upper and the lower limbs respectively with the axial skeleton. Each girdle is formed of two halves with each half consisting of a clavicle and a scapula. Scapula is a small triangular flat bone situated in the ventral part of the thorax between the third and the seventh ribs. The body of scapula has a slightly elevated ridge called the spine which projects as a flat, expanded process called the acromion to which femur articulates. A depression below the acromion called the glenoid cavity articulates with the head of the femur to form the knee joint. Pelvic girdle consists of four coxal bones each of which is formed by the fusion of ilium, ischium and pubis. At the point of fusion of these three bones is a cavity called acetabulum, to which the arm bone articulates. The two halves of the pelvic girdle meet dorsally to form the pubic symphysis containing fibrous cartilage.

Assertion & Reason

In each of the following questions, a statement of Assertion (A) is given and a corresponding statement of Reason (R) is given just below it. Of the statements, mark the correct answer as :

(a) If both A and R are true and R is the correct explanation of A.
(b) If both A and R are true but R is not the correct explanation of A.
(c) If A is true but R is false.
(d) If A is false but R is true.

19. **Assertion :** The last two pairs of ribs are called floating ribs.
Reason : The floating ribs are not connected ventrally.

20. **Assertion :** A primary myofilament is composed of a bundle of rod-like molecules of a protein myosin.
Reason : Myosin and actin together form a contractile apparatus.

21. **Assertion :** Synovial joints do not allow any other movements.
Reason : Synovial joint is characterised by fluid filled synovial cavity.

22. **Assertion :** Muscle fibre is a syncitium.
Reason : The sarcolemma of the muscle fibre is the store house of calcium and sodium ions.

23. **Assertion :** White muscle fibres are dependent on anaerobic process for energy.
Reason : White muscle fibres have more number of mitochondria as compared to red muscle fibres.

24. **Assertion :** Supply of extra oxygen to fatigued muscle results in disappearance of fatigue.
Reason : Extra oxygen tends to disperse off excess lactic acid.

25. **Assertion :** Skull is dicondylic in man.
Reason : A pair of occipital condyles articulate with atlas vertebra.

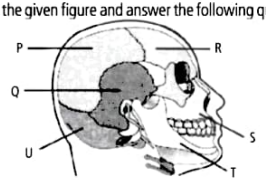
26. **Assertion :** The joint between glenoid cavity of pectoral girdle and head of humerus is most movable joint.
Reason : Articulation surface between glenoid cavity and head of humerus contains synovial fluid.

27. **Assertion :** Bone has very hard matrix whereas cartilage has pliable matrix.
Reason : Bone has calcium salts in its matrix whereas cartilage has chondroitin salts in its matrix.

28. **Assertion :** Contraction of a muscle fibre takes place by the sliding of the thin filaments over the thick filaments.
Reason : The central part of thick filament is not overlapped by thin filaments in a resting state.

Figure Based Questions

29. Observe the given figure and answer the following questions.



(a) Identify the given figure and its labelled parts P, Q, R, S, T and U.
(b) Briefly explain the type of joint found between the labelled parts in the figure.
(c) Write down the functions of the given figure.

30. Refer to the given figure of actin filament and answer the following questions.

(a) Identify the parts labelled as A, B and C.
(b) Briefly describe the structure and function of part A.
(c) Which protein attaches itself to F-actin?

CHAPTER : NEURAL CONTROL AND COORDINATION

Multiple Choice Questions

1. The part of brain associated with hunger and thirst is
(a) hypothalamus (b) medulla oblongata
(c) cerebrum (d) cerebellum.

2. What would happen to a person, if he suffers from injury localised to the hypothalamus region?
(a) Short-term memory loss
(b) Disrupted co-ordination during locomotion
(c) Disrupted regulation of body temperature
(d) Executive function such as decision making will affected

3. Type of neuron in which cell body has only one axon is
(a) multipolar neuron (b) non-polar neuron
(c) unipolar neuron (d) neurite.

4. During the transmission of nerve impulse through a nerve fibre, the potential on the inner side of the plasma membrane has which type of electric charge?
(a) First positive, then negative and continue to be negative
(b) First negative, then positive and continue to be positive
(c) First positive, then negative and again back to positive
(d) First negative, then positive and again back to negative

5. The correct sequence of meninges from inner to outer side is
(a) duramater → arachnoid membrane → piamater
(b) duramater → piamater → arachnoid membrane
(c) piamater → arachnoid membrane → duramater
(d) arachnoid membrane → duramater → piamater.

6. Limbic system in human brain is primarily concerned with
(a) memory
(b) communication
(c) body temperature
(d) regulation of sexual behaviour.

7. Read the statements about human neural system and find the wrong one.
(a) The CNS includes the brain and the spinal cord.
(b) The PNS is divided into somatic and autonomic neural system.
(c) The somatic neural system is classified into sympathetic and parasympathetic neural system.
(d) The autonomic neural system transmits impulses from the CNS to the involuntary organs and smooth muscles.

8. The human hindbrain comprises three parts, one of which is
(a) spinal cord (b) corpus callosum
(c) cerebellum (d) hypothalamus.

9. The tract of nerve fibres which connects the cerebral hemispheres is
(a) corpus luteum (b) corpus callosum
(c) corpora quadrigeminia (d) cerebral aqueduct.

10. Consider the following statements.
1. Synaptic cleft of neurons secrete adrenaline.
2. Myelinated nerve fibres are enveloped with Schwann cells, which form a myelin sheath around the axon.
3. Non-myelinated nerve fibre is enclosed by a Schwann cell that does not form a myelin sheath.
4. Spinal cord and cranial nerves are made of non-myelinated nerve fibres.

Of the four statements,
(a) 1, 2 are correct but 3 and 4 are incorrect
(b) 1, 2 and 3 are correct but 4 is incorrect
(c) 3 and 4 are correct but 1 and 2 are incorrect
(d) 2 and 3 are correct while 1 and 4 are incorrect.

11. Myelin sheath is formed by
(a) Ranvier cells (b) muscle cells
(c) Schwann cells (d) axon.

12. In the following table, the structures and their locations are given. Find the incorrect match.

	Neuron	Organs/structure
(a)	Multipolar	Cerebral cortex
(b)	Bipolar	Retina of eye
(c)	Unipolar	Embryo
(d)	Nissl's granules	Axon

13. Grey matter of the brain
(I) constitute the cerebral cortex
(II) constitute the inner part of cerebral hemisphere
(III) is grey in colour
(IV) is matter containing cell bodies
Which of the statements mentioned above are correct?
(a) Only (I)
(b) Only (II) and (III)
(c) (I), (III) and (IV)
(d) (II), (III) and (IV)

14. Which of the following statements is/are correct?
(a) Dendrites possess Nissl's granules.
(b) Unmyelinated neurons have Schwann cell.
(c) Receptors site for neurotransmitters are present on pre-synaptic membrane.
(d) Both (a) and (b)

15. Afferent nerve fibres carries impulses from
(a) central neural system to organs
(b) organs to central neural system
(c) central neural system to muscle
(d) central neural system to peripheral neural system.

Match The Columns

16. Match column I with column II.

	Column I		Column II
A.	Cerebrum	(i)	Controls the body temperature
B.	Cerebellum	(ii)	Maintains body posture
C.	Hypothalamus	(iii)	Controls the gastric secretions
D.	Medulla	(iv)	Site of intelligence

17. Match column I with column II. (There can be more than one match for items in column I).

	Column I		Column II
A.	Multipolar neuron	(i)	Neuron with one axon and two or more dendrites
B.	Bipolar neuron	(ii)	Neuron with one axon and one dendrite
C.	Unipolar neuron	(iii)	Cell body with one axon only
		(iv)	Cerebral cortex
		(v)	Embryonic stage
		(vi)	Retina of eye

Passage Based Questions

18.(A) Complete the given passage with appropriate words or phrases.

The forebrain consists of three parts. (i) forms the major part of the human brain. A deep cleft divides this part of brain longitudinally into two halves, which are connected by a tract of nerve fibres called (ii) . (i) wraps around a structure called (iii) , which is a major coordinating centre for sensory and motor signalling. Another very important part of the brain called (iv) lies at the base of the thalamus. It contains a number of centres which control body temperature, urge for eating and drinking. It also contains several groups of neurosecretory cells, which secrete (v) . Along with the hypothalamus, (vi) system is involved in the regulation of sexual behaviour, expression of emotional reactions and motivation.

(B) Read the given passage and correct the errors, wherever present.

The human neural system is divided into central neural system (CNS) and peripheral neural system (PNS). The CNS including brain and spinal cord is the site of information processing and control. The PNS comprises of all the nerves of the body associated with the CNS. The nerve fibres of the PNS consists of afferent and efferent fibres. The efferent nerve fibres transmit impulses from tissues/organs to the CNS and the afferent fibres transmit regulatory impulses from the CNS to the concerned peripheral tissues/organs. The CNS is divided into two divisions called somatic and autonomic neural system. The somatic neural system relays impulses from the CNS to smooth muscles while the autonomic neural system transmits impulses from the PNS to the voluntary organs and smooth muscles of the body. Visceral nervous system is the part of the central nervous system in which impulses travel from the peripheral nervous system to the viscera and from the viscera to the central nervous system.

Assertion & Reason

In each of the following questions, a statement of Assertion (A) is given and a corresponding statement of Reason (R) is given just below it. Of the statements, mark the correct answer as :

(a) If both A and R are true and R is the correct explanation of A.
(b) If both A and R are true but R is not the correct explanation of A.
(c) If A is true but R is false.
(d) If A is false but R is true.

19. **Assertion :** Somatic neural system is the voluntary division of PNS.
Reason : Somatic neural system relays impulses from the CNS to skeletal muscles.

20. **Assertion :** Corpus callosum connects the two cerebral hemispheres.
Reason : Association areas are responsible for complex functions like intersensory association of memory and communication.

21. **Assertion :** Medulla contains centres which control respiration, cardiovascular reflexes and gastric secretions.
Reason : Medulla contains several neurosecretory cells which secrete hormones.

22. **Assertion :** Multipolar neurons have two or more axons and one dendrite.
Reason : Multipolar neurons are found usually in the cerebral cortex.

23. **Assertion :** Afferent nerve fibres conduct impulses from CNS to the effectors.
Reason : Afferent nerve fibres are part of PNS.

24. **Assertion :** The resting membrane of the neuron exhibits polarity of charges.
Reason : The outer surface of the resting axonal membrane possesses a positive charge while its inner surface is negatively charged.

25. **Assertion :** The electrical synapse transmits impulse faster than chemical synapse.
Reason : In an electrical synapse, there is direct flow of electric current from one neuron into the other through gap junctions.

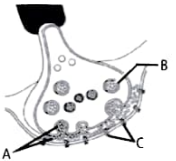
26. **Assertion :** Neurons are excitable cells.
Reason : The membrane of neurons in a depolarised state is responsible for excitability.

27. **Assertion :** Schwann cells are present in myelinated and unmyelinated axons.
Reason : Schwann cell transmit information from dendrite to axon.

28. **Assertion :** Brain stem connects the brain and spinal cord.
Reason : The midbrain, pons and medulla oblongata are collectively called brain stem.

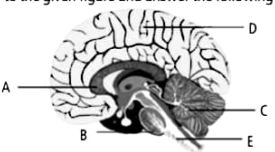
Figure Based Questions

29. Refer to the given figure and answer the following questions.



(a) What does the given figure show?
(b) Label the parts marked A, B and C.
(c) Give two examples of part A and also mention the type of neurons from which they are released.

30. Refer to the given figure and answer the following questions.



(a) Describe the part labelled as 'A'.
(b) What is the function of part 'B'?
(c) Identify 'C'. Discuss its structure and function.

CHAPTER : CHEMICAL CONTROL AND COORDINATION

Multiple Choice Questions

1. Select the set of hormones which are secreted by kidney.
(a) Erythropoietin, Serotonin and Calcitriol
(b) Erythropoietin, Serotonin and ANF
(c) Serotonin and Calcitriol
(d) Erythropoietin and Renin

2. Select the incorrectly matched pair.
(a) Intestine – Secretin
(b) Parathyroid gland – Thyrocalcitonin
(c) Adrenal cortex – Adrenaline
(d) Anterior lobe of pituitary – Prolactin

3. Select the correct statement.
(a) Glucagon is secreted by β-cells of islets of Langerhans.
(b) FSH stimulates the secretion of prolactin.
(c) Exopthalmic goitre is caused by excessive secretion of thyroid hormone.
(d) Secretion of thymosin increases with aging.

4. The source of growth hormone is same as that of
(a) thyroxine and calcitonin
(b) insulin and glucagon
(c) FSH and prolactin
(d) vasopressin and adrenaline.

5. Oxytocin play role in
(a) inflammatory and allergic reactions
(b) blood clotting
(c) smooth muscle contraction
(d) conduction of nerve impulses.

6. Estrogen and testosterone are steroid hormones, and most likely bind to
(a) membrane ion channels
(b) enzyme-linked membrane receptors
(c) G-protein coupled membrane receptors
(d) nuclear receptors.

7. Insulin and androgens respectively are
(a) peptide and steroid hormones
(b) amino acid derivative and protein hormones
(c) steroid and amino acid derivative hormones
(d) protein and steroid hormones.

8. Select the incorrect statement regarding thyroid gland.
(a) Thyroxine and triiodothyronine, produced by the thyroid gland, are synthesised from iodine.
(b) Deficiency of iodine in our diet leads to hypothyroidism.
(c) Thyroid gland possess four lobes.
(d) Calcitonin is secreted by thyroid gland.

9. Cretinism is caused due to
(a) hypothyroidism
(b) hypoparathyroidism
(c) hyperthyroidism
(d) hyperparathyroidism.

10. Feeling the tremors of an earthquake, a scared resident of seventh floor of a multistoryed building starts climbing down the stairs rapidly. Which hormone initiated this action?
(a) Thyroxine (b) Glucagon
(c) Gastrin (d) Adrenaline

11. The signal transduction of steroid hormone across cell is through
(a) binding of hormone to the nuclear receptor and then the complex regulates gene expression
(b) binding of hormone to the transmembrane receptor which initiates the production of second messenger that activates enzymes which further activates transcription factors
(c) binding of hormone to the transmembrane receptor which diffuse inside the cell cytoplasm and then activates the enzyme necessary for the activation of transcription factors

(d) binding of hormone to the nuclear receptor that initiates the production of second messenger which activates enzymes that further activates transcription factors.

12. In humans, vasopressin stimulates
(a) resorption of water and electrolytes
(b) growth and development of ovarian follicles
(c) vigorous contraction of uterus during parturition
(d) the growth of the mammary glands.

13. The 24 hour (diurnal) rhythm of our body such as the sleep-wake cycle is regulated by the hormone
(a) calcitonin (b) prolactin
(c) adrenaline (d) melatonin.

14. Adrenaline and nor-adrenaline hormones promote
(a) glycogenolysis and decrease blood glucose level
(b) breakdown of lipids and synthesis of proteins
(c) glycogenesis and synthesis of lipids and proteins
(d) breakdown of glycogen, lipids and proteins.

15. What is the effect of GnRH produced by hypothalamus?
(a) Stimulates the pituitary synthesis and release of gonadotropins
(b) Stimulates secretion of milk in mammary glands
(c) Stimulates fetal ejection reflex
(d) Stimulates synthesis of carbohydrates from non-carbohydrates in liver

Match The Columns

16. Match column I with column II.

Column I	Column II
A. Pituitary gland	(i) Graves' disease
B. Thyroid gland	(ii) Diabetes mellitus
C. Adrenal gland	(iii) Diabetes insipidus
D. Pancreas	(iv) Addison's disease

17. Match column I with column II. (There can be more than one match for items in column I).

Column I	Column II
A. Membrane bound receptor	(i) LH
B. Intracellular receptor	(ii) FSH
	(iii) Estrogen
	(iv) Thyroxine
	(v) Insulin
	(vi) Testosterone

Passage Based Questions

18.(A) Complete the given passage with appropriate words or phrases.

The adrenal medulla secretes two hormones, (i) and (ii). These are commonly called as (iii). (i) is rapidly secreted in response to stress of any kind and during emergency situations, hence called (iv) hormone or (v). This hormone (vi) alertness, piloerection, etc. It also stimulates the breakdown of glycogen resulting in an (vii) concentration of glucose in blood. This hormone also stimulates the (viii) of lipids and proteins.

(B) Read the given passage and correct the errors, wherever present.

The parathyroid glands secrete a peptide hormone called thyroxine. The secretion of this hormone is regulated by the circulating levels of sodium ions and decreases the Ca^{2+} levels in the blood. It acts on bones and inhibits the process of bone resorption. It also stimulates reabsorption of Na^{+} by the renal tubules and decreases Ca^{2+} absorption from the digested food. It is thus, clear that this hormone is a hypocalcemic hormone, *i.e.*, it decreases the blood Ca^{2+} levels.

Assertion & Reason

In each of the following questions, a statement of Assertion (A) is given and a corresponding statement of Reason (R) is given just below it. Of the statements, mark the correct answer as :
(a) If both A and R are true and R is the correct explanation of A.
(b) If both A and R are true but R is not the correct explanation of A.
(c) If A is true but R is false. (d) If A is false but R is true.

19. **Assertion :** The endocrine gland secretes hormones that are poured into blood or lymph.
Reason : Endocrine gland is a ductless gland.

20. **Assertion:** Melatonin act as a 'biological clock'.
Reason : It helps in maintaining the normal rhythms of sleep-wake cycle.

21. **Assertion :** Thyroid hormones promote physical growth and development of mental faculties.
Reason : Exopthalamic goitre is a form of hypothyroidism.

22. **Assertion :** Insulin is an anabolic hormone.
Reason : It promotes conversion of glycogen to glucose in target cells.

23. **Assertion :** Acromegaly is characterised by disproportionate increase in size of bones of face, hands and feet.
Reason : Acromegaly is caused by excess of growth hormones after adult size is reached.

24. **Assertion :** Prolactin hormone is synthesised by pars distalis of pituitary.
Reason : Prolactin regulates growth of mammary glands.

25. **Assertion :** Renal cells are involved in stimulating the formation of RBCs.
Reason : The juxtaglomerular cells of kidney produce erythropoietin.

26. **Assertion :** Insulin stimulates glycogenolysis and gluconeogenesis resulting in hyperglycemia.
Reason : Prolonged hyperglycemia leads to complex disorder called diabetes mellitus.

27. **Assertion :** Mineralocorticoids regulates the balance of water and electrolytes in our body.
Reason : Aldosterone stimulates excretion of Na^+ and water and reabsorption of K^+ and phosphate ions.

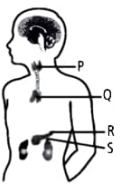
28. **Assertion:** Glucagon is a hyperglycemic hormone.
Reason : Glucagon reduces the cellular glucose uptake and utilisation.

Figure Based Questions

29. Refer to the given figure of endocrine glands and answer the following questions.

(a) Identify the parts A, B and C.
(b) Name the hormones secreted by glands A and C.
(c) Name the hormone secreted by the intermediate lobe of part B with its function.

30. Refer to the given figure and answer the following questions.
(a) Identify P, Q, R, and S in the given figure.
(b) Name the two diseases associated with P.
(c) Write down the names of hormones secreted by R.



SOLUTIONS

CHAPTER : LOCOMOTION AND MOVEMENT

1. (d) **2.** (b) **3.** (c) **4.** (d) **5.** (a)
6. (c) **7.** (b) **8.** (b) **9.** (c) **10.** (d)
11. (d) **12.** (a) **13.** (d) **14.** (b) **15.** (c)

16. A-(iv), B-(iii), C-(ii), D-(i)

17. A-(ii), (v); B-(iii), (vi); C-(i), (iv)

18. **(A)** (i) Actin (ii) G actin
(iii) F actin (iv) Tropomyosin
(v) troponin (vi) myosin
(vii) actin (viii) Ca^{2+}
(ix) actomyosin

(B) Pectoral and pelvic girdle bones helps in the articulation of the upper and the lower limbs respectively with the axial skeleton. Each girdle is formed of two halves with each half consisting of a clavicle and a scapula. Scapula is a ~~small~~ large triangular flat bone situated in the ~~ventral~~ dorsal part of the thorax between the ~~third~~ second and the seventh ribs. The body of scapula has a slightly elevated ridge called the spine which projects as a flat, expanded process called the acromion to which ~~femur~~ clavicle articulates. A depression below the acromion called the glenoid cavity articulates with the head of the ~~femur~~ humerus to form the ~~knee~~ shoulder joint. Pelvic girdle consists of ~~four~~ two coxal bones each of which is formed by the fusion of ilium, ischium and pubis. At the point of fusion of these three bones is a cavity called acetabulum, to which the ~~arm~~ thigh bone articulates. The two halves of the pelvic girdle meet ~~dorsally~~ ventrally to form the pubic symphysis containing fibrous cartilage.

19. (a) **20.** (b) **21.** (d) **22.** (c) **23.** (c)
24. (a) **25.** (a) **26.** (a) **27.** (a) **28.** (b)

29. **(a)** The given figure is of a human skull.
P – Parietal bone Q – Temporal bone
R – Frontal bone S – Maxilla
T – Mandible U – Occipital bone

(b) In the given figure, fibrous or immovable joints are found. In this type of joint, synovial cavity and ligaments are absent. There is no movement between the concerned bones as the flat skull bones fuse end-to-end with the help of white dense fibrous connective tissue in the form of sutures to form the cranium.

(c) The functions of the skull are :
(i) The cranium of the skull protects the brain.
(ii) The skull bears jaws which help the animal for cutting and masticating its food.
(iii) The nasal-cum-auditory capsules and the orbits found in the skull protects and supports the special sense organs.
(iv) It provides the rigid walls of a respiratory passage through which inhalation occurs.
(v) The hyoid apparatus protects and supports the throat.

UNSCRAMBLED WORDS
FEBRUARY 2024

1-b- METAMERISM	2-i-CHITINASE
3-f- THALASSEMIA	4-h-ANTIPODALS
5-j- MUTUALISM	6-c-MYCOBIONT
7-a-SYNCARPOUS	8-e-ANDROGENS
9-g-COLOSTRUM	10-d-ETHYLENE

Winner : Pradeep B Gudage (Karnataka)

30. **(a)** Labelled part A, B and C are troponin, tropomyosin and F-actin respectively.

(b) Labelled part A is protein troponin, a complex of 3 polypeptides. (i) Troponin T binds to tropomyosin and two other troponin components. (ii) Troponin I inhibits F-actin-myosin interaction and (iii) Troponin C is calcium binding polypeptide. The strong affinity of the troponin for calcium ions is believed to initiate the contraction process.

(c) Tropomyosin is a fibrous molecule that attaches to F-actin in the groove between its filaments.

CHAPTER : NEURAL CONTROL AND COORDINATION

1. (a) **2.** (c) **3.** (c) **4.** (d) **5.** (c)
6. (d) **7.** (c) **8.** (c) **9.** (b) **10.** (d)
11. (c) **12.** (d) **13.** (c) **14.** (d) **15.** (b)

16. A-(iv), B-(ii), C-(i), D-(iii)

17. A-(i, iv), B-(ii, vi), C-(iii, v)

18. **(A)** (i) Cerebrum (ii) corpus callosum
(iii) thalamus (iv) hypothalamus
(v) hormones (vi) limbic

(B) The human neural system is divided into central neural system (CNS) and peripheral neural system (PNS). The CNS including brain and spinal cord is the site of information processing and control. The PNS comprises of all the nerves of the body associated with the CNS. The nerve fibres of the PNS consists of afferent and efferent fibres. The ~~efferent~~ afferent nerve fibres transmit impulses from tissues/organs to the CNS and the ~~afferent~~ efferent fibres transmit regulatory impulses from the CNS to the concerned peripheral tissues/organs. The ~~CNS~~ PNS is divided into two divisions called somatic and autonomic neural system. The somatic neural system relays impulses from the CNS to ~~smooth~~ skeletal muscles while the autonomic neural system transmits impulses from the ~~PNS~~ CNS to the ~~voluntary~~ involuntary organs and smooth muscles of the body. Visceral nervous system is the part of the ~~central~~ peripheral nervous system in which impulses travel from the ~~peripheral~~ central nervous system to the viscera and from the viscera to the central nervous system.

19. (a) **20.** (b) **21.** (c) **22.** (d) **23.** (d)
24. (a) **25.** (a) **26.** (a) **27.** (c) **28.** (b)

29. **(a)** The given diagram shows the transmission of nerve impulse at a chemical synapse.

(b) A - Neurotransmitters; B - Synaptic vesicles; C - Receptors

(c) Two examples of neurotransmitters are:
- Acetylcholine, released from cholinergic neurons.
- Noradrenaline, released from adrenergic neurons.

30. **(a)** A is the corpus callosum, a large bundle of myelinated fibres connecting left and right cerebral hemispheres. Anteriorly it is folded back to form genu and posteriorly curves ventrally to form splenium.

(b) B is pons varolii. It relays impulses between medulla oblongata and superior part of brain. The pneumotaxic centres present in pons limits inspiration.

(c) C is cerebellum. It is the second largest part of human brain. It has two cerebellar hemispheres and central worm shaped part vermis. It contains flask shaped Purkinje cells. Cerebellum control muscular activities such as running, typing, talking, etc.

CHAPTER : CHEMICAL CONTROL AND COORDINATION

1. (d) **2.** (b) **3.** (c) **4.** (c) **5.** (c)
6. (d) **7.** (a) **8.** (c) **9.** (a) **10.** (d)
11. (a) **12.** (a) **13.** (d) **14.** (d) **15.** (a)

16. A-(iii), B-(i), C-(iv), D-(ii)

17. A-(i, ii, v), B-(iii, iv, vi)

18. **(A)** (i) adrenaline (ii) noradrenaline
(iii) catecholamines, (iv) emergency
(v) hormone of fight or flight (vi) increase,
(vii) increased (viii) breakdown

(B) The parathyroid glands secrete a peptide hormone called ~~thyroxine~~ parathyroid hormone (PTH). The secretion of this hormone is regulated by the circulating levels of ~~sodium~~ calcium ions and ~~decreases~~ increases the Ca^{2+} levels in the blood. It acts on bones and ~~inhibits~~ stimulates the process of bone resorption. It also stimulates reabsorption of ~~Na^+~~ Ca^{2+} by the renal tubules and ~~decreases~~ increases Ca^{2+} absorption from the digested food. It is thus, clear that this hormone is a ~~hypocalcemic~~ hypercalcemic hormone, *i.e.*, it ~~decreases~~ increases the blood Ca^{2+} levels.

19. (a) **20.** (a) **21.** (c) **22.** (c) **23.** (a)
24. (b) **25.** (a) **26.** (d) **27.** (c) **28.** (a)

29. **(a)** A-Hypothalamus, B-Pituitary, C-Pineal

(b) Hormones synthesised by hypothalamus (gland A) are:
(i) Adrenocorticotropic Releasing Hormone (ARH)
(ii) Thyrotropin Releasing Hormone (TRH)
(iii) Growth Hormone - Releasing Hormone (GHRH)
Pineal gland (gland C) secretes melatonin hormone.

(c) Melanocyte stimulating hormone is secreted by the intermediate lobe of the pituitary. It is associated with growth and development of melanocytes in man which gives colour to the skin, by dispersing pigment granules in the pigment cells.

30. **(a)** P - Thyroid, Q - Thymus, R - Pancreas, S - Adrenal

(b) The two diseases associated with P are cretinism and myxoedema.

(c) Pancreas (R) secretes hormones named glucagon and insulin. ☺☺

CBSE warm-up!

CLASS-XI

Practice Paper for CBSE Exams as per the latest pattern and rationalised syllabus by CBSE for the academic session 2023-24.

Practice Paper 2023-24

GENERAL INSTRUCTIONS

(i) All questions are compulsory.
(ii) The question paper has five sections and 33 questions.
(iii) Section–A has 16 questions of 1 mark each; Section–B has 5 questions of 2 marks each; Section– C has 7 questions of 3 marks each; Section– D has 2 case-based questions of 4 marks each; and Section–E has 3 questions of 5 marks each.
(iv) There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
(v) Wherever necessary, neat and properly labelled diagrams should be drawn.

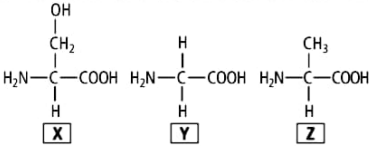
SECTION-A

1. The diatoms do not easily decay like most of the other algae because
   (a) they have water proof cells
   (b) their walls are mucilaginous
   (c) they have highly siliceous wall
   (d) they are non living.
2. If Henle's loop were absent from mammalian nephron, which one of the following is to be expected ?
   (a) There will be no urine formation.
   (b) There will be hardly any change in the quality and quantity of urine formed.
   (c) The urine will be more concentrated.
   (d) The urine will be more dilute.
3. Which of the following match is correct?

	Structure	Percentage	Function
(a)		20 – 25	Phagocytic
(b)		0.3 – 1.0	Secrete histamine and serotonin
(c)		10 – 20	Defence against parasites
(d)		30 – 40	Allergic reactions

4. Which of the following is/are not a function of vertebral column?
   (a) Protects spinal cord and supports the head.
   (b) Serves as the point of attachment for ribs and musculature of the back.
   (c) Supports tarsals and metacarpals.
   (d) Both (b) and (c)
5. If you remove the fimbriae from the bacterial cell, which of the following would you expect to happen?
   (a) The bacteria could no longer swim.
   (b) The bacteria would not adhere to the host tissue.
   (c) Transportation of molecules across the membrane would stop.
   (d) The shape of bacteria would change.

6. The correct name of X, Y and Z amino acids respectively are



(a) glutamic acid, tyrosine and alanine
(b) cysteine, tyrosine and glycine
(c) serine, glycine and alanine
(d) cysteine, glutamic acid and serine.

7. There are 9 chromosomes and 2C DNA in each somatic cell. Different stages of cell undergoing mitosis are given in the table below. Read carefully and select the correct option.

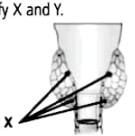
	Stage	Chromosome number	DNA content
(i)	G_1	9	2C
(ii)	S	9	4C
(iii)	G_2	18	4C
(iv)	M	18	2C

(a) (i) and (ii) (b) (i) and (iii)
(c) (iii) and (iv) (d) (ii) and (iv)

8. Medulla oblongata is centre for
(a) respiration (b) cardiovascular reflexes
(c) gastric secretion (d) all of these.

9. Pyruvate dehydrogenase catalyses the conversion of
(a) pyruvate to glucose
(b) glucose to pyruvate
(c) pyruvic acid to lactic acid
(d) pyruvic acid to acetyl CoA.

10. The hormone released by label "X" in the given figure helps to restore Y. Identify X and Y.



	X	Y
(a)	Thyroxine	Too much calcium in the blood.
(b)	PTH	Lowered levels of calcium in blood.
(c)	Thymosin	Decreased level of blood sugar.
(d)	Adrenaline	Excessive loss of sodium in extracellular fluid.

11. The second meiotic division leads to
(a) separation of sex chromosomes
(b) fresh DNA synthesis
(c) separation of chromatids and centromere
(d) separation of homologous chromosomes.

12. Following are some characteristics of a plant family.
(i) Flower : Bisexual, actinomorphic
(ii) Calyx : Sepals 5, gamosepalous, valvate aestivation
(iii) Corolla : Petals 5, gamopetalous, valvate aestivation
(iv) Androecium : Stamens five, epipetalous
(v) Gynoecium : Bicarpellary, obligately placed, syncarpous, superior ovary, axile placentation

Select the floral formula that corresponds to the above mentioned family.

(a) $\oplus \, ♀ \, K_{(1)+4} \, C_{(5)} \, A_{(5)} \, \underline{G}_2$

(b) $\% \, ♂ \, K_{(5)} \, \overbrace{C_{1+2+(2)}} \, A_{1+4} \, \underline{G}_2$

(c) $\oplus \, ♂ \, K_{(5)} \, \overbrace{C_{(5)}} \, A_5 \, \underline{G}_{(2)}$

(d) $\oplus \, ♂ \, K_5 \, C_{(5)} \, A_{(5)} \, \underline{G}_2$

Q. No. 13 to 16 consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true and R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

13. **Assertion :** The bryophytes exist in two phases- gametophyte and sporophyte.
Reason : In bryophytes, the sporophyte is nutritionally independent.

14. **Assertion :** Prokaryotic cell lacks membrane bound organelles.
Reason : Ribosomes are present in eukaryotic cells only.

15. **Assertion :** Gibberellins are used commercially in sugarcane industries.
Reason : Gibberellins induce internodal elongation.

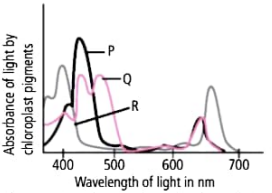
16. **Assertion :** Residual volume averages 1100 mL to 1200 mL in normal adult person.
Reason : Residual volume is the volume of air that remains in lungs after a forcible expiration.

SECTION-B

17. Cats and dogs belong to two different families but are assigned to a same Order Carnivora. On the basis of which characteristics they are assigned Order Carnivora?

18. **(a)** How is ribosome different from other organelles? Where are 70S ribosomes found?
(b) What are the functions of ribosomes?

19. A chromatographic separation of the leaf pigments shows that the different colour of leaves is due to various pigments.
The given graph is showing the absorption spectrum of photosynthetic pigments.



Interpret the graph and state the role of labelled pigments in the photosynthesis.

20. The cardiac cycle is defined as a sequence of alternating contraction and relaxation of the atria and ventricles in order to pump blood throughout the body. It starts at the beginning of one heartbeat and ends at the beginning of another.

(a) Identify the phases X and Y of the cardiac cycle.

X Y

(b) What is the duration of one cardiac cycle?

21. You have collected ten flowers from a garden. How will you decide whether these flowers are actinomorphic or zygomorphic or asymmetric?

OR

What are the identifying features of dicot root?

SECTION-C

22. Refer to the given figures and answer the following questions.

(a) (b) (c)

(i) Identify figures a, b and c.

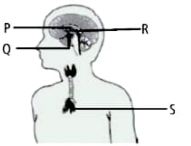
(ii) To which group these three belong?

23. Deuteromycetes are commonly known as imperfect fungi. Why? Mention any two characteristics of such fungus.

24. **(a)** Discuss the characteristic events of prophase of mitosis.

(b) A cell has 40 chromosomes during G_1 phase. How many sister chromatids does the cell have during prophase of mitosis?

25. A patient was diagnosed with diuresis condition. He was injected with a hormone. Identify the hormone, its site of production and release from the labelled part and consequence of injecting it.



26. ATPase enzyme consists of two parts. What are those parts? How are they arranged in the thylakoid membrane?

27. Prateek's grandmother complains about the severe pain in her back. Doctor examined her and suggested bone mineral density (BMD) test.

(a) Which disorder does doctor want to confirm? Why is he suspecting this?

(b) What could be the likely cause of this medical condition?

(c) What are the long term effects of this disease?

OR

(a) (i) What percentage of CO_2 is transported in the form of carbaminohaemoglobin?

(ii) What do you mean by carbaminohaemoglobin?

(b) How does the change in pCO_2 affects oxygen dissociation curve?

28. The digestive system of frogs consists of alimentary canal and digestive glands. The alimentary canal is short because they are carnivores and hence the length of intestine is reduced. Describe the process of digestion in frogs.

TRIO

The same THREE LETTERS will complete these four words.

Can you find the three-letter sequence?

TY — — — ID

MOR— — — LOGY

LYM — — — CYTE

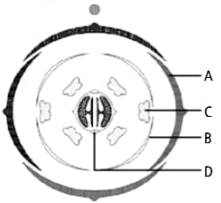
TRO— — — BLAST

Readers can send their responses at editor@mtg.in or post us with complete address by 10th of every month. Winners' names will be published in next issue.

SECTION-D

Q. No. 29 and 30 are case based questions. Each question has 3 subparts with internal choice in one subpart.

29. Refer to the given diagram and answer the following questions.



(a) Identify the given diagram and the symbols for labels A, B, C and D.

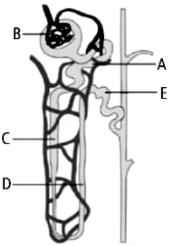
OR

Write the formula of the shown figure with the help of identified symbols.

(b) Identify the aestivation as seen in B.

(c) What is the function of D?

30. Given below shows a diagrammatic representation of a nephron showing blood vessels, duct and tubules.



(a) In which of the labelled parts reabsorption is minimum?

(b) Which of the labelled parts is not situated in the cortical region of the kidney?

(c) Write the functions of C and D.

OR

Write the functions of E.

SECTION-E

31. Refer to the given table and answer the following questions.

Characters	Monera	Protista	Fungi	Plantae	Animalia
Cell type	**A**	Eukaryotic	Eukaryotic	Eukaryotic	Eukaryotic
Cell wall	**B**	Present in some	Present	Present	Absent
Nuclear membrane	Absent	Present	Present	Present	**C**
Body organisation	Cellular	Cellular	**D**	Tissue/organ	Tissue/organ/ organ system

(i) Identify A, B, C and D.

(ii) Name the organism which is also called rust and smut and state to which kingdom it belongs.

(iii) Which kingdom includes blue-green algae, nitrogen fixing bacteria and methanogenic archaebacteria? What is the criteria of including these diverse organisms in single kingdom?

OR

Write general characters of Phylum Ctenophora.

32. Comment on the statement "Telophase is reverse of prophase".

OR

A living tissue (for e.g., a vegetable) is taken and grind in trichloroacetic acid using a mortar and a pestle. A thick slurry obtained is strained through a cheesecloth in which two types of fractions are obtained. One is called the filtrate or more technically, the acid-soluble pool, and the second, the retentate or the acid-insoluble fraction. The acid insoluble fraction has proteins, nucleic acids, polysaccharides and lipids. Most of the biomolecules have molecular weights in the range of ten thousand daltons and above.

(a) Name two storage homopolysaccharides.

(b) Name the chemical constituents of a nucleotide.

(c) (i) Name the smallest amino acid and draw its structure.
(ii) Which biomolecules form the basic components of carbohydrates?

33. Elucidate the formation or production of 38 molecules per glucose molecule oxidised in an aerobic cell. Compare fermentation and aerobic repiration.

OR

Discuss the discovery, synthesis and physiological functions of growth inhibiting hormones.

SOLUTIONS

1. **(c) :** The diatoms do not easily decay like most of the other algae because they have highly siliceous wall.
2. **(d) :** Basically loop of Henle, in association with vasa recta, plays an important role in the counter current mechanism (the process which makes urine hypertonic, *i.e.*, more concentrated). Therefore, if Henle's loop was absent from mammalian nephron the urine will be more dilute.
3. **(b)**
4. **(c) :** The vertebral column protects the spinal cord, supports the head and serves as the point of attachment for the ribs and musculature of the back.
5. **(b) :** Fimbriae are hair-like structures present in large number in bacteria. They help in attaching bacteria to solid surfaces or host tissues.
6. **(c) :** X – Serine, Y – Glycine, Z – Alanine
7. **(a) :** During synthesis S-phase, amount of DNA per cell doubles, but there is no increase in chromosome number. During G_2 and M phase chromosome number will remain same, *i.e.*, 9.
8. **(d)**
9. **(d) :** Pyruvate dehydrogenase catalyses the process of conversion of pyruvic acid to acetyl CoA.
10. **(b)**
11. **(c) :** Meiosis first is followed by second meiotic division, which is essentially a mitotic division and is referred as mitotic. In anaphase-II of meiosis-II, the chromosome and centromere divide. The sister chromatids separate and move towards opposite poles.
12. **(b)**
13. **(c) :** The bryophytes have evolved a life cycle which comprises two phases - gametophyte and sporophyte. The gametophyte (haploid) is concerned with sexual reproduction and constitutes the most conspicuous, nutritionally independent phase in the life cycle. The sporophyte is dependent partly or wholly on the gametophyte for nutritional purpose.
14. **(c) :** Ribosomes are membraneless cell organelle present in both prokaryotic and eukaryotic cells.
15. **(b)** 16. **(b)**
17. The Family Felidae of cats and the Family Canidae of dogs are assigned to the Order Carnivora as both cats and dogs have large canine teeth and are flesh-eaters.
18. **(a)** Ribosomes are not bounded by any membrane unlike other cell organelles. 70S ribosomes are found both in prokaryotes and eukaryotes. In prokaryotes, they occur freely inside the cytoplasm. In eukaryotes, they are found in the matrix of plastids and mitochondria.
19. **(b)** Ribosomes are the site of protein synthesis. Several ribosomes may attach to a single *m*RNA and form a chain called polyribosomes or polysome. The ribosomes of a polysome translate the *m*RNA into proteins.
20. P is chlorophyll ***b***, Q is carotenoids and R is chlorophyll ***a***. R, *i.e.*, chlorophyll ***a*** is the major (Primary) pigment responsible for trapping light.
    Chlorophyll ***b***, xanthophylls and carotenoids, which are called accessory pigments, also absorb light and transfer the energy to chlorophyll ***a***. Indeed, they not only enable a wider range of wavelength of incoming light to be utilised for photosynthesis but also protect chlorophyll ***a*** from photo-oxidation.
21. (a) X shows atrial systole and Y shows ventricular systole of cardiac cycle.
    (b) 0.8 second is the duration of one cardiac cycle.
22. A flower is termed as actinomorphic when its symmetry remains undisturbed if one cuts the flower into two equal radial halves through any radial plane passing through the axis, *e.g.*, mustard and ***Datura***. In zygomorphic flowers, symmetry remains intact when the flower is cut into two equal halves-only through one particular vertical plane, *e.g.*, pea, bean and ***Cassia***. A flower, which cannot be divided into two equal parts by any vertical plane passing through the centre, it is known as asymmetric as in ***Canna***.

    OR

    Dicotyledonous root can be easily identified on account of the following features :
    (i) Presence of root hairs
    (ii) Endodermis with Casparian strip
    (iii) Small or inconspicuous pith
    (iv) Usually 2 to 4 xylem and phloem patches
23. (i) a - Male thallus of ***Marchantia***
        b - ***Funaria***
        c - ***Sphagnum***
    (ii) ***Marchantia*** is a liverwort while ***Funaria*** and ***Sphagnum*** are mosses. These three belongs to division Bryophyta.
24. Deuteromycetes are a large number of true fungi whose sexual stages (perfect stages) are either unknown or not commonly found. Since only the imperfect stages (asexual stages) of these fungi are known, they are called the fungi imperfecti.
    Two characteristics of deutermycetes are: (i) The majority of fungi imperfecti are saprophytic on decaying organic matter and in the soil, but a number of species are parasitic on plants, animals and human beings, causing number of serious diseases. (ii) The mycelium consists of well developed septate, branched hyphae.

24. (a) Chromosomal material condenses to form compact mitotic chromosomes. Chromosomes are seen to be composed of two chromatids attached together at the centromere. Centrosome which had undergone duplication during interphase, begins to move towards opposite poles of the cell. Each centrosome radiates out microtubules called asters. The two asters together with spindle fibres forms mitotic apparatus.

(b) Since the chromosomes consists of two chromatids attached together at the centromere, the cell would have 80 chromatids during prophase stage of mitosis.

25. Vasopressin, also known as anti-diuretic hormone (ADH) is secreted by hypothalamus (P) and released by pituitary gland (Q). It increases the permeability of kidney tubules to water thereby increasing the reabsorption of water into the blood capillaries in the kidney tubules. This will result in decrease in the volume of urine produced.

26. ATP synthase is a group of polypeptide that converts ATP and inorganic phosphate (Pi) to ATP and water. It is called coupling factor because it couples ATP formation to transport electrons and H^+ across the thylakoid membrane. It exists along with photosystem I, only in stroma thylakoids and the non-appressed regions of grana thylakoids. The two components of ATPase complex are CF_0 (coupling factor$_0$) and CF_1 (coupling factor$_1$). CF_0 is embedded in the thylakoid membrane where it forms a transmembrane channel that facilitates diffusion of protons across the membrane. CF_1 protrudes on the outer surface of thylakoid membrane. This is the site where ATP is synthesised from ADP.

27. (a) Doctor wants to confirm osteoporosis. His suspicion is due to the old age of his grandmother and osteoporosis is an age-related disorder.

(b) Osteoporosis is a disease in which bone loses minerals and fibres from its matrix (decreased bone mass). Major causes of this disease are imbalances of hormones like calcitonin, parathormone, sex hormones and deficiencies of vitamin D and calcium.

(c) Osteoporosis increases the fragility of bones which become prone to fracture. Fractures occur most often in bones of the hip, spine and wrist but any bone can be affected.

OR

(a) (i) About 20-25% of CO_2 is transported by haemoglobin in the form of carbamino – haemoglobin.

(ii) Carbon dioxide reacts directly with amine radicals (NH_2) of haemoglobin to form an unstable compound called carbaminohaemoglobin ($HbCO_2$).

$$CO_2 + \underset{\text{(Haemoglobin)}}{Hb} \rightleftharpoons \underset{\text{(Carbaminohaemoglobin)}}{HbCO_2}$$

(b) Increase in pCO_2 shifts oxygen dissociation curve to right indicating dissociation of oxygen from haemoglobin. Decrease in pCO_2 shift the curve to left, indicating association of oxygen to haemoglobin.

28. Frogs capture food by the bilobed tongue. Digestion of food takes place by the action of HCl and gastric juices secreted from the walls of the stomach. Partially digested food called chyme is passed from stomach to the first part of the small intestine, the duodenum. The duodenum receives bile from gall bladder and pancreatic juices from the pancreas through a common bile duct. Bile emulsifies fat and pancreatic juices digest carbohydrates and proteins. Final digestion takes place in the intestine. Digested food is absorbed by the numerous finger-like folds in the inner wall of intestine called villi and microvilli. The undigested solid waste moves into the rectum and passes out through cloaca.

29. (a) The given figure represents the floral diagram of a plant.
A is calyx - Symbol K
B is corolla - Symbol C
C is androecium - Symbol A
D is gynoecium - Symbol G

OR

$\oplus \, ♂♀ \, K_{2+2} \, C_4 \, A_{2+4} \, \underline{G}_{(2)}$

(b) According to the figure, B is corolla (petals) and has valvate aestivation. In valvate aestivation, the margins of adjacent sepals/petals are close to each other without overlapping.

(c) D represents gynoecium which is fourth whorl of floral diagram. Gynoecium has carpel which consists of three parts stigma, style and ovary. Ovary bears ovules. After fertilisation, ovules develop into seeds and the ovary matures into fruits.

30. (a) Reabsorption is minimum in ascending limb of loop of Henle (Label D).

(b) The Malpighian corpuscles (B), PCT (A) and DCT (E) of the nephron are situated in the cortical region of the kidney whereas the loop of Henle (C) dips into the medulla.

(c) The descending limp of loop of Henle (C) is permeable to water but almost impermeable to electrolytes. This concentrates the filtrate as it moves down. The ascending limb (D) is impermeable to water but allows transport of electrolytes actively or passively.

OR

Conditional reabsorption of Na^+ and water takes place in DCT (E). DCT is also capable of reabsorption of HCO_3^- and selective secretion of hydrogen and potassium ions and NH_3 to maintain the pH and sodium-potassium balance in blood.

31. (i) A-Prokaryotic, B-Non-cellulosic, C-Present D-Multicellular

(ii) *Puccinia* is also called rust fungus and *Ustilago* is known as small fungus, these organisms belongs to Kingdom Fungi.

(iii) Blue-green algae, nitrogen fixing bacteria and methanogenic archaebacteria are included in Kingdom Monera. All these organisms are prokaryotic and primitive, thus including them in the Kingdom Monera as prokaryotes differentiate them from all other organisms in their genetic, cellular, reproductive and physiological organisation.

OR

Ctenophores, commonly known as sea walnuts or comb jellies are exclusively marine. It is a small group of about 50 species. The general characters are:

(i) Body form is variable. It may be rounded, oval, conical or flattened.

(ii) They are radially symmetrical.

(iii) Ctenophores are diploblastic with two germ layers, ectoderm and endoderm.

(iv) Ctenophores have tissue level of organisation.

(v) They have the property to emit light *i.e.*, bioluminescence.

(vi) The body bears eight external rows of ciliated comb plates, which help in locomotion.

(vii) Coelom is absent.

(viii) Digestion is both extracellular and intracellular.

(ix) Sexes are not separate. Gonads are endodermal. Asexual reproduction is absent.

(x) Fertilisation is generally external. Development is indirect.

32. During telophase, events of prophase occur in reverse sequence. Prophase is known for the initiation of condensation of chromosomal material, during which the process of chromatin condensation becomes untangled, and finally the centriole (already duplicated during S phase of interphase) begins to move towards the opposite pole of the cell. In this phase, initiation of mitotic spindle assembly, microtubular and proteinaceous components of cell cytoplasm helps in completion of the process.

At the end of the prophase, *i.e.*, during late prophase the nucleolus disintegrates gradually and the nuclear envelope

UNSCRAMBLE ME

Unscramble the words given in column I and match them with their explanations in column II.

Column I	Column II
1. ESEIPCS	(a) A protein present on the dark band of myofibrils.
2. MEITRIOPLPOS	(b) Term used to define distribution of species confied to a specific region.
3. TOERYCTSEH	(c) Male sex accessory duct in which vasa efferentia opens.
4. MBONAIASL	(d) Intestinal infection that is caused by protozoan parasite.
5. BASMOAEISI	(e) A specialised cell in cyanobacteria that helps in nitrogen fixation.
6. NAGLI	(f) Single gene exhibiting multiple phenotypic expression.
7. DENEMSMI	(g) The group of individual organism with fundamental similarities.
8. ILAGNIT	(h) Member of phaeophyceae that produces hydrocolloids.
9. EYSIMDIDPI	(i) hnRNA processing in which adenylate residues are added at 3′-end.
10. SONIYM	(j) The process of synthesis of complex molecules in living organism.

Readers can send their responses at editor@mtg.in or post us with complete address by 10th of every month. Winners' names and answers will be published in next issue.

disappear. This disappearance marks the end of the prophase. Reverse of prophase is the telophase. At the onset of this stage, the spindle disappears (absorbed in cytoplasm) and the chromosomes decondense and further loses their individuality after reaching their respective poles. The chromosomes gradually uncoil and cluster at opposite spindle poles thus, their individual identity as discrete elements is lost. Nuclear envelope slowly reforms around each group of chromosomes and nucleolus. Golgi complex, endoplasmic reticulum and other organelles reappear.

OR

(a) The two storage homopolysaccharides are glycogen and starch. Glycogen is stored in animals and starch is stored in plants.

(b) A nucleotide consists of three smaller molecules :
(1) Phosphoric acid (2) Pentose sugar molecule and
(3) Nitrogenous base molecule

(c) (i) Glycine is the smallest amino acid. Its structure is as follows:

(ii) Carbohydrates are compounds of carbon, hydrogen and oxygen where hydrogen atoms and oxygen atoms generally occur in ratio of 2 : 1 as in a molecule of water. Carbohydrates are also called as hydrates of carbon. Their general formula is $C_nH_{2n}O_n$.

33. The total ATP production from the complete oxidation of a glucose molecule to CO_2 and H_2O under aerobic conditions are:

(i) Glycolysis provides 2 ATP molecules and $2NADH + 2H^+$.

(ii) Pyruvate oxidation yields $2 NADH + 2H^+$ only.

(iii) Krebs' cycle gives 2 GTP molecules, $6 NADH + 6H^+$ and $2FADH_2$. Generally no distinction is made between ATP and GTP because GTP is changed into ATP in the cytoplasm by an enzyme nucleoside diphosphate kinase. Therefore, GTP is regarded ATP in the concerned calculations.

(iv) ETS produces 34 ATP molecules, and is the major source of energy for a cell. Oxidation of one molecule of NADH gives rise to 3 molecules of ATP, while that of one molecule of FADH2 produces 2 molecules of ATP. Its yield is as under :

- 2 NADH molecules from glycolysis give 6 ATP molecules.
- 2 NADH molecules from pyruvate oxidation yield 6 ATP molecules.
- 6 NADH molecules from Krebs' cycle yield 18 ATP molecules.
- 2 $FADH_2$ molecules from Krebs' cycle yield 4 ATP molecules.

34 ATP from electron transfers, when added to 4 ATP from glycolysis and Krebs' cycle, give a grand total of 38 ATP for each glucose molecule fully oxidised to CO_2 and H_2O.

The differences between fermentation and aerobic respiration are as follows:

(i) Fermentation accounts for only a partial breakdown of glucose whereas in aerobic respiration it is completely degraded to CO_2 and H_2O.

(ii) In fermentation there is a net gain of only two molecules of ATP for each molecule of glucose degraded to pyruvic acid whereas many more molecules of ATP are generated under aerobic conditions.

(iii) NADH is oxidised to NAD^+ rather slowly in fermentation, however the reaction is very vigorous in case of aerobic respiration.

OR

The growth inhibiting plant hormones are abscisic acid and ethylene.

(i) Ethylene

It was first recognised as a plant hormone by Crocker *et al.*, though it was first confirmed by R. Gane (1934) with the help of gas chromatography as the volatile substance causing ripening. Cousins was the first to discover that ripened oranges produce a volatile substance that hastened ripening of nearby unripened fruits.

The inhibiting functions of ethylene are-

(i) Ethylene inhibits longitudinal growth but stimulates transverse or horizontal growth and swelling of axis.

(ii) It promotes the senescence of leaves and flowers.

(iii) Abscission of various parts (leaves, flower, fruit) is stimulated by ethylene which induces the formation of hydrolases.

(ii) Abscisic Acid

This hormone was first isolated by Addicott *et al* from cotton balls. During the mid 1960, three different types of inhibitors were discovered separately, inhibitor B, abscission II and dormin. All three of them were found to be chemically identical and later named as abscisic acid.

The inhibiting functions of abscisic acid are:

(i) Exogenous application of low concentration of ABA to leaves causes stomatal closure within 3-9 minutes under water stressed condition.

(ii) ABA appears to play a role in the dormancy of seeds and buds. It also inhibits the sprouting of potato tubers.

(iii) ABA in general inhibits plant growth. However, it induces parthenocarpy in *Rosa*.

(iv) Application of ABA on the apical portion causes growth of lateral branches and suppression of apical buds. So it may be concluded that ABA inhibits the effect of IAA in case of apical dominance.

(v) ABA has a regulatory role in abscission of flowers, fruits and leaves. ☺☺

MONTHLY TEST DRIVE

XI

This specially designed column enables students to self analyse their extent of understanding of complete syllabus . Give yourself four marks for correct answer and deduct one mark for wrong answer. Self check table given at the end will help you to check your readiness.

Total Marks : 160 **Complete Syllabus** Time : 40 Min.

1. Fungi multiply and spread easily due to _____ they produce.
   (a) spores (b) buds
   (c) mycelium (d) fragments

2. Methanogens belong to
   (a) eubacteria (b) archaebacteria
   (c) dinoflagellates (d) slime moulds.

3. Which of the following statements are correct about the respiration in frog?
   (i) In adult frog, cutaneous, buccopharyngeal and pulmonary respiration are found.
   (ii) A pair of elongated pink coloured, sac-like structures lungs are found in thorax.
   (iii) During aestivation and hibernation, gaseous exchange takes place through skin.
   (a) (i), (ii) and (iii) (b) (i) and (iii) only
   (c) (ii) and (iii) only (d) (i) and (ii) only

4. Which of the following algae represents colonial and filamentous forms, respectively?
   (a) *Volvox, Spirogyra* (b) *Ulothrix, Volvox*
   (c) *Spirogyra, Volvox* (d) *Spirogyra, Ulothrix*

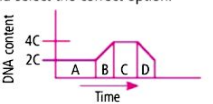
5. Coelom is found between
   (a) body wall and ectoderm
   (b) ectoderm and endoderm
   (c) mesoderm and body wall (endoderm)
   (d) mesoderm and ectoderm.

6. Select the option that do not hold true for the formation of floral axis.
   (a) Apex produce floral appendages
   (b) Axis gets condensed
   (c) Internodes elongates
   (d) Floral appendages formed laterally at successive node

7. Cell walls are thickened at the corners in collenchyma due to deposition of
   (a) suberin
   (b) lignin
   (c) hemicellulose and pectin
   (d) calcium.

8. The cavities of alveoli of lungs are lined by
   (a) cuboidal epithelium
   (b) columnar epithelium
   (c) stratified cuboidal epithelium
   (d) squamous epithelium.

9. The given graph shows the change in DNA content during various phases (A to D) in a typical mitotic cell cycle. Identify the phases and select the correct option.



	A	B	C	D
(a)	G_2	G_1	S	M
(b)	G_2	S	G_1	M
(c)	G_1	S	G_2	M
(d)	M	G_1	S	G_2

10. Select the secondary metabolites from the given list.
    (I) Alkaloids (II) Flavonoids
    (III) Rubber (IV) Essential oils
    (V) Antibiotics (VI) Coloured pigments
    (VII) Scents (VIII) Gums
    (IX) Spices
    Choose the correct option.
    (a) (I) to (IX) (b) All except (II) and (IX)
    (c) (I), (III), (IV) and (VI) (d) All except (I) and (VII)

11. Arrange the following in ascending order of Linnaean hierarchy.
(a) Anacardiaceae → *Mangifera* → Sapindales → Dicotyledonae
(b) *Mangifera* → Sapindales → Anacardiaceae → Angiospermae
(c) Dicotyledonae → Sapindales → *Mangifera* → Angiospermae
(d) *Mangifera* → Anacardiaceae → Sapindales → Dicotyledonae

12. An alga, very rich in protein, is
(a) *Chlorella* (b) *Nostoc*
(c) *Spirogyra* (d) *Ulothrix.*

13. Match List-I with List-II.

List I	List II
(p) Cristae	(i) Primary constriction in chromosome
(q) Thylakoids	(ii) Disc-shaped sacs in Golgi apparatus
(r) Centromere	(iii) Infoldings in mitochondria
(s) Cisternae	(iv) Flattened membranous sacs in stroma of plastids

Choose the correct answer from the options given below.

	(p)	(q)	(r)	(s)
(a)	(ii)	(iii)	(iv)	(i)
(b)	(iv)	(iii)	(ii)	(i)
(c)	(i)	(iv)	(iii)	(ii)
(d)	(iii)	(iv)	(i)	(ii)

14. Choose the correct option regarding enzyme (E), substrate (S), product (P) and enzyme substrate complex (EP).
(a) $E + S \rightarrow ES \rightarrow E + P \rightarrow EP$
(b) $E + S \rightleftharpoons ES \rightarrow EP \rightarrow E + P$
(c) $E + S \rightarrow ES \rightleftharpoons EP \rightarrow E + P$
(d) $E + S \rightleftharpoons ES \rightleftharpoons EP \rightleftharpoons E + P$

15. The feature responsible for the survival of archaebacteria in extreme conditions is
(a) different shapes
(b) different cell wall structure
(c) different mode of nutrition
(d) different mode of reproduction.

16. Identify the smallest plant of angiosperms.
(a) *Azadirachta* (b) Grass
(c) *Wolffia* (d) *Eucalyptus*

17. "Triploblastic, acoelomate, exhibiting bilateral symmetry and develop through many larval stages with some parasitic forms". The given description is characteristic of the Phylum
(a) Annelida (b) Ctenophora
(c) Cnidaria (d) Platyhelminthes.

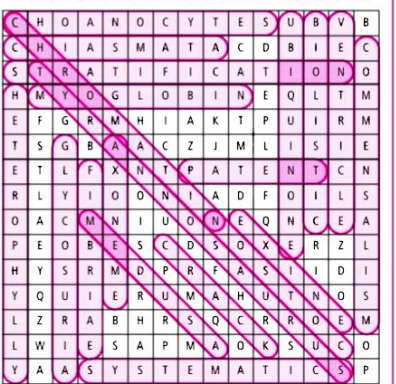
18. Which of the following is incorrectly matched?
(a) *Tobacoo* – Fumigatory
(b) Chilli – Spice
(c) *Petunia* – Fumigatory
(d) *Belladonna* – Medicine

19. Which of the following are correct statements?
(I) The parenchyma performs various functions like photosynthesis, storage and secretion.
(II) Cells of collenchyma are much thickened at the corners due to a deposition of cellulose, hemicellulose and pectin.
(III) Cells of sclerenchyma are usually dead and without protoplasts.
(IV) Parenchyma, collenchyma and sclerenchyma are complex permanent tissues.
(a) II, III and IV only (b) I, II and IV only
(c) I, III and IV only (d) I, II and III only

20. Select the correct match.
(a) Quiescent phase - G_2 phase
(b) Synthesis phase - G_1 phase

Contributed by : Adrija Maity

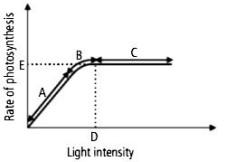
SOLUTIONS TO FEBRUARY 2024 WORD GRID



1. Systematics
2. Commensalism
3. Axoneme
4. Biolistic
5. Ubiquinone
6. Tyrannosaurus
7. Nostoc
8. Fimbriae
9. Glycosuria
10. Myoglobin
11. Exine
12. Ventricle
13. Medusa
14. Chromatin
15. Heterophylly
16. Crack
17. Chiasmata
18. Patent
19. Choanocytes
20. Stratification

(c) Centromere splitting - Anaphase
(d) Chromosomal condensation - Telophase

21. The graph given below shows the effect of light intensity on the rate of photosynthesis. Which of the following statements regarding the graph is correct?



(a) Light is a limiting factor in the region A.
(b) Region C represents that the rate of photosynthesis is not increased further by increasing light intensity because some other factor becomes limiting.
(c) Point D represents the intensity of light at which some other factor becomes limiting.
(d) All of these

22. Identify A, B and C in the given diagram and choose the correct option.

(a) A-Cervical vertebra, B-Coccyx, C-Sacrum
(b) A-Cervical vertebra, B-Coccyx, C-Atlas
(c) A-Cervical vertebra, B-Coccyx, C-Axis
(d) A-Cervical vertebra, B-Sacrum, C-Coccyx

23. ____ is the product of incomplete oxidation of glucose while _____ is obtained by complete oxidation of glucose.
(a) Acetyl CoA, ethanol (b) NADH, lactic acid
(c) Ethanol, CO_2 (d) NADH, ethanol

24. Read the following statements and select the correct option.
Statement A : The first pair of wings in cockroach arise from metathorax.
Statement B : The forewings in cockroach are adapted for flight.
(a) Both statements A and B are correct.
(b) Statement A is incorrect but B is correct.
(c) Statement A is correct but statement B is incorrect.
(d) Both statements A and B are incorrect.

25. Graves' disease and Addison's disease is caused respectively due to
(a) hyposecretion of thyroid gland; hypersecretion of thyroid gland
(b) hypersecretion of thyroid gland; hyposecretion of adrenal cortex
(c) hyposecretion of adrenal gland; hyposecretion of adrenal cortex
(d) hypersecretion of adrenal gland; hypersecretion of thyroid gland

26. During the ATP synthesis through chemiosmosis, the protons are released into
(a) inner side of the membrane
(b) outer side of the membrane
(c) lumen side of the membrane
(d) both (a) and (c).

27. Choose the correct pathway of the transmission of impulses in the heart beat.
(a) AV node → SA node → Bundle of His → Purkinje fibres
(b) SA node → AV node → Bundle of His → Purkinje fibres
(c) SA node → Bundle of His → AV node → Purkinje fibres
(d) AV node → Bundle of His → SA node → Purkinje fibres

28. In the given diagram few steps of glycolysis are shown. The ATP is utilised in step P and Q.

Glucose (6C)
↓ **Step 1**
Glucose-6-phosphate (3C)
↓ **Step 2**
Fructose-6-bisphosphate (6C)
↓ **Step 3**
Fructose 1, 6-bisphosphate (6C)
↓ **Step 4**
G-3-P ⇌ Triose phosphate (Dihydroxyacetone phosphate)

Choose the correct option regarding P and Q.

	P	Q
(a)	Step 1	Step 3
(b)	Step 1	Step 4
(c)	Step 2	Step 3
(d)	Step 2	Step 4

29. $RuBP + CO_2 \xrightarrow{RuBisCO} X$.
In the given equation, identify X.
(a) 2 × 2 – PGA (b) 2 × 3 – PGA
(c) 2 × 4 – PGA (d) 2 × 1 – PGA

30. Which one of the following is correct?
(a) Blood = Plasma + RBCs + WBCs + Platelets
(b) Plasma = Blood – Lymphocytes
(c) Lymph = Plasma + RBCs + WBCs
(d) Both (b) and (c)

31. A fall in glomerular filtration rate activates
(a) adrenal medulla to release adrenaline
(b) juxtaglomerular cells to release renin
(c) posterior pituitary to release vasopressin
(d) adrenal cortex to release aldosterone.

32. Match the following hormones with their respective disease.

(A) Insulin	(i) Addison's disease
(B) Thyroxine	(ii) Diabetes insipidus
(C) Corticoids	(iii) Acromegaly
(D) Growth hormone	(iv) Goitre
	(v) Diabetes mellitus

Select the correct option.

	(A)	(B)	(C)	(D)
(a)	(ii)	(iv)	(i)	(iii)
(b)	(v)	(i)	(ii)	(iii)
(c)	(ii)	(iv)	(iii)	(i)
(d)	(v)	(iv)	(i)	(iii)

33. Read the given statements and select the option that correctly identifies true and false ones.

(I) The axoplasm inside the axon contains high concentration of K^+ and negatively charged proteins.

(II) The axoplasm inside the axon contains low concentration of Na^+.

(III) The fluid outside the axon contains a low concentration of K^+.

(IV) The fluid outside the axon contains a high concentration of Na^+ and negatively charged proteins.

(a) (I)-True, (II)-False, (III)-False, (IV)-True
(b) (I)-True, (II)- True, (III)-False, (IV)- False
(c) (I)-True, (II)- True, (III)- True, (IV)- False
(d) (I)- False, (II)- True, (III)-False, (IV)- False

34. In the given figure, identify the structure correctly with specific feature and function.

(a) A-actin filament with active site on G-actin
(b) B-troponin- makes coils around actin
(c) C- tropomyosin- masks the active site of F- actin
(d) C-troponin- masks the active site of F-actin

35. Melatonin is secreted by gland 'X' located on the dorsal side brain. Identify 'X'.

(a) Pineal (b) Hypothalamus
(c) Pituitary (d) Thyroid

36. How many ATP molecules are produced from the complete oxidation of a molecule of acetyl CoA?

(a) 38 ATP (b) 15 ATP
(c) 12 ATP (d) 4 ATP

37. Given below is an incomplete table of hormones, their source glands and one major effect of each on human body. Identify the option representing correct grouping of hormones, its gland and effect.

	Gland	Secretion	Effect on body
(i)	A	Estrogen	Maintenance of secondary sexual characters
(ii)	α-cells of islets of Langerhans	B	Raises blood sugar level
(iii)	Anterior pituitary	C	Oversecretion leads to gigantism

	A	B	C
(a)	Ovary	Glucagon	Growth hormone
(b)	Placenta	Insulin	Vasopressin
(c)	Ovary	Insulin	Calcitonin
(d)	Placenta	Glucagon	Calcitonin

38. The somatic neural system relays impluses from CNS to _____ while autonomic neural system transmits impluses from CNS to _____.

(a) smooth muscles, skeletal muscles
(b) involuntary organs, smooth muscles
(c) involuntary organs, skeletal muscles
(d) skeletal muscles, smooth muscles

39. Spraying of which of the following phytohormones on juvenile conifers helps in hastening the maturity period, that leads to early seed production?

(a) Zeatin (b) Abscisic acid
(c) Indole-3-butyric acid (d) Gibberellic acid

40. If CO_2 concentration increases, which type of plants show better photosynthetic rate and higher productivity?

(a) C_3 plants
(b) C_4 plants
(c) C_3 and C_4 plants equally
(d) Mostly C_4 plants, sometimes C_3 plants

❖❖

Key is published in this issue. Search now! ☺

SELF CHECK

Check your score! If your score is

> 90%	EXCELLENT WORK !	You are well prepared to take the challenge of final exam.
90-75%	GOOD WORK !	You can score good in the final exam.
74-60%	SATISFACTORY !	You need to score more next time.
< 60%	NOT SATISFACTORY!	Revise thoroughly and strengthen your concepts.

No. of questions attempted .....
No. of questions correct .....
Marks scored in percentage .....

Why Government Colleges are Top Choice for MBBS Students?

Just 10 among the first 2,000 NEET rank holders chose private medical colleges and 6 of them went to CMC vellore.

When it comes to choosing a medical college, high-ranking students in the entrance test overwhelmingly prefer government colleges, especially the older and well established ones that also happen to have the lowest annual fees.

That's the conclusion from National Medical Commission's data on over 1 lakh MBBS admissions across India in 2023-24. However, data for admissions to 20 functional AIIMS and JIPMER - altogether 2,269 seats - and four other colleges that account for 420 seats isn't included.

Delhi and Kerala are Top Choices

TOI analysed this mega-set of NEET rank holders to arrive at the median rank (midpoint - 50% of admissions are ranked lower than the median) of admissions to each college.

Government colleges in Delhi have a median rank of 4,597. Kerala, where government college annual fees range from Rs 20,000 to Rs 30,000, and there is no bonded service after MBBS, has the next highest median rank for government colleges (12,592) . Even private medical colleges in Kerala have a relatively high median rank (96,600) as the average fee is less than Rs 7 lakh annually.

In fact, their median rank would be even higher if the deemed university of Amrita School of Medicine in Kochi with an annual fee of Rs 19 lakh is left out.

Calculating Median Rank of a State

Let's take the case of Delhi. Data is available for 1,114 seats in government medical colleges in Delhi. The median rank of the students who got admission into these colleges is 4,597 - meaning, 50% of those who took admission in Delhi scored above this rank, and 50% below. So, the median rank of Delhi is 4,597. Similarly, 1,752 students were admitted into government medical colleges in Kerala. The median rank of those who got admission was 12,592 - which is also Kerala's median rank.

Demand for Cheap Private Colleges

Annual tuition fees in CMC Vellore, Maharaja Agrasen Medical College and MGIMS-Wardha are Rs 52,000, Rs 1.8 lakh and over Rs 1.6 lakh, respectively, the lowest among private colleges. Affordability thus seems to have a very high impact on students' choice.

OPERATION ADMISSION

TOP 10 GOVT COLLEGES BY MEDIAN RANK*		TOP 10 PVT COLLEGES BY MEDIAN RANK	
College Name	**Median rank**	**College Name**	**Median rank**
Maulana Azad Medical College, New Delhi	1,112	Christian Medical College, Vellore	18,832
Institute of Medical Sciences, BHU, Varanasi	1,325	Maharaja Agrasen Medical College, Agroha	20,531
Vardhman Mahavir Medical College & Safdarjung Hospital, Delhi	2,718	Mahatma Gandhi Institute of Medical Sciences, Sevagram, Wardha	23,598
SMS Medical College, Jaipur	2,886	Army College of Medical Sciences, Delhi	25,213
King George Medical University, Lucknow	3,095	KJ Somaiya Medical College & Research Centre, Mumbai	38,067
B J Medical College, Ahmedabad	3,271	Kasturba Medical College, Manipal	40,130
Madras Medical College, Chennai	3,308	Bharatratna Atal Bihari Vajpayee Medical College, Pune	41,008
Seth GS Medical College and KEM Hospital, Mumbai	3,667	Jubilee Mission Medical College & Research Institute, Thrissur	41,081
Government Medical College, Kozhikode, Calicut	3,708	Acharya Shri Chander College of Medical Sciences, Jammu	45,704
University College of Medical Sciences & GTB Hospital Delhi * AIIMS, JIPMER data not included	4,497	M.E.S Medical College, Malappuram, Kerala	45,830

GOVT COLLEGES: HIGH MEDIAN IN MOST STATES	PVT COLLEGES: MEDIAN ABOVE 1 LAKH RANGE
Govt medical colleges in the top 14 states have a median NEET rank higher than 30,000, which shows the bulk of high scoring students opted for them. In only eight states, the median rank at govt colleges slipped below 1 lakh.	The median tank for all private colleges ten together was 2,05,975 - almost six times lower than the overall median rank at Govt colleges. Pvt colleges in only four states-Delhi, Kerala, Jharkhand and J & K- had a median rank higher than 1 lakh.

Bottom Rung can be Very Costly

Rajasthan's private medical colleges have the lowest median rank of 6.38 lakh, behind Puducherry's private colleges (5.96 lakh median rank). However, Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry has the lowest overall median rank (10.4 lakh), behind Pacific Medical College in Udaipur, Rajasthan (8.82 lakh). Yet, these colleges have among the highest fees for MBBS - Rs 23 lakh and Rs 21 lakh per year, respectively, for state quota seats, and in case of Pacific Medical College, Rs 35 lakh per year for management quota seats.

Steep Penalty is a Deterrent

However, fees alone don't determine choice. Assam's government colleges, for example, have low annual tuition fees (Rs 20,000-28,000), but the mainstream perception that they are far away, and the very high penalty of Rs 30 lakh for not doing one year of rural service after graduation, deter top-rankers. In fact, this is true for most government colleges in the North-East. Yet, Haryana with the longest bond of five years, a penalty of Rs 36 lakh, and government college fees of Rs 90,000 per year, has the third highest median rank in government colleges. Clearly, location too is an important factor.

Courtesy : The Times of India

Immunity

- Immunity is the overall ability of the host to fight the disease causing organisms, conferred by the immune system. It is of two types :

Innate Immunity
Non-specific type of defence

Physiological barriers	Physical barriers	Cellular barriers	Cytokine barriers
Acid in (stomach), saliva in (mouth), tears from (eyes)	Skin, mucus coating of epithelium	PMNL-neutrophils, monocytes, NK cells, macrophages	Interferons

Acquired Immunity
Specific type of defence, characterised by memory

Active immunity
It is produced due to contact with pathogen or its antigen and subsequent production of antibodies.

Passive immunity
It occurs when ready-made antibodies are directly given to protect the body against foreign agents, *e.g.*, Colostrum (contains abundant IgA) and fetus receiving antibodies from mother.

Lymphoid Organs

- Primary lymphoid organs : Bone marrow, thymus
- Secondary lymphoid organs : Spleen, lymph nodes, Peyer's patches, appendix, etc.
- **Mucosal Associated Lymphoid Tissue (MALT)** located within the lining of the major tracts (respiratory, digestive and urogenital tracts).

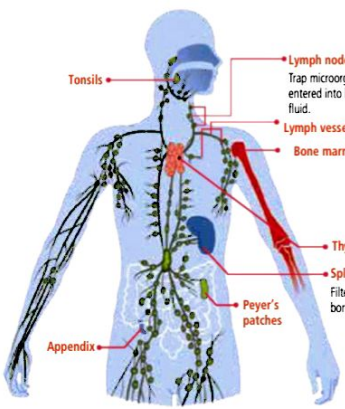
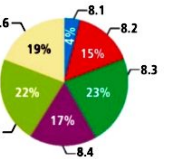


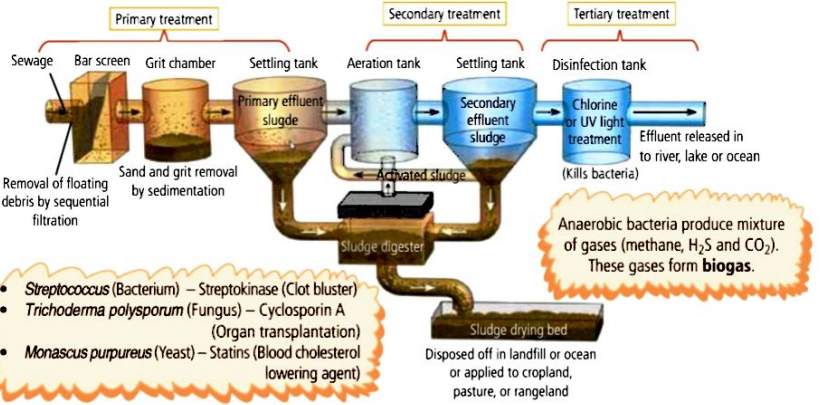
Fig. : Human immune system

B-lymphocytes : Humoral immunity
T-lymphocytes : Cell-mediated immunity



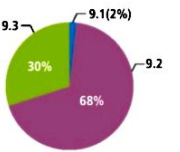
08 Microbes in Human Welfare

Microbes in Sewage Treatment



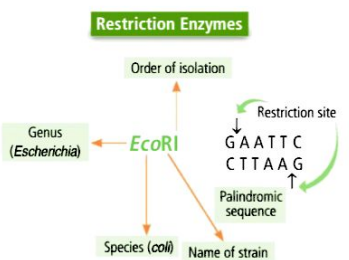
Microbes as Biocontrol Agents

- Ladybird control aphids.
- Dragonflies control mosquitoes.
- *Bt* (*Bacillus thuringiensis*) control butterfly caterpillars.
- *Trichoderma* control plant pathogens.
- Baculoviruses (*Nucleopolyhedrovirus*) control insects and arthropods.



09 Biotechnology : Principles and Processes

Tools of Recombinant DNA Technology



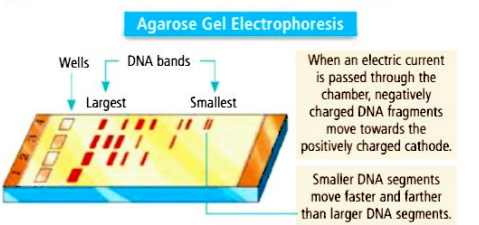


Fig.: A typical agarose gel electrophoresis showing migration of undigested (lane 1) and digested set of DNA fragments (lane 2 to 4)

Cloning Vector

- **Features :** *ori*, selectable marker, single recognition site.
- Presence of DNA insert results into the **insertional inactivation** of the α-galactosidase and the colonies do not produce any colour, these are identified as recombinant colonies.

Competent Host (For transformation with recombinant DNA)

- Heat shock, $CaCl_2$ treatment
- Microinjection
- Biolistics or Gene gun
- Disarmed pathogen vectors

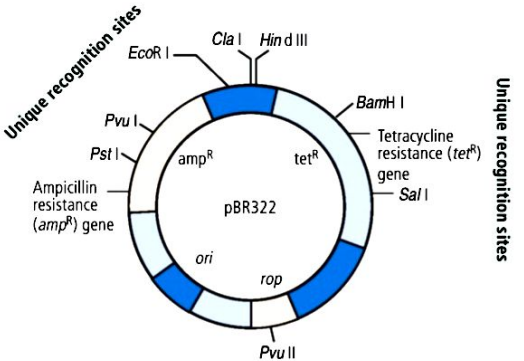


Fig.: *E. coli* cloning vector pBR322 showing restriction sites (*Hind* III, *Eco*R I, *Bam*H I, *Sal* I, *Pvu* II, *Pst* I, *Cla* I), *ori* and antibiotic resistance genes (amp^R and tet^R). *rop* codes for the proteins involved in the replication of the plasmid.

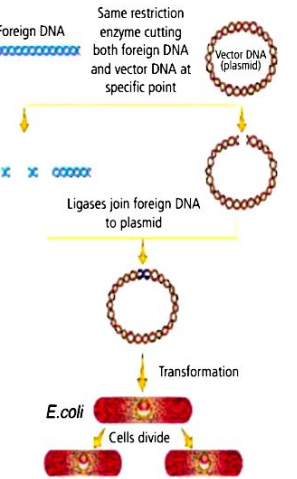


Fig.: Diagrammatic representation of recombinant DNA technology

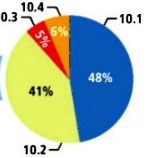
Processes of Recombinant DNA Technology

Polymerase chain reaction

Amplification of DNA *in vitro*.

Steps

Denaturation	Annealing	Extension
High temperature induced separation of two strands of DNA.	Primers (Small chemically synthesised oligonucleotide complementary to regions of DNA) anneal to each of ssDNA.	*Taq* DNA polymerase synthesises the DNA region between the primers, using dNTPs.



10 Biotechnology and its Applications

Biotechnology Applications in Agriculture

Tissue Culture

Plant tissue culture is the technique of maintaining and growing plant cells, tissues or organs, especially on an artificially sterilised nutrient medium, under controlled environmental conditions.

- Proteins produced by *Bt* kill lepidopterans (tobacco budworm, armyworm), coleopterans (beetles) and dipterans (flies, mosquitoes).
  - *cry* I Ac and *cry* II Ab control cotton bollworms.
  - *cry* I Ab control corn borer.

- First transgenic cow (Rosie) → Produced human lactalbumin enriched milk.
- α-1-antitrypsin → Treat emphysema

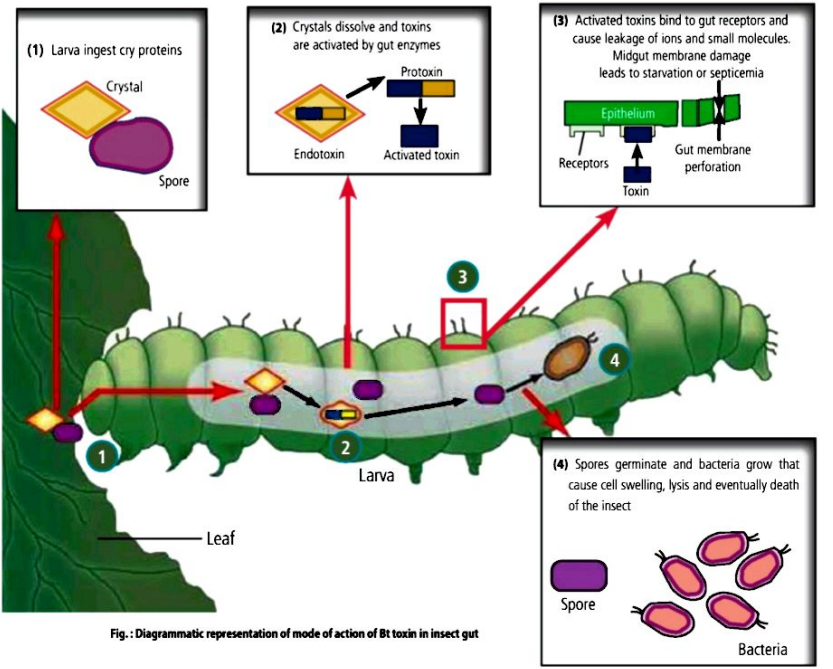
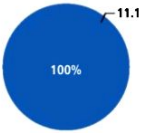


Fig. : Diagrammatic representation of mode of action of Bt toxin in insect gut

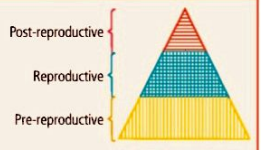


11 Organisms and Populations

Populations

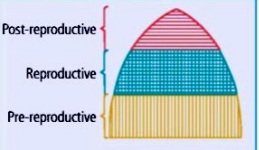
Various types of age pyramid

Triangular Age Pyramid



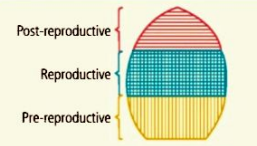
The number of pre-reproductive individuals is very large, number of reproductive individuals is moderate while post-reproductive individuals are fewer.

Bell Shaped Age Pyramid



The number of pre-reproductive and reproductive individuals is almost equal. Post-reproductive individuals are comparatively fewer.

Urn-Shaped Age Pyramid



Proportion of reproductive age group is higher than the individuals in pre-reproductive age group. Number of post-reproductive individuals is also sizeable.

Population growth

Calculation of Birth Rate

Birth rate = New offsprings produced/ Total number of individuals during a specific time interval

Immigration (I)

Number of individuals of the same species that have come into the habitat from elsewhere during the time period.

Natality (B)

Number of births during a given period in the population.

Population Density (N)

Mortality (D)

Number of deaths in the population during a given time period.

Emigration (E)

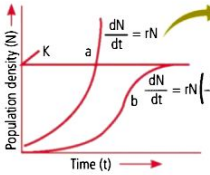
Number of individuals of the population who left the habitat and gone elsewhere during the time period.

Population density at time $t + 1$,

$N_{t+1} = N_t + [(B + I) - (D + E)]$

If $(B + I) > (D + E)$, then population density will increase.

Growth Curve



When resources are not limiting the growth, plot is exponential.

$\frac{dN}{dt} = rN$

$\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$

When resources are limiting the growth, plot is logistic.

Integral form of exponential growth is as follows :

$N_t = N_0 e^{rt}$

where, N_t = Population density after time t,

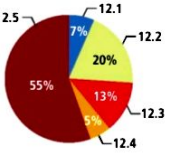
N_0 = Population density at time zero,

r = intrinsic rate of natural increase,

e = base of natural logarithms

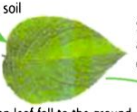
Types of biotic interactions

Interaction	Species A	Species B	Examples
			With positive effect
Mutualism	+	+	Lichens, Mycorrhiza, etc.
			With negative effect
Parasitism	+	–	*Cuscuta*, a parasitic plant
Predation	+	–	Carnivorous animals, insectivorous plants.
Competition	–	–	The Abingdon tortoise in Galapagos Islands became extinct within a decade after goats were introduced on the island, apparently due to the greater browsing efficiency of the goats.
Amensalism	–	Zero	*Penicillium* does not allow the growth of *Staphylococcus* bacterium.

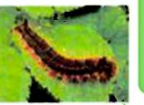


12 Ecosystem

A tree grows in the soil



Some are eaten by insects and other animals. Nutrients and energy enter food web



A green leaf fall to the ground

Leaves partially consumed by decomposers such as fungi and bacteria. They begin to lose form and become litter.

Some nutrients leach into soil by chemical action

Further decomposition by earthworms, bacteria, soil, mites, fungi, etc.

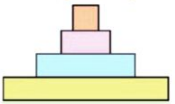
Organic rich soil

- Lignin and chitin rich detritus, low temperature and anaerobiosis slow down decomposition.
- Nitrogen and water soluble substance rich detritus, warm and moist environment favours decomposition.

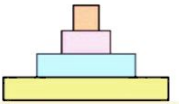
According to Lindeman, only 10% of energy is transferred to each trophic level from the lower trophic level.

Fig. : Diagrammatic representation of decomposition cycle in a terrestrial ecosystem

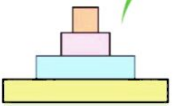
Ecological Pyramids



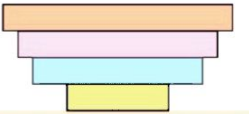
Upright pyramid of numbers in a grassland ecosystem.



Upright pyramid of biomass in terrestrial ecosystem showing a sharp decrease in dry weight at higher trophic levels.



Upright pyramid of energy



Inverted pyramid of biomass in aquatic ecosystem where a small standing crop of phytoplankton supports large standing crop of zooplankton

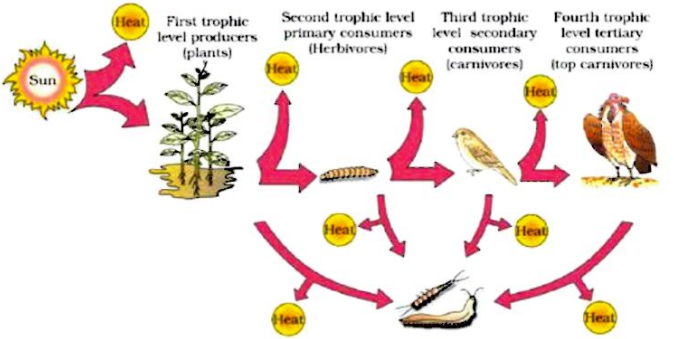
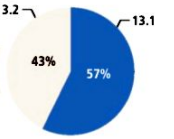


Fig.: Energy flow through different trophic levels



13 Biodiversity and Conservation

Biodiversity

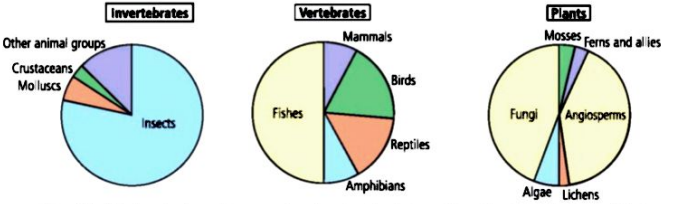


Fig.: Global biodiversity : Proportionate number of species of major taxa of invertebrates, vertebrates and plants.

- Species diversity decreases as we move away from the equator towards the poles.
- Tropical environments, unlike temperate ones, are less seasonal, relatively more constant and predictable.
- More solar energy available in the tropics, which contributes to higher productivity; this in turn might contribute indirectly to greater diversity.

Species– Area Relationship

- German naturalist and geographer Alexander von Humboldt proposed that species richness increases with increasing area, but upto a certain limit.
- Value of Z lies generally in the range of 0.1 to 0.2.
- In large areas like continents, the value of Z is in range of 0.6 – 1.2.
- Z is 1.15 for frugivorous birds and mammals in tropical forests of different continents.

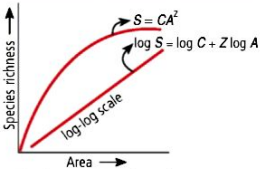
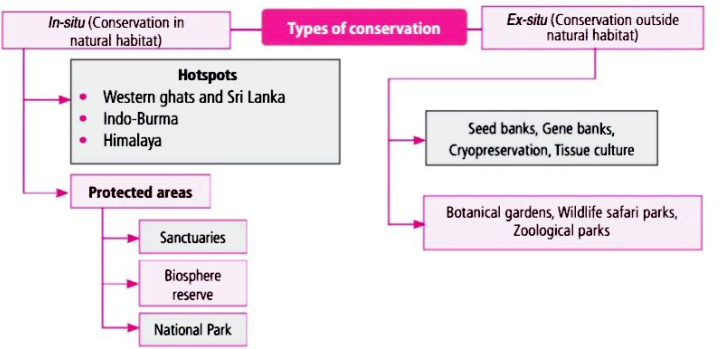


Fig.: Species-area relationship

Causes of Biodiversity Loss

1. Habitat loss and fragmentation
2. Alien species invasion : *Eichhornia*, Nile perch, *Lantana*, *Parthenium*, *Clarias gariepinus*
3. Co-exinction : *E.g.*, Plant-pollinator mutualism
4. Over exploitation : Dodo, Passenger pigeon, Steller's sea cow, Three sub-species of tiger (Bali, Javan, Caspian) got extinct.

Biodiversity Conservation



BIO Digest

This article covers high yield facts of the given topic.

Biodiversity and Conservation

- **Biodiversity** is defined as the occurrence of different types of ecosystems, different species of organisms with the whole range of their variants and genes adapted to different environments along with their processes and interactions.
- The term biodiversity was coined by **W.G. Rosen (1985)** whereas **Edward Wilson (1992)**, a sociobiologist, popularised the term biodiversity.
- According to IUCN (2004), globally total number of known plants and animal species are more than 1.5 million. Some extreme estimates range from 20 to 50 million, but a more conservative and scientifically sound estimate made by Robert May places the global species diversity at about 7 million.
- Biodiversity is generated where there are more heterogeneity such as in tropical rainforests and coral reefs.
- India is one of the **17 megadiversity regions** of the world. India shares 8.1% of total global species diversity.
- India has been divided into ten biogeographical regions (i) Trans Himalayas, (ii) Himalayas, (iii) Desert, (iv) Semi-arid, (v) Western Ghats, (vi) Deccan Peninsula, (vii) Gangetic plain, (viii) North East, (ix) Coasts, (x) Islands.
- More than 70 per cent of all the species recorded are animals, while plants (including algae, fungi, bryophytes, gymnosperms and angiosperms) comprise no more than 22 per cent of the total. Among animals, insects are the most species-rich taxonomic group, making up more than 70 per cent of the total. That means, out of every 10 animals on this planet, 7 are insects. The number of fungi species in the world is more than the combined total of the species of fishes, amphibians, reptiles and mammals.

LEVELS OF BIODIVERSITY

- Diversity helps in producing more productive and stable ecosystems which can tolerate various stresses. Biodiversity has three inter-related hierarchical levels.

(i) **Genetic diversity :** The diversity in the numbers and types of genes as well as chromosomes present in different species and the variations in the genes and their alleles in the same species. The genetic variation shown by the medicinal plant *Rauwolfia vomitoria* growing in different Himalayan ranges might be in terms of the potency and concentration of the active chemical (reserpine) that the plant produces. India has more than 50,000 genetically different strains of rice, and 1,000 varieties of mango.

(ii) **Species diversity :** The variety in the number and richness of the species of a region. The number of the species per unit area is called **species richness**. Number of individuals of different species represent **species evenness** or **species**

equitability. For example, the Western Ghats have a greater amphibian species diversity than the Eastern Ghats.

(iii) **Ecological diversity :** It is the variety of forms in the ecosystem due to diversity of niches, trophic levels, energy flow, food webs, etc. India with its deserts, rain forests, mangroves, coral reefs, wetlands, estuaries, and alpine meadows has a greater ecosystem diversity than a Scandinavian country like Norway.

PATTERNS OF BIODIVERSITY

Latitudinal Gradients

- Barring arid/semi-arid and aquatic habitats, biodiversity shows latitudinal and altitudinal gradients.
- Species diversity decreases from the equator towards the poles (from low to high latitudes).
- Tropics, having a latitudinal range of 23.5°N - 23.5°S, are home for more species in comparison to temperate or polar regions.
- Amazon rainforest situated in South America has the maximum biodiversity on earth.
- The reasons for higher tropical diversity are:

(i) Tropical latitudes have **remained undisturbed** for millions of years allowing species to evolve and flourish unlike temperate areas that have undergone frequent glaciations.

(ii) **Favourable environment** and relatively constant and predictable climate promoted more niche specialisation and thus, more diversity.

(iii) Higher productivity due to **more solar energy available** in the tropics is related to greater diversity.

(iv) Reduced competition due to favourable environment and high resource availability, resulted in more diversity.

Species-Area Relationship

- **Alexander von Humboldt** proposed that species richness increases with increasing area but upto a certain limit.
- The relationship between species richness and area turned out to be a **rectangular hyperbola** for wide variety of taxa.
- On a logarithmic scale, the relationship is a straight line described by the equation; $\log S = \log C + Z \log A$

  where, S = Species richness, A = Area, Z = Slope of the line **(regression coefficient)** and C = Y-intercept

- Value of Z is generally in the range of 0.1 to 0.2 irrespective of the taxonomic group or region except for very large areas like continents, where the value of Z is in range of 0.6 – 1.2.

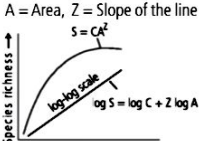


Fig.: Species-area relationship

- For frugivorous (fruit-eating) birds and mammals in the tropical forests of different continents, the slope (Z) is found to be 1.15.

IMPORTANCE OF BIODIVERSITY TO THE ECOSYSTEM

- The maintenance of biodiversity is important because of the following reasons :
  - Biodiversity is essential for stability of an ecosystem.
  - Biodiversity serves as source of food and provides source material for new improved varieties.
  - Various products of human use can be obtained from rich biodiversity, *e.g.*, gums, resins, dyes, paper, fibres, etc.
  - Various plant species provide different drugs and medicines, *e.g.*, quinine from *Cinchona*, taxol from *Taxus*, etc.
  - Different animal species are used for biological and medical research.
- Importance of species diversity to ecosystem can be explained by various hypotheses such as:
  - **Productivity-stability hypothesis :** David Tilman found that areas with more species showed less year to year variation in total biomass. He experimentally showed that, increased diversity contributed to higher productivity.
  - **Rivet popper hypothesis :** According to this hypothesis proposed by Stanford ecologist **Paul Ehrlich** (1981), the relationship between species richness and ecosystem functioning is non-linear, but may follow a variety of possible trajectories. The loss of a few species (or rivets holding together an aeroplane) will initially create no problem, but beyond a certain point losses will cause catastrophic effect.
- Biodiversity in ecosystem provides services without which humans cannot survive. These include soil fertility, pollinators of plants, predators, decomposition of wastes, purification of the air and water, stabilisation and moderation of the climate, decreasing floods, droughts and other environmental disasters.
- **Keystone species** are the crucial species that determine the capacity of large number of species to persist in a community. Protection of keystone species is a priority in conservation efforts, as many important species depend on keystone species for food, reproduction and some other basic needs. Thus, if a keystone species is lost from a conservation area, numerous other species might be lost as well.

Intext Practice Questions

1. **Write the level of biodiversity represented by a mangrove. Give another example falling in the same level.**
2. **How did Dr. David Tilman relate experimentally, the stability of a community and its species richness?**

IUCN AND RED DATA BOOK

- **IUCN (International Union of Conservation of Nature and Natural Resources)** is now known as **World Conservation Union (WCU)**. Its headquarters are situated at Gland, Switzerland.
- A **red data book** or **red list** is maintained at WCU which is a catalogue of taxa facing risk of extinction.
- To highlight the legal status of rare species for the purpose of conservation, IUCN has earlier (1963, 84, 88) established the five main conservation categories. These are **extinct, endangered, vulnerable, rare** and **insufficiently known species.**
- The purpose of preparation of red list is to:
  - Provide awareness to the degree of threat to biodiversity
  - Provide global index about already declined biodiversity
  - Identify and document the number of species facing high-risk of extinction
  - Prepare conservation priorities and help in conservation action

LOSS OF BIODIVERSITY

- The most serious aspect of the loss of biodiversity is the **extinction of species**. Extinction is of three types – natural extinction, mass extinction and anthropogenic extinction.

(i) **Natural or background extinction** is a slow process of replacement of existing species with the better adapted species due to alternate evolution, changes in environmental conditions, predators and diseases.

(ii) Earth has experienced five **mass extinctions** due to environmental catastrophes.

(iii) **Anthropogenic extinctions** are extinctions abetted by human activities like settlements, hunting, over exploitation and habitat destruction.

- Loss of biodiversity in a region may lead to

(a) decline in plant production,
(b) lowered resistance to environmental perturbations such as drought and
(c) increased variability in certain ecosystem processes such as plant productivity, water use, and pest and disease cycles.

Causes of Biodiversity Losses

- There are four major causes – the **evil quartet :**

(i) **Habitat loss and fragmentation** causes serious effects such as microclimatic changes in light, temperature, wind, etc. The most subtle form of habitat degradation is environmental pollution.

(ii) Increasing human population has escalated the use of natural resources. Many animals (Steller's sea cow, passenger pigeon) have become extinct in the last 500 years due to **over exploitation** by humans.

(iii) Non-native or **alien species** often become invasive and drive away the local species. **Water hyacinth** (*Eichhornia crassipes*) was introduced in Indian waters to reduce pollution. It has clogged water bodies including wetlands at many places resulting in death of several aquatic plants and animals. The Nile perch introduced into Lake Victoria in east Africa led eventually to the extinction of an ecologically unique assemblage of more than 200 species of cichlid fish in the lake. The recent illegal introduction of the African catfish *Clarias gariepinus* for aquaculture purposes is posing a threat to the indigenous catfishes in our rivers. Other invasive alien species are invasive weed species like carrot grass (*Parthenium*) and *Lantana*.

(iv) Certain obligatory mutualistic relationships exist in nature, *e.g.*, *Pronuba yuccasella* and *Yucca*. Extinction of one will automatically cause extinction of the other. This is known as **co-extinction**.

CONSERVATION OF BIODIVERSITY

- The maintenance of a high level of biodiversity is important for the stability of ecosystems. Thus, there are **three main reasons** to conserve the biological diversity which can be grouped in three categories :

(i) **Narrowly utilitarian** (useful human products like food, fibres, drugs and medicine, etc.) with increasing resources put into 'bioprospecting' (exploring molecular, genetic and species-level diversity for products of economic importance), nations endowed with rich biodiversity can expect to reap enormous benefits.

(ii) **Broadly utilitarian** (ecosystem services like provision of pollinators, climate regulation, flood and erosion control, ecological balance through nutrient cycling, etc.). There are other intangible benefits – that we derive from nature– the aesthetic pleasures of walking through thick woods, watching spring flowers in full bloom or waking up to a bulbul's song in the morning.

(iii) **Ethical** (every living species has an intrinsic value though it may not have any direct economic value, and also, every species has a right to live).

Conservation Strategies

- It is of two types :

I. In-situ conservation

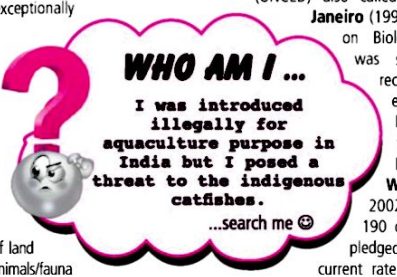
- *In situ* (on site) is conservation and protection of the whole ecosystem and its biodiversity at all levels in order to protect the threatened species. Two methods are being used to save biodiversity, hotspots and protected areas.

– **Hotspots** - Biodiversity **hotspots** are the areas characterised by very high levels of **species richness**, high degree of **endemism** and also accelerated **habitat loss**. Ecologically hotspots are determined by four factors as: number of species/species diversity; degree of endemism; degree of threat to habitat due to its degradation and fragmentation; degree of exploitation. Total number of biodiversity hotspots in the world to 36. These hotspots are also regions of accelerated habitat loss. Three of these hotspots – Western Ghats and Sri Lanka, Indo-Burma and Himalaya – cover our country's exceptionally high biodiversity regions.

– **Protected areas**

(i) **National parks** - These are large areas meant for the protection of flora and fauna and are maintained for scientific, educational and recreational use. They are not usually used for commercial extraction of resources.

(ii) **Sanctuaries** - These are tracts of land with or without lake where wild animals/fauna can take refuge without being hunted.



(iii) **Biosphere reserves** - These are multipurpose protected areas which are meant for preserving genetic diversity in representative ecosystems of various natural biomes and unique biological communities.

(iv) **Sacred forests and lakes (= sacred groves)**- These are forest patches around places of worship which are held in high esteem by tribal communities. *E.g.*, Aravalli (Rajasthan), Khasi and Jaintia hill (Meghalaya), Western Ghat regions (Karnataka and Maharashtra) and the Sarguja, Chanda and Bastar areas (Madhya Pradesh).

II. Ex-situ conservation

- It is the conservation of threatened plants and animals outside their natural habitats. These include offsite collections and gene banks.
- **Offsite collections** are live collections of wild and domesticated species in botanical gardens, zoological parks, wildlife safari parks, arboreta, etc.
- **Gene banks** are institutes that maintain stocks of viable seeds (seed banks), tissue culture and frozen germplasm (cryopreservation) with the whole range of genetic variability.

International Efforts for Biodiversity Conservation

- Several international treaties and conventions engaged in conservation of biodiversity are as follows:

United Nations conference on Environment and Development (UNCED) also called **Earth Summit** at **Rio de Janeiro** (1992), Brazil, promoted Convention on Biological Diversity (CBD) which was signed by 152 nations. Its recommendations came into effect on 29th December 1993. India became a signatory to this Convention on Biological Diversity in May, 1994. A second **World Summit** was held in 2002 in Johannesberg, South Africa. 190 countries attending the Summit pledged to significantly reduce the current rate of biodiversity loss at global, regional and local levels by the year 2010.

Intext Practice Questions

3. **Give reasons why there is a need to conserve biodiversity.**
4. **What do you mean by offsite collection?**
5. **Why are sacred groves highly protected?**

CBSE warm-up!

Exam on 19th March

CLASS-XII

Practice paper for CBSE Exams as per the latest pattern and rationalised syllabus by CBSE for the academic session 2023-24.

Practice Paper 2023-24

GENERAL INSTRUCTIONS

(i) All questions are compulsory.
(ii) The question paper has five sections and 33 questions.
(iii) Section–A has 16 questions of 1 mark each; Section–B has 5 questions of 2 marks each; Section– C has 7 questions of 3 marks each; Section– D has 2 case-based questions of 4 marks each; and Section–E has 3 questions of 5 marks each.
(iv) There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
(v) Wherever necessary, neat and properly labelled diagrams should be drawn.

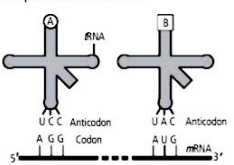
Time Allowed : 3 hours **Maximum Marks : 70**

SECTION-A

1. Which of the following options has a haploid (n), diploid (2n) and triploid (3n) structures respectively?
   (a) Egg, zygote and endosperm
   (b) Egg, endosperm and nucellus
   (c) Antipodals, synergids and integuments
   (d) Endosperm, nucellus and egg

2. A primary spermatocyte which is in metaphase of first meiotic division have 2n = 16. What shall be the total number of chromatids in each of the secondary spermatocyte?
   (a) 16 (b) 24
   (c) 32 (d) 8

3. Consider the given diagram of *t*RNA and select the right choice with respect to amino acid.



	A	B
(a)	Arg	Met
(b)	Pro	Tyr
(c)	Ser	Arg
(d)	Leu	Tyr

4. In ZW - ZZ type of sex determination,
   (a) male is heterogametic, female is homogametic
   (b) female is heterogametic, male is homogametic
   (c) both male and female are heterogametic
   (d) both male and female are homogametic.

5. The Hardy-Weinberg principle cannot operate if
   (a) does not migrate for a longtime to a new habitat
   (b) frequent mutations occur in the population
   (c) the population has no chance of interaction with other populations
   (d) free interbreeding occurs among all members of the population.

6. If the Neanderthals are not the direct ancestors of humans, is it still possible for humans and Neanderthals to be related?
   (a) Yes, because we share a common ancestor.
   (b) Yes, but only if humans and Neanderthals could have interbred.

(c) No, because the human evolutionary tree is strictly linear and without branches.
(d) No, because this means that Neanderthals evolved from an entirely different branch of organisms than humans did.

7. If the total amount of adenine and thymine in a double stranded DNA is 55%, the amount of guanine in this DNA will be
(a) 45% (b) 27.5%
(c) 25% (d) 22.5%.

8. Study the given table and identify X, Y and Z.

Blood group phenotype	Genotype	Antigen	Antibody
O	**X**	–	a, b
B	I^Bi	**Y**	a
AB	I^AI^B	A, B	**Z**

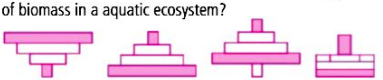
	X	Y	Z
(a)	I^Ai	b	a
(b)	*ii*	b	A
(c)	*ii*	B	Absent
(d)	I^Ai	A	b

9. Statin, a blood-cholesterol lowering agent, is commercially obtained from
(a) *Trichoderma polysporum*
(b) *Acetobacter aceti*
(c) *Clostridium butylicum*
(d) *Monascus purpureus*.

10. Identify the palindromic sequence in the following.
(a) $\frac{GAATTC}{CTTUUG}$ (b) $\frac{GGATCC}{CCTAGG}$
(c) $\frac{CCTGG}{GGACC}$ (d) $\frac{CGATA}{GCTAA}$

11. Tissue culture technique can produce infinite number of new plants from a small parental tissue. The economic importance of the technique is in raising
(a) genetically uniform population identical to the original parent
(b) homozygous diploid plants
(c) new species
(d) variants through picking up somaclonal variations.

12. Which of the following representations shows the pyramid of biomass in a aquatic ecosystem?



(a) D (b) A
(c) B (d) C

Q. No. 13 to 16 consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true and R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

13. **Assertion :** Ex-albuminous seeds do not possess any residual endosperm, as it is completely consumed during embryo development.
Reason : Wheat, castor, pea and groundnut all are examples of ex-albuminous seeds.

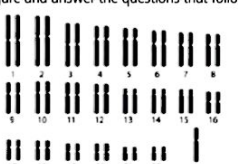
14. **Assertion :** In eukaryotes, replication and transcription occur in the cytoplasm but translation occurs in the nucleus.
Reason : *m*RNA is transferred from the nucleus to the cytoplasm where ribosomes and amino acids are available for protein synthesis.

15. **Assertion :** Autoimmune disorder is a condition where body defense mechanism recognises its own cells as foreign bodies.
Reason : Rheumatoid arthritis is a condition where body does not attack self cells.

16. **Assertion :** *Eco*RI cuts between the DNA bases A and T when the sequence in DNA is GAATTC.
Reason : *Eco*RI produces sticky ends.

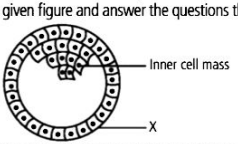
SECTION-B

17. The given figure shows karyotype of a child who is suffering from a chromosomal abnormality which occurs due to failure of segregation of chromatids during cell division cycle. This results in the gain or loss of a chromosome (s), called aneuploidy. Study the figure and answer the questions that follow :



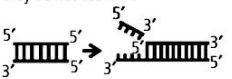
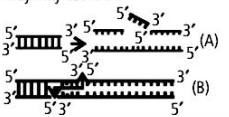
(a) Identify the disease from the given karyotype.
(b) Write the chromosomal complement of the child.

18. Refer to the given figure and answer the questions that follow :



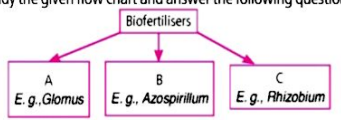
(a) Name the stage of human embryo the figure represents. Identify 'X' in the figure and mention its functions.
(b) Where are the stem cells located in this figure?

19. The table given below indicates the differences between two enzymes X and Y.

	X	Y
(i)	These nucleases cleave base pairs of DNA at their terminal ends.	They cleave DNA at any point except the terminal ends.
(ii)	They act on single strand of DNA or gaps in double stranded DNA.	They cleave one strand or both strands of double stranded DNA.
(iii)	They do not cut RNA. 	They may cut RNA. 

(a) What could be enzymes 'X' and 'Y' here?
(b) Give an example of any two enzymes that belongs to Y.

20. Study the given flow chart and answer the following questions.



(a) Identify A, B and C.
(b) Give one another example of biofertiliser B.
(c) How does the application of the fungal genus, ***Glomus***, to the agricultural farm increase the farm output?

21. Why is earthworm considered a farmer's friend? Explain humification and mineralisation occurring in a decomposition cycle.

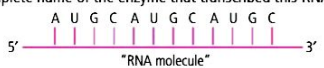
OR

Why the pyramid of energy is always upright? Explain.

SECTION-C

22. Medically it is advised to all young mothers that breast feeding is the best of their newborn babies. Do you agree? Give reasons in support for your answer.

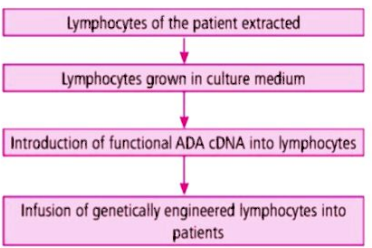
23. Construct and label a transcription unit from which the RNA segment given below has been transcribed. Write the complete name of the enzyme that transcribed this RNA.



24. (a) Can a bisexual flowering plant in Mumbai be pollinated by pollen grains of the same species growing in New Delhi? Provide explanations to your answer.

(b) Draw the diagram of pistil where pollination has successfully occurred. Label the parts involved in transferring the male gametes to their desired destination.

25. The clinical gene therapy is given to a 4-years old patient for an enzyme which is crucial for the immune system to function. Observe the given flow chart of gene therapy and answer the following questions.



(a) Identify the disease to be cured with gene therapy.
(b) Why the method shown is not a complete solution to the problem?
(c) Mention a possible permanent cure for this disease.

26. (a) Rearrange the following in the correct order of their appearance on earth between two million years to 40,000 years back.
Neanderthals, ***Australopithecines***, ***Homo erectus*** and ***Homo habilis***.
(b) Which one of the above
(i) had the largest brain size
(ii) ate fruits?

27. A person gave blood at a blood donation camp where the nurse recklessly injected used syringe. After that, he suffered from bouts of fever, diarrhoea and weight loss and experienced weakness. The levels of helper T-lymphocytes and interferons showed significant change. Doctor suggested he was suffering from severe viral infection.

(a) (i) Name the diagnostic test for the given condition.
(ii) Name the virus and enzyme responsible for its replication.

(b) Mention two measures for preventing this viral infection.

(c) Name the cells of immune system of body that are affected by this infection. Also, mention its role.

OR

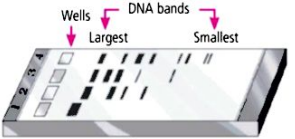
State the role of thymus as a lymphoid organ. Name the cells that are released from it and mention their function.

28. The sacred groves of Aravalli Hills and Ooty botanical garden both aim at biodiversity conservation. How do they differ in their approaches? Explain.

SECTION-D

Q. No. 29 and 30 are case based questions. Each question has 3 subparts with internal choice in one subpart.

29. Refer to the below mentioned diagram showing a technique X that helps in separating the DNA fragments formed by the use of restriction endonuclease.



'X'

(a) What is technique 'X' here?

OR

In this figure, what can be understood from the lanes 1, 2, 3 and 4?

(b) How are separated DNA fragments visualised in technique 'X'?

(c) Name the material used as matrix in technique 'X' and mention its role.

30. Population interaction is the interaction between different populations. There is no natural habitat on earth *i.e.*, inhabited by single species.
Refer to the given table that represents the interaction between organism 1 and organism 2.

Effect on organism 1		Effect on Organism 2		
		Benefit	Harm	No Effect
	Benefit	A	B	Commensalism
	Harm	Parasitism	C	Amensalism
	No effect	Commensalism	Amensalism	–

(a) Identify the types of interaction A, B and C.

OR

Which type of interaction is shown by mycorrhizae?

(b) (i) Which type of interaction is being shown in the given figure?

(ii) Define 'C' with the help of the examples.

(c) 'A' is positive interaction while 'B' and 'C' are negative interactions. Comment.

SECTION-E

31. Reproductive and Child Health Care (RCH) Programmes are currently in operation. One of the major tasks of these programmes is to create awareness amongst people about the wide range of reproduction related aspects as this is important and essential for building a reproductively healthy society.

(a) "Providing sex education in schools is one of the ways to meet this goal." Give four points in support of your opinion regarding this statement.

(b) List any two 'indicators' that indicate a reproductively healthy society.

Form IV

1.	Place of Publication	: New Delhi
2.	Periodicity of its Publication	: Monthly
3.	Printer's Name	: HT Media Ltd.
3a.	Publisher's Name	: MTG Learning Media Pvt. Ltd.
	Nationality	: Indian
	Address	: 406, Taj Apartment, New Delhi - 110029
4.	Editor's Name	: Anil Ahlawat
	Nationality	: Indian
	Address	: 19, National Media Centre, Gurugram, Haryana - 122002
5.	Name and address of individuals who own the newspapers and partners or shareholders holding more than one percent of the total capital	: Mahabir Singh Ahlawat 64, National Media Centre, Nathupur, Gurugram : Krishna Devi 64, National Media Centre, Nathupur, Gurugram : Anil Ahlawat & Sons 19, National Media Centre, Nathupur, Gurugram : Anil Ahlawat 19, National Media Centre, Nathupur, Gurugram

I, Mahabir Singh, authorised signatory for MTG Learning Media Pvt. Ltd. hereby declare that particulars given above are true to the best of my knowledge and belief.

For MTG Learning Media Pvt. Ltd.
Mahabir Singh
Director

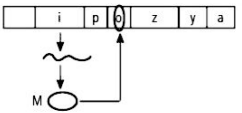
OR

A large number of married couples over the world are childless. It is shocking to know that in India the female partner is often blamed for the couple being childless.

(a) State any two possible reasons for the cause of infertility.

(b) Suggest an ART that can help the couple to have a child where the problem is with male partner.

32. Refer to given figure showing regulation of gene expression in *E.coli* and answer the following questions.



(a) Name the molecule 'M' that binds with the operator.

(b) Mention the result of such binding.

(c) What will prevent the binding of the molecule 'M' with the operator gene? Mention the event that follows.

OR

(a) Dihybrid cross between two garden pea plant, one homozygous tall with round seeds and the other dwarf with wrinkled seeds was carried.

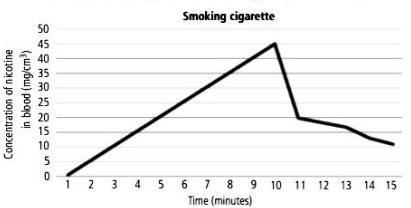
(i) Write the genotype and phenotype of the F_1 progeny obtained from this cross.

(ii) Give the different types of gametes of the F_1 progeny.

(iii) Write the phenotypes and its ratios of the F_2 generation obtained in this cross along with the explanation provided by Mendel.

(b) How were the observations of F_2 progeny of dihybrid crosses in *Drosophila* by Morgan different from that of Mendel carried in pea plants? Explain giving reasons.

33. Refer to the given graph representing, the concentration of nicotine smoked by a smoker taking 10 puffs/ minute.



(a) What will be the concentration of nicotine in blood at 10 minutes. How will this affect the concentration of carbon monoxide and haembound oxygen at 10 minutes?

(b) What is the harmful impacts of cigarette smoking?

(c) "Cigarette smoking causes lung cancer and emphysema". Justify this statement.

OR

Describe the asexual and sexual phases of life cycle of *Plasmodium* that causes malaria in humans.

SOLUTIONS

1. **(a) :** In angiospermic plants, one male gamete (n) moves towards the egg cell (n) and fuses with its nucleus, which results in the formation of zygote (2n). The other male gamete moves towards the two polar nuclei of the central cell and fuses with them to produce a triploid endosperm (3n).

2 **(a) :** Secondary spermatocyte contains half the number of chromosomes, *i.e.*, 8. Each chromosome has 2 chromatids, therefore, 8 chromosomes will have 16 chromatids in all.

3. **(a)**

4. **(b) :** In birds, sex determination is of ZW-ZZ type. In this type, males are homogametic and have ZZ sex chromosomes and females are heterogametic with ZW pair of sex chromosome.

5. **(b)**

6. **(a)**

7. **(d) :** According to the Chargaff's rule,

$A = T$ and $G = C$

$A + G = T + C$

$A + T = 55\%$

So, $A = 27.5$ then $T = 27.5\%$

$G + C = 100 - 55\% = 45\%$

$G = C = 22.5\%$

8. **(c)**

9. **(d) :** Statins produced by the yeast *Monascus purpureus* have been commercialised as blood cholesterol lowering agents. Statins act by competitively inhibiting the enzyme responsible for synthesis of cholesterol.

10. **(b) :** The palindromes in DNA are base pair sequences that

MONTHLY TEST DRIVE CLASS XII ANSWER KEY

1.	(b)	**2.**	(a)	**3.**	(b)	**4.**	(a)	**5.**	(b)
6.	(c)	**7.**	(a)	**8.**	(b)	**9.**	(a)	**10.**	(b)
11.	(a)	**12.**	(d)	**13.**	(d)	**14.**	(d)	**15.**	(a)
16.	(a)	**17.**	(a)	**18.**	(d)	**19.**	(b)	**20.**	(c)
21.	(b)	**22.**	(d)	**23.**	(d)	**24.**	(b)	**25.**	(c)
26.	(d)	**27.**	(c)	**28.**	(d)	**29.**	(d)	**30.**	(b)
31.	(c)	**32.**	(d)	**33.**	(c)	**34.**	(a)	**35.**	(a)
36.	(d)	**37.**	(a)	**38.**	(b)	**39.**	(a)	**40.**	(d)

are the same when read forward (left to right) or backward (right to left) from a central axis of symmetry.

Thus, $\frac{GGATCC}{CCTAGG}$ is a palindromic sequence.

11. (a) : Micropropagation is used for rapid vegetative multiplication of plants. As the size of the propagule is minute, thus the technique is named micropropagation. Each, such plant, will be genetically identical to the parent plant.

12. (b)

13. (c) : Pea and groundnut have ex-albuminous seeds while wheat and castor have albuminous seeds.

14. (d)

15. (c) : Rheumatoid arthritis (RA) is a result of auto-immune reaction. In RA, immune system mistakenly attacks healthy self cells in our body, causing inflammation, painful swelling in the affected parts of the body.

16. (d) : *Eco*RI cuts between the DNA bases G and A when the sequence in DNA is GAATTC.

17. (a) The karyotype shown is of Turner syndrome.

(b) Genotype of the child is 44 + XO *i.e.*, 2n = 45 chromosomes.

18. (a) The given figure represents blastocyst stage of human embryo.

X is trophoblast. It helps in attachment of the blastocyst to the endometrium of uterine wall, provides nutrition to the developing embryo and later forms extra embryonic membranes namely, chorion and amnion and parts of placenta.

(b) The stem cells are located in the inner cell mass.

19. (a) Enzymes 'X' and 'Y' are exonucleases and endonucleases respectively.

(b) Two examples of endonucleases (Y) are *Eco*RI and *Hin*dIII.

20. (a) In the given flow chart, A represents mycorrhiza, B represents free-living nitrogen fixing bacteria and C represents symbiotic nitrogen fixing bacteria.

(b) *Azotobacter* is free living nitrogen fixing bacteria.

(c) Many members of the genus *Glomus* form symbiotic associations with plants to form mycorrhiza. *Glomus* helps to absorb phosphorus from soil and passes it to the plant. Plants having such associations show other benefits also, such as resistance to root-borne pathogens, tolerance to salinity and drought and an overall increase in plant growth and development. Therefore, *Glomus* increases the farm yield.

21. Earthworms are called farmer's friend because they help in fragmentation of detritus, *i.e.*, breakdown of complex organic matter and loosening of the soil.

Humification and mineralisation occur during decomposition in the soil. Humification is the process of formation of highly resistant, dark coloured amorphous substance called humus from detritus or organic remains. Mineralisation is the release of inorganic substances, both non-mineral and minerals from organic matter.

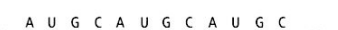
OR

The pyramid of energy is always upright in shape as there is always a gradual decrease in the energy content at successive trophic levels from producers to various consumers. This is because some energy is used at each trophic level for various metabolic activities and some energy is lost as heat, so only 10% of the energy is available to the next trophic level (Lindeman's 10% law).

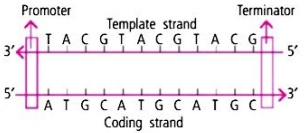
22. Yes, I agree that all young mothers must breast-feed their newborn babies to provide best nourishment to them. Mammary glands start producing milk at the end of pregnancy. The milk produced by the mammary glands of mother during initial days after child birth, is called colostrum. It is rich in proteins (lactalbumin and lactoprotein) and various other nutrient like fat, casein (milk protein), lactose (milk sugar), mineral salts (sodium, calcium, potassium, phosphorus, etc.) and vitamins that are necessary for development of the child. It also contains certain antibodies (IgA), which provide passive immunity to the baby. This milk helps in developing resistance to disease for newborn babies. It helps the baby to fight from viruses and bacteria. It is also easily digested by the baby with no constipation or diarrhoea.

23. RNA segment that has been transcribed from a transcription unit which has the polarity (5′ → 3′) have uracil in the place of thymine.

Given RNA strand :



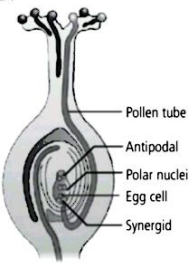
For the given RNA, the transcription unit is given as:



DNA dependent RNA polymerase is an enzyme that transcribed the given RNA segment.

24. **(a)** Yes, a bisexual flowering plant in Mumbai can be pollinated by pollen grains of the same species of flower growing in New Delhi. This can be done by preserving the pollen grains in liquid nitrogen (–196°C) and bringing them from New Delhi to Mumbai. Now, with the help of artificial hybridisation techniques, the pollen grains are dusted over the pistil to complete the process of pollination.

(b) Longitudinal section of pistil showing the parts involved in transferring the male gametes to desired destination is shown ahead :



25. (a) Adenosine deaminase (ADA) deficiency can be cured with gene therapy.
(b) As genetically engineered lymphocytes are not immortal, the patient requires periodic infusion of cells.
(c) If the gene isolated from bone marrow cells producing ADA is introduced into cells at early embryonic stage, then it could be a permanent cure.

26. (a) *Australopithecus* → *Homo habilis* → *Homo erectus* → Neanderthals
(b) (i) Neanderthals (ii) *Australopithecus*

27. (a) (i) The given condition could be AIDS and it can be diagnosed by enzyme linked immuno sorbent assay (ELISA).
(ii) HIV is a member of a group of viruses called retrovirus which have an envelope enclosing the RNA genome. Reverse transcriptase catalyses replication of viral RNA to viral DNA in host cell.
(b) (i) Ensuring the use of only fresh needles or syringe.
(ii) Screening blood before transfusion.

(c) HIV attacks helper T-lymphocytes, (also called CD_4 cell, *i.e.*, cluster of differentiation), due to which there is reduction in their number. Helper T-cells stimulate antibody production by B-cells. This result in loss of natural defence against viral infection.

OR

Thymus is a primary lymphoid organ where the maturation of T-lymphocytes takes place. Thymus is quite large in size at the time of birth but it atrophies with age.
T-lymphocytes are released from thymus. These cells provide cell-mediated immunity and defend against pathogens including protists and fungi that enter the cells.

28. Sacred groves are undisturbed forest patches, surrounded by highly degraded landscapes where not even a single branch of tree is allowed to be cut. As a result, many endemic species which are rare or have become extinct, seen to flourish here. While botanical gardens are areas where many species of plants, are conserved outside their natural habitats. They help to restore endangered species, whose chances of survival are very small. Thus, sacred groves of Aravalli Hills are sites of ***in-situ*** conservation, where endangered species are protected in their natural habitat whereas Ooty Botanical gardens are sites of ***ex-situ*** conservation, where the endangered species are protected outside their natural habitats.

29. **(a)** Technique 'X' is gel electrophoresis which is used for the separation of DNA fragments.

OR

Lane 1 shows migration of undigested DNA fragments and lanes 2-4 show migration of digested set of DNA fragments.

(b) The separated DNA fragments can be visualised only after staining the DNA with a compound known as ethidium bromide followed by exposure to UV radiation. The separated DNA fragments can be seen as bright orange coloured bands.

(c) Most commonly used matrix in DNA gel electrophoresis(X) is agarose. It provides sieving effect for separation of DNA fragments according to their size.

30. **(a)** In the give table, A- Mutualism, B- Predation/Parasitism, C – Competition.

OR

Mycorrhizae are associations between fungi and the roots of higher plants. The fungi help the plant in the absorption of essential nutrients from the soil while the plant in turn provides the fungi with energy-yielding carbohydrates. Thus, they show mutualism.

(b) (i) Predation is an interaction between members of two species in which members of one species capture, kill and eat up members of other species. The former are called predators and the latter are called preys.

(ii) Competition, *i.e.*, C is an interaction between two species belonging to either the same species or different species with the same needs. In this type of interaction, both the species suffer. For *e.g.*, The Abingdon tortoise in Galapagos Islands became extinct within a decade after goats were introduced on the island, apparently due to the greater browsing efficiency of the goats.

(c) Mutalism (A) is positive interaction in which no organism is harmed and both organisms are benefitted.

Predation/Parasitism (B) and Competition(C) are considered as negative interactions as one or both the species are harmed.

31. (a) Providing sex education is one of the most effective ways to create a reproductively healthy society because :

(i) It will provide the pre-requisite knowledge to the curious adolescents, which will prevent them from getting misguided.

(ii) It will create awareness about STDs (sexually transmitted diseases) and ways to prevent and cure them.

(iii) It will teach methods of family planning and taking care of a female during pregnancy.

(iv) It will also create awareness about topics such as infertility and different methods of curing the same.

(b) Two indicators of reproductively healthy society are :

(i) Reproductively healthy society does not emphasise on a single sex. In such society, the female and male sex ratio is maintained. Moreover, due to implementation of family planning measures, the population size is under control.

(ii) A reproductively healthy society has fewer incidences of diseases related to reproductive system and few cases of spread of sexually transmitted diseases. Incidences of death of pregnant women or feticide due to complicated pregnancies are much reduced due to availability of precise health care for pregnant women.

OR

(a) Infertility can be due to following reasons:

(i) Infertility in males can be due to low sperm count, blockage of vasa deferentia and vasa efferentia affecting sperm transport, hormonal deficiency, impotency (inability to erect and penetrate penis into vagina of female) and presence of anti-sperm antibodies in semen.

(ii) Infertility in females can be due to ovulation disorders, abnormality in uterus, blockage or damage to fallopian tubes, chronic endometritis, fibroid in uterus, etc.

(b) If the problem is with a male partner then artificial insemination technique can be adopted. In this technique the sperms collected either from the husband or a healthy donor are artificially introduced either into the vagina or into the uterus (IUI-Intra-Uterine Insemination) of the female.

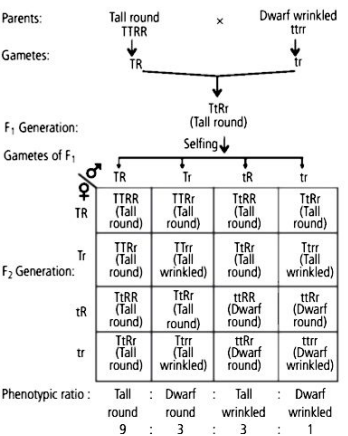
32. (a) M is repressor protein.

(b) Binding of repressor (M) with operator (o) switches off the *lac* operon.

(c) Presence of inducer *i.e.*, lactose will prevent the binding of the molecule M with the operator gene. Inducer will bind to the repressor, change the latter into non-DNA binding state so as to free the operator gene and switch on the *lac* operon.

OR

(a) Cross between parents with two different contrasting traits is as follows:



(i) Genotype and phenotype of F_1 progeny are TtRr and Tall and round seeded plant respectively.

(ii) Gametes produced of F_1 progeny are TR, Tr, tR, tr.

(iii) When F_1 seeds were grown into plants, F_2 seeds were obtained which showed all the four possible combinations, *i.e.*, (i) tall and round seeds (ii) tall and wrinkled seeds, (iii) dwarf and round seeds and (iv) dwarf and wrinkled seeds in 9 : 3 : 3 : 1 ratio.

(b) Morgan observed that the F_2 ratio obtained in the cross deviates significantly from 9 : 3 : 3 : 1 ratio *i.e.*, Mendelian ratio. This is because the genes are linked. They are carried on the same chromosome and are inherited together. Linkage was not observed by Mendel as the characters he chose were unlinked genes.

33. (a) Concentration of nicotine is maximum at 10 minutes where concentration of nicotine increases steadily in the blood to reach 45mg/cm^3. The concentration of CO will increase resulting in reduced concentration of haembound oxygen.

(b) Nicotine results in stimulating the adrenal gland which results in release of adrenaline/nor - adrenaline in the blood resulting in increase of blood pressure and heart rate.

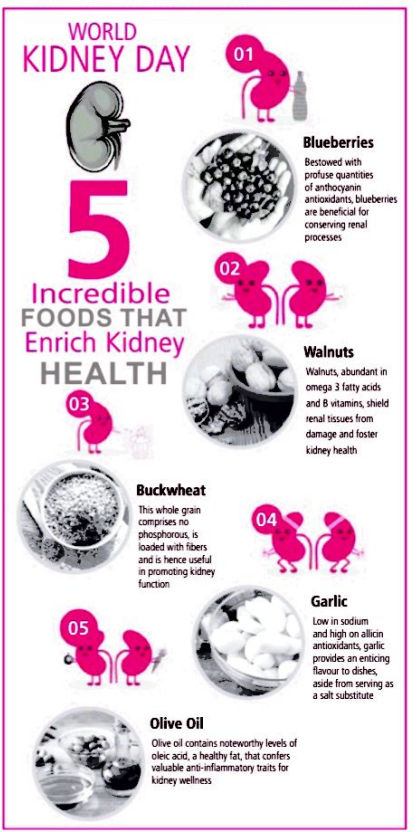
(c) Chemical carcinogens present in tobacco smoke are the major cause of lung cancer due to chemical present in tobacco. The cigarette smoke also causes emphysema as it irritates the air passages of the lungs causing them to produce mucus which causes cough resulting in collapse or alveolar septa which greatly reduces the surface area for gas exchange. Walls of alveolar sac loses elasticity and thus alveolar sacs remain filled with air even after expiration.

OR

Malaria is caused by the toxins produced in the human body by malarial parasite ***Plasmodium***. Life cycle of ***Plasmodium*** requires two hosts for completion.

Life cycle of ***Plasmodium*** in man (asexual phase): The infective stage of ***Plasmodium*** is sporozoite. When the mosquito bites man, sporozoites present in the salivary gland of female ***Anopheles*** mosquito are injected into the blood of the man. The parasites initially multiply within the liver cells and then attack the red blood cells (RBCs) resulting in their rupture. The rupture of RBCs is associated with release of a toxic substance, haemozoin, which is responsible for the chills and high fever recurring every three to four days. The released parasites from the ruptured RBCs infect new RBCs and develop into gametocytes (male and female). When a female ***Anopheles*** mosquito sucks the blood of an infected human host, it receives RBCs containing gametocytes.

Life cycle of ***Plasmodium*** in mosquito: The gametocytes come out of the RBCs into the lumen (cavity) of the stomach of the mosquito. Inside the stomach of the mosquito, the male and female gametocytes fuse (fertilize) to form zygote called oocyst. The nucleus of oocyst divides first by meiosis and subsequently by mitosis, forming large number of small haploid nuclei. At the same time, spindle shaped bodies called sporozoites are formed. When mature oocysts rupture, the sporozoites are liberated into the haemocoel (body cavity filled with blood) of the mosquito. Being motile, the sporozoites move to different organs in the body cavity of the mosquito, but many of them penetrate the salivary glands. The mosquito now becomes infective. When the female ***Anopheles*** mosquito bites a healthy person, the sporozoites are injected in his/her blood along with saliva. These sporozoites start the cycle again in human body.



MONTHLY TEST DRIVE

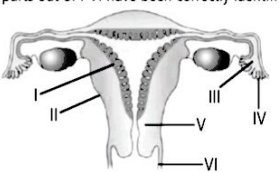
This specially designed column enables students to self analyse their extent of understanding of complete syllabus. Give yourself four marks for correct answer and deduct one mark for wrong answer. Self check table given at the end will help you to check your readiness.

Total Marks : 160

Complete Syllabus

Time : 40 Min.

1. Intine of pollen grain is made of
   (a) callose only (b) pectocellulose
   (c) cellulose only (d) sporopollenin only.
2. By which process, sperms are released from the seminiferous tubules?
   (a) Spermiation (b) Insemination
   (c) Spermatogenesis (d) Spermiogenesis
3. In grasshopper, the sex determination is
   (a) XX, XY type (b) XX, XO type
   (c) ZW, ZZ type (d) ZO, ZZ type.
4. Which of the following is not a correct pair?
   (a) *Ichthyosaurs* – Biggest reptile
   (b) Natural selection – Charles Darwin
   (c) Study of fossil – Paleontology
   (d) Mutation theory – Hugo de Vries
5. Infective stage of *Plasmodium* to human is
   (a) gametocytes (b) sporozoites
   (c) merozoites (d) both (b) and (c).
6. Reproductive health in society can be improved by
   I. introduction of sex education in schools
   II. increased medical assistance
   III. awareness about contraception and STDs
   IV. equal opportunities to male and female child
   V. ban on amniocentesis for sex determination
   VI. encouraging myths and misconceptions.
   (a) II, V only (b) I, II, IV, VI only
   (c) I, II, III, IV, V only (d) All of these
7. Choose the correct sequence of formation of mature dicot embryo.
   (a) zygote → proembryo → globular embryo → heart shaped embryo → mature embryo
   (b) proembryo → zygote → heart shaped embryo → globular embryo → mature embryo
   (c) proembryo → heart shaped embryo → globular embryo → zygote → mature embryo
   (d) zygote → globular embryo → heart shaped embryo → proembryo → mature embryo
8. The figure given below depicts a diagrammatic sectional view of the human female reproductive system. Which set of three parts out of I-VI have been correctly identified?



   (a) (II) Endometrium, (III) Infundibulum, (IV) Fimbriae
   (b) (III) Infundibulum, (IV) Fimbriae, (V) Cervix
   (c) (IV) Isthmus funnel, (V) Uterus, (VI) Cervix
   (d) (I) Perimetrium, (II) Myometrium, (III) Fallopian tube
9. Which of the following is a correct match?
   (a) Down's syndrome – 21st chromosome
   (b) Sickle cell anaemia – X-chromosome
   (c) Haemophilia – Y-chromosome
   (d) Klinefelter's syndrome – XO females
10. *E.coli* about to replicate was placed in a medium containing radioactive thymidine for five minutes. Then it was made to replicate in a normal medium. Which of the following observations would be correct?
    (a) Both the strands of DNA will be radioactive.
    (b) One strand will be radioactive.
    (c) Each strand will be half radioactive.
    (d) None of the strands will be radioactive.

11. Match the following columns and select the correct option.

	Column I		Column II
A.	Vector borne diseases	(1)	Pneumonia
B.	Airborne diseases	(2)	Malaria
C.	Through contaminated food and water	(3)	Ringworm
D.	Fungal disease	(4)	Typhoid

	A	B	C	D
(a)	2	1	4	3
(b)	1	4	3	2
(c)	4	2	1	3
(d)	2	1	3	4

12. Which of the following statements are correct about Down's Syndrome?

A. This disorder was first described by Langdon Down (1866).
B. Such an individual has overall masculine development. However, the feminine development is also expressed.
C. The affected individual is short statured.
D. Physical, psychomotor and mental development is retarded.
E. Such individuals are completely sterile.

Choose the correct option given below.

(a) B and E only (b) A and E only
(c) A and B only (d) A, C and D only

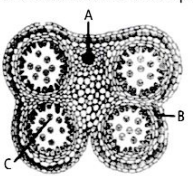
13. Methanogenic bacteria are present in

(a) anaerobic sludge (b) rumen of cattle
(c) primary sludge (d) both (a) and (b).

14. Which one of the following can be determined by amniocentesis?

(a) Turner's syndrome
(b) Klinefelter's syndrome
(c) Sex of the unborn child
(d) All of these

15. Following diagram shows T.S. of anther. Identify the parts labelled A, B and C and select the correct option.



(a) A-Connective tissue, B-Endothecium, C-Pollen grain
(b) A-Endothecium, B-Connective tissue, C- Pollen grain
(c) A-Pollen grain, B-Connective tissue, C-Endothecium
(d) A-Endothecium, B-Pollen grain, C-Connective tissue.

16. Which of the following depicts the correct pathway of transport of sperms?

(a) Rete testis → Vasa efferentia → Epididymis → Vas deferens
(b) Rete testis → Epididymis → Vasa efferentia → Vas deferens
(c) Rete testis → Vas deferens → Vasa efferentia → Epididymis
(d) Vasa efferentia → Rete testis → Vas deferens → Epididymis

17. Read the following statements and select the correct option.
Statement I : Loss of biodiversity leads to decline in plant production.
Statement II : Loss of biodiversity leads to lowered resistance to environment perturbation.

(a) Both statements I and II are correct.
(b) Statement I is correct but statement II is incorrect.
(c) Statement I is incorrect but statement II is correct.
(d) Both statements I and II are incorrect.

18. Which of the following provides microenvironment for the development and maturation of T-lymphocytes?

(a) Bone marrow (b) Thymus
(c) Spleen (d) Both (a) and (b)

19. Read the following statement having two blanks (A and B).
"Cyclosporin A used for _A_ patients is obtained from _B_."
Select the option that correctly identifies A and B.

(a)	Heart	*Penicillium*
(b)	Organ-transplant	*Trichoderma*
(c)	Swine flu	*Monascus*
(d)	AIDS	*Pseudomonas*

20. *Taq* polymerase enzyme is obtained from

(a) *Bacillus subtilis* (b) *Pseudomonas putida*
(c) *Thermus aquaticus* (d) *Thiobacillus ferroxidans.*

21. Golden rice is a genetically modified crop plant where the incorporated gene is meant for biosynthesis of

(a) omega 3 (b) vitamin A
(c) vitamin B (d) vitamin C.

22. Match the following columns and select the correct option.

	Column I		Column II
A.	Barrier	(1)	Copper-T and multiload 375
B.	IUDs	(2)	Vasectomy and tubectomy
C.	Surgical technique	(3)	Condoms and cervical caps
D.	Oral pills	(4)	Progestogen

	A	B	C	D
(a)	4	2	1	3
(b)	1	2	3	4
(c)	4	3	2	1
(d)	3	1	2	4

ERRATA

In the January 2024 edition, answer key of question no. 16, page no. 27 is (d) instead of (b).

23. A very large area, such as the whole continent, was explored for species richness and area relationship. What is true for such study?
(a) The slope of line Z is less steeper, range is 0.10 to 0.15.
(b) Z, the slope of line in range of 0.6 to 2.1.
(c) Slope of line Z is less steeper, and to be 1.15.
(d) Slope of line Z is much steeper, range is 0.6 to 1.2.

24. *cry* I endotoxins obtained from *Bacillus thuringiensis* are effective against
(a) nematodes (b) bollworms
(c) mosquitoes (d) flies.

25. Read the following statements and choose the correct statements.
I. RNA polymerase associates transiently with 'Rho' factor to initiate transcription.
II. In bacteria, transcription and translation takes place in the same compartment.
III. RNA polymerase I is responsible for transcription of *t*RNA.
IV. When hnRNA undergoes capping process, adenylate residues are added at 3′ end in a template independent manner.
V. hnRNA is the precursor of *m*RNA.
(a) III and IV only (b) II, III and V
(c) II and V only (d) I and IV only

26. Side effects of anabolic steroids in females includes
I. masculinisation II. aggressiveness
III. mood swings IV. abnormal menstrual cycle
V. excessive facial and body hair
Choose the correct option.
(a) I, II and III only (b) I, II, III and IV only
(c) II, III, IV and V only (d) I, II, III, IV and V

27. Select the correct group of biocontrol agents.
(a) *Nostoc, Azospirillum, Nucleopolyhedrovirus*
(b) *Bacillus thuringiensis*, Tobacco mosaic virus, Aphids
(c) *Trichoderma*, Baculovirus, *Bacillus thuringiensis*
(d) *Oscillatoria, Rhizobium, Trichoderma*

28. In *Antirrhinum*, the plant with red flowers was crossed with white flowers producing plant. The F_1 offsprings will produce
(a) 50% red, 50% white (b) 75% red, 25% white
(c) 100% white (d) 100% pink.

29. The given figure shows an example of

(a) homologous organs (b) convergent evolution
(c) divergent evolution (d) both (a) and (c).

30. The different basic steps of genetic engineering are given below randomly.

I. Identification of DNA with desirable genes
II. Transfer of DNA to its progeny
III. Maintenance of introduced DNA in host
IV. Introduction of DNA into host to form recombinant DNA

Which of the following represents the correct sequence of steps?

(a) I, II, III, IV (b) I, IV, III, II
(c) III, IV, II, I (d) I, III, IV, II

31. Match the columns and select the correct option.

	Column I		Column II	
	Species X	Species Y		
A.	+	+	(i)	Competition
B.	+	–	(ii)	Amensalism
C.	0	–	(iii)	Parasitism
D.	–	–	(iv)	Mutualism

(a) A-(ii), B-(i), C-(iv), D-(iii)
(b) A-(iii), B-(iv), C-(i), D-(ii)
(c) A-(iv), B-(iii), C-(ii), D-(i)
(d) A-(i), B-(ii), C-(iii), D-(iv)

32. Which of the following is used to make vaccines?

(a) Inactivated pathogen
(b) Pathogen blocked by antibody
(c) Weakened pathogen
(d) Both (a) and (c)

33. The direction of energy flow is

(a) producers → carnivores → herbivores
(b) producers → herbivores → decomposers → omnivores
(c) producers → herbivores → carnivores
(d) producers → decomposers → carnivores → herbivores.

34. If '8' *Drosophila* in a laboratory population of '80' died during a week, the death rate in the population is _____ individuals per *Drosophila* per week.

(a) 0.1 (b) 10
(c) 1.0 (d) zero

35. The specific palindromic sequence which is recognised by *Eco* RI is

(a) 5′ - GAATTC - 3′ (b) 5′ - GGAACC - 3′
3′ - CTTAAG - 5′ 3′ - CCTTGG - 5′
(c) 5′ - CTTAAG - 3′ (d) 5′ - GGATCC - 3′
3′ - GAATTC - 5′ 3′ - CCTAGG - 5′.

36. Which of the following techniques serves the purpose of early diagnosis of AIDS, cancer, etc?

I. Polymerase chain reaction
II. Recombinant DNA technology
III. Enzyme linked immune-sorbent assay

Choose the correct option.

(a) I and II only (b) I and III only
(c) II and III only (d) I, II and III only

37. Select the incorrect match.

(a) Apple and mango – False fruit
(b) Pea and groundnut – Non-albuminous seed
(c) Cashew and strawberry – False fruit
(d) Castor and barley – Albuminous seed

38. The process of breakdown of detritus into smaller particles by earthworm is called

(a) humification (b) fragmentation
(c) mineralisation (d) catabolism.

39. Match the tissues/molecules mentioned in column I with those of their degrading enzymes mentioned in column II and select the correct option from the given codes.

	Column I		Column II
A.	Bacterial cell wall	(i)	Chitinase
B.	RNA	(ii)	Lysozyme
C.	Fungal cell wall	(iii)	Ribonuclease
D.	Plant cell wall	(iv)	Cellulase

(a) A-(ii), B-(iii), C-(i), D-(iv)
(b) A-(ii), B-(i), C-(iv), D-(iii)
(c) A-(i), B-(ii), C-(iii), D-(iv)
(d) A-(iii), B-(iv), C-(ii), D-(i)

40. RNA is the genetic material in

(a) TMV (b) Qβ bacteriophage
(c) bacterial cell (d) both (a) and (b).

☺☺

Key is published in this issue. Search now! ☺

SELF CHECK

Check your score! If your score is

No. of questions attempted	.....	> 90%	EXCELLENT WORK ! You are well prepared to take the challenge of final exam.
No. of questions correct	.....	90-75%	GOOD WORK ! You can score good in the final exam.
Marks scored in percentage	.....	74-60%	SATISFACTORY ! You need to score more next time.
		< 60%	NOT SATISFACTORY! Revise thoroughly and strengthen your concepts.

PRACTICE PAPER
NEET 2024

SECTION - A (BOTANY)

1. In garden pea, round shape of seeds is dominant over wrinkled shape. A pea plant heterozygous for round shape of seed is selfed and 1600 seeds produced during the cross are subsequently germinated. How many seedlings would have the parental phenotype?
   (a) 400 (b) 1600
   (c) 1200 (d) 800

2. Match the given columns and select the correct option.

A.	Isogamous	(i)	Fusion of gametes dissimilar in size	(P) *Spirogyra*
B.	Anisogamous	(ii)	Fusion of gametes similar in size	(Q) *Volvox*
C.	Oogamous	(iii)	Fusion of static female and motile male gamete	(R) *Eudorina*

   (a) A-(ii)-(P), B-(i)-(R), C-(iii)-(Q)
   (b) A-(ii)-(P), B-(iii)-(R), C-(i)-(Q)
   (c) A-(iii)-(P), B-(i)-(Q), C-(ii)-(R)
   (d) A-(i)-(R), B-(ii)-(Q), C-(iii)-(P)

3. **Assertion :** Pollen grains are well-preserved as fossils.
   Reason : Exine of a pollen grain is made up of sporopollenin which is resistant to high temperature, strong acid or alkali as well as enzymatic degradation.
   (a) Both assertion and reason are true and reason is the correct explanation of assertion.
   (b) Both assertion and reason are true but reason is not the correct explanation of assertion.
   (c) Assertion is true but reason is false.
   (d) Assertion is false but reason is true.

4. Which of the following amino acids is coded by single codon?
   (a) Valine (b) Phenylalanine
   (c) Tyrosine (d) Tryptophan

5. Consider the following statements.
   A. Gymnosperms are homosporous.
   B. *Sequoia* is one of smallest gymnosperm.
   C. In gymnosperms, the seeds are not covered.
   D. In gymnosperms, the male and female gametophytes have an independent free living existence.
   Of the given statements,
   (a) A and B are correct
   (b) only C is correct
   (c) B and C are correct
   (d) C and D are correct.

6. Match the column I and column II and choose the correct combination from the given options.

	Column I		Column II
A.	Purple and green bacteria	(i)	T.W. Engelmann
B.	Light reaction	(ii)	Carbon reaction
C.	*Cladophora*	(iii)	Photochemical reaction
D.	Dark reaction	(iv)	van Niel

   (a) A-(ii), B-(iv), C-(i), D-(iii)
   (b) A-(iv), B-(iii), C-(i), D-(ii)
   (c) A-(ii), B-(iii), C-(iv), D-(i)
   (d) A-(iii), B-(iv), C-(i), D-(ii)

7. When tripalmitin is used as respiratory substance in aerobic respiration, the process consumes 145 molecules of oxygen and releases 102 molecules of CO_2, then RQ value would be
   (a) 0.5 (b) 0.7
   (c) 1.4 (d) 1.0.

8. Read the given statements and select the correct option.
   Statement I : OAA is the first product of CO_2 fixation in C_3 pathway.
   Statement II : The first product of CO_2 fixation in C_4 pathway is PGA.

(a) Both statement I and statement II are correct.
(b) Both statement I and statement II are incorrect.
(c) Statement I is correct but statement II is incorrect.
(d) Statement I is incorrect but statement II is correct.

9. Read the following statements and select the correct option.

Statement I : Red algae reach upto the maximum depth in oceans.

Statement II : Red algae possess the red thalli which is multicellular.

(a) Both statement I and statement II are correct.
(b) Both statement I and statement II are incorrect.
(c) Statement I is correct but statement II is incorrect.
(d) Statement I is incorrect but statement II is correct.

10. What is the function of the enzyme 'recombinase' during meiosis?

(a) Formation of synaptonemal complex
(b) Crossing over between non-sister chromatids of the homologous chromosomes
(c) Condensation of chromosomes
(d) Alignment of bivalent chromosomes on equatorial plate

11. Match column I with column II and select the correct option from the given codes.

	Column I		Column II
A.	IAA	I.	Gas
B.	N^6-furfurylamino purine	II.	Terpene
C.	ABA	III.	Derivatives of carotenoid
D.	GA_3	IV.	Adenine derivative
E.	C_2H_4	V.	Indole compound

	A	B	C	D	E
(a)	I	II	III	IV	V
(b)	V	IV	III	II	I
(c)	V	IV	I	II	III
(d)	IV	III	I	II	V

12. *Eco*R I restriction enzyme

(a) is isolated from *Escherichia coli* RY13
(b) indicates the name of strain 'R'
(c) produces complementary blunt ends
(d) both (a) and (b).

13. Select the incorrect statements.

A. In marginal placentation, placenta forms a ridge along ventral suture of ovary and ovule are borne on ridges.
B. When the placenta is axial, the ovules are attached to it in a multilocular ovary.
C. In *Dianthus*, the ovules are borne on outer walls of ovary.
D. In *Primrose*, ovules are borne on central axis and septa are absent.
E. Placenta develops at the base of ovary in basal placentation and it bears multiple ovules attached to it.

(a) C and E only (b) A, B and C only
(c) D and E only (d) A, B, C, D and E

14. Which of the following is the most abundant plant protein in the whole of biosphere?

(a) PEPcase
(b) Ribozyme
(c) Alcohol dehydrogenase
(d) RuBisCO

15. Match column I with column II and select the correct option.

	Column I		Column II
A.	Tobacco	I.	Vitamin-A
B.	Bt cotton	II.	High yield and pest resistant
C.	Golden rice	III.	*Meloidogyne incognita*

	A	B	C
(a)	III	II	I
(b)	I	II	III
(c)	I	III	II
(d)	III	I	II

16. Which of the following is not an ***ex-situ*** conservation strategy?

(a) Cryopreservation
(b) Seed bank
(c) Biosphere reserves
(d) Botanical garden

17. Which of the following statements are incorrect?

(i) C_2H_4 breaks seed and bud dormancy.
(ii) ABA stimulates the opening of stomata.
(iii) Cytokinin is primarily concerned with cell division.
(iv) ABA is synergistic to GA.

(a) (i), (ii) and (iii) (b) (i) and (ii)
(c) (ii) and (iv) (d) (i) and (iii)

18. Read the following statements and choose the incorrect option.

I. RNA polymerase associates transiently with 'sigma' factor to initiate transcription.
II. In eukaryotes, transcription and translation takes place in the same compartment.
III. RNA polymerase III is responsible for transcription of *t*RNA, 5S*r*RNA and snRNAs.
IV. When hnRNA undergoes tailing process, adenylate residues are added at 5′ end in a template independent manner.

(a) III and IV only
(b) II and III
(c) II and IV only
(d) I and IV only

19. Match column I with column II and choose the correct option.

Column I	Column II
I. Funicle	A. Small opening at the tip of ovule
II. Integuments	B. Stalk of ovule
III. Hilum	C. Protective envelopes of ovule
IV. Chalaza	D. Basal part of the ovule
V. Micropyle	E. Junction between ovule and funicle

(a) I-B ; II-C ; III-E ; IV-D ; V-A
(b) I-A ; II-C ; III-B ; IV-D ; V-E
(c) I-B ; II-C ; III-A ; IV-D ; V-E
(d) I-B ; II-D ; III-E ; IV-A ; V-C

20. The function of a selectable marker is to
(a) eliminate transformants and permit the growth of non-transformants
(b) identify *ori* site
(c) eliminate non-transformants and permit the growth of transformants
(d) destroy recognition sites.

21. Cells in the quiescent stage (G_0)
(a) always become cancerous
(b) show indefinite proliferation
(c) remain metabolically inactive
(d) remain metabolically active.

22. Bt brinjal is an example of transgenic crops. In this, Bt refers to
(a) *Bacillus tuberculosis* (b) biotechnology
(c) β carotene (d) *Bacillus thuringiensis.*

23. Read the following statements and select the correct option.
(i) Substrate binds at the active site of enzyme.
(ii) Enzymes denature at 40°C.
(iii) All enzymes are proteins except ribozyme.
(a) (i) and (iii) only (b) (i) and (ii) only
(c) (i), (ii) and (iii) (d) (iii) only

24. In prokaryotes, the transcription of DNA is terminated with the help of
(a) rho factor (b) elongation factor
(c) sigma factor (d) stop codon.

25. Which of the following statements is correct about energy flow in an ecosystem?
(a) Pyramid of energy is always inverted.
(b) Energy flow is unidirectional.
(c) The transfer of energy follows 10 percent law.
(d) Both (b) and (c)

26. Albuminous seeds store their reserve food mainly in
(a) endosperm (b) cotyledons
(c) hypocotyl (d) perisperm.

27. **Assertion (A) :** Filament is the longest portion of bacterial flagellum.
Reason (R) : Flagellum emerge from centriole–like structure called the basal bodies.
(a) Both (A) and (R) are correct and (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct but (R) is not the correct explanation of (A).
(c) (A) is correct but (R) is not correct.
(d) (A) is not correct but (R) is correct.

28. In a 3.2 Kbp long piece of DNA, 820 adenine bases were found. What would be the number of cytosine bases?
(a) 780 (b) 1560 (c) 740 (d) 1480

29. Primary endosperm nucleus is formed by fusion of
(a) ovum and male gamete
(b) one polar nucleus and male gamete
(c) two polar nuclei and two male gametes
(d) two polar nuclei and one male gamete.

30. Which one of the following statements is wrong with respect to separation of DNA fragments on gel electrophoresis?
(a) The DNA fragments move towards cathode under electric field through the matrix.
(b) The commonly used matrix is agarose gel.
(c) The DNA fragments resolve according to their size.
(d) Smaller the DNA fragments, the farther it moves.

31. Read the given statements and select the correct option.
Statement I : Geitonogamy is genetically similar to autogamy.
Statement II : In geitonogamy, pollen grains come from the same plant.
(a) Both statement I and statement II are correct.
(b) Both statement I and statement II are incorrect.
(c) Statement I is correct but statement II is incorrect.
(d) Statement I is incorrect but statement II is correct.

32. Smack and Crack are produced from
(a) *Cannabis sativa* and *Papaver somniferum*
(b) *Cannabis sativa* and *Atropa belladonna*
(c) *Erythroxylum coca* and *Atropa belladonna*
(d) *Papaver somniferum* and *Erythroxylum coca.*

ANSWERS FEBRUARY 2024

Across	Down
1. Urochordate	2. Aschelminth
3. Translation	4. Antrum
5. Catecholamine	6. Nephron
7. Protist	8. Opioid

Winner : Adrija Maity

33. Which of the following statements are correct for meiosis?
I. Meiosis is a double division, it gives rise to four cells.
II. The cells undergoing meiosis may be haploid or diploid.
III. Meiosis is not responsible for evolution of organisms.
IV. Pairing or synapsis of homologous chromosomes takes place during zygotene of prophase-I.
(a) I only (b) I and IV
(c) II and III (d) All of these

34. In castor and maize plant,
(a) male and female flowers are borne on different plants
(b) autogamy is prevented but not geitonogamy
(c) the anthers and stigma are placed at different positions to encourage cross pollination
(d) both autogamy and geitonogamy are prevented.

35. Morphine is obtained from the
(a) inflorescences of *Cannabis*
(b) leaves of *Erythroxylum*
(c) latex of poppy plant
(d) roots of *Atropa*.

SECTION - B

Attempt any 10 questions out of 15.

36. **Assertion (A) :** Pneumatophores are found in plants like *Rhizophora*.
Reason (R) : Pneumatophores help to absorb water and minerals from the soil.
(a) Both (A) and (R) are correct and (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct but (R) is not the correct explanation of (A).
(c) (A) is correct but (R) is not correct.
(d) (A) is not correct but (R) is correct.

37. Read the given statements and select the correct option.
Statement I : 'Cry' proteins are named so because they are crystal proteins.
Statement II : In acidic environment of insect midgut, 'Cry' proteins gets solubilised.
(a) Both statements I and II are correct.
(b) Statement I is correct but statement II is incorrect.
(c) Statement I is incorrect but statement II is correct.
(d) Both statements I and II are incorrect.

38. **Assertion :** Sclereids are less thickened dead cells.
Reason : Sclereids are found in pulp of guava, pear and sapota.
(a) Both assertion and reason are true and reason is the correct explanation of assertion
(b) Both assertion and reason are true but reason is not the correct explanation of assertion
(c) Assertion is true but reason is false
(d) Assertion is false but reason is true.

39. Which of the following is/are found in plant cells?
(a) Centrioles (b) Cell wall
(c) Vacuole (d) Both (b) and (c)

40. Match the following RNA polymerases with their transcribed products and select the correct option.

	Column I		Column II
A.	RNA polymerase I	(i)	*r*RNA
B.	RNA polymerase II	(ii)	*r*RNA
C.	RNA polymerase III	(iii)	hnRNA

(a) A-(i), B-(iii), C-(ii) (b) A-(i), B-(ii),C-(iii)
(c) A-(ii), B-(iii), C-(i) (d) A-(iii), B-(ii), C-(i)

41. Read the given statements and select the correct option.
Statement I : During G_1 phase, the cell is metabolically active.
Statement II : Chromosome number doubles during S phase.
(a) Both statement I and statement II are correct.
(b) Both statement I and statement II are incorrect.
(c) Statement I is correct but statement II is incorrect.
(d) Statement I is incorrect but statement II is correct.

42. Read the following events of mitosis.
Event A-Chromosomes reach opposite poles.
Event B-Chromosomes are highly condensed.
Event C-Movement of chromosomes towards equator.
Event D-Reappearance of nucleolus and nuclear material.
Which will be the third to occur in sequence?
(a) Event A (b) Event B (c) Event C (d) Event D

43. Read the given statements and select the correct option.
Statement I : Net primary productivity is gross primary productivity minus respiration.
Statement II : Secondary productivity is the rate of formation of new organic matter by heterotrophs.
(a) Both statements I and II are correct.
(b) Statement I is correct but statement II is incorrect.
(c) Statement I is incorrect but statement II is correct.
(d) Both statements I and II are incorrect.

44. Read the given statements and select the correct option.
(i) Percentage of homozygous dominant individuals obtained by selfing Aa individuals is 25%.
(ii) Types of genetically different gametes produced by genotype AABbcc are 2.
(iii) Phenotypic ratio of monohybrid F_2 progeny in case of *Antirrhinum* is 3 : 1.
(a) Statements (ii) and (iii) are true, but statement (i) is false.
(b) Statements (i) and (ii) are true, but statement (iii) is false.
(c) Statements (i) and (iii) are true, but statement (ii) is false.
(d) All the statements are true.

45. Which type of vascular bundles are found in monocot stem?
(a) Collateral, open and endarch
(b) Conjoint and closed
(c) Radial, open and mesarch
(d) Collateral, closed and endarch

46. How many molecules of reduced coenzymes are produced inside mitochondria during complete oxidation of one glucose?
(a) Five - $4NADH_2 + 1FADH_2$
(b) Twelve - $10NADH_2 + 2FADH_2$
(c) Ten - $8NADH_2 + 2FADH_2$
(d) Four - $3NADH_2 + 1FADH_2$

47. Select the pair of dominant traits studied by Mendel.
(a) Axial flower, green pod, green seed
(b) Green pod, inflated pod, axial flower
(c) Yellow seed, violet flower, yellow pod
(d) Round seed, constricted pod, axial flower

48. Heroin
(a) is a depressant
(b) slows down body functions
(c) is commonly called smack
(d) all of these.

49. If wheat field is inoculated with *Rhizobium*,
(a) soil will become rich in nitrogen
(b) no effect on soil nitrogen
(c) soil will be depleted of nitrogen
(d) soil will become rich in calcium.

50. If a pond had 20 lotus plants last year and 8 new plants are added through reproduction. Then the birth rate is
(a) 0.8 offspring per lotus per year
(b) 0.2 offspring per lotus per year
(c) 0.4 offspring per lotus per year
(d) 0.6 offspring per lotus per year.

SECTION - A (ZOOLOGY)

51. **Assertion :** Secondary treatment of sewage is also called biological treatment.
Reason : During secondary sewage treatment, microbes are involved.
(a) Both assertion and reason are true and reason is the correct explanation of assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Assertion is false but reason is true.

52. Match the following column I with column II and choose the correct combination from the options given.

	Column I		Column II
A.	Earthworm	I.	Tracheae
B.	Cockroach	II.	Radula
C.	Frog	III.	Nephridia
D.	*Pila*	IV.	Cloaca

(a) A - I, B - II, C - IV, D - III
(b) A - III, B - I, C - IV, D - II
(c) A - II, B - I, C - III, D - IV
(d) A - III, B - I, C - II, D - IV

53. In *lac*-operon concept of gene expression, allolactose acts as
(a) repressor (b) inducer
(c) co-repressor (d) co-enzyme.

54. "Spermiogenesis" is a process in which
(a) spermatids transform into spermatozoa
(b) spermatogonia produce a spermatid
(c) spermatocytes give rise to spermatozoa
(d) dormant spermatozoa become active just before ejaculation.

55. Match column I with column II and choose the correct answer.

	Column I		Column II
I.	Incomplete digestive system	A.	Sponges
II.	Cellular level of organisation	B.	Coelenterates
III.	Radial symmetry	C.	Annelids
IV.	Pseudocoelomate	D.	Platyhelminthes
V.	Metamerism	E.	Aschelminthes

(a) I - C, II - D, III - A, IV - B, V - E
(b) I - D, II - E, III - B, IV - C, V - A
(c) I - D, II - A, III - B, IV - E, V - C
(d) I - A, II - B, III - C, IV - D, V - E

56. Given below are two statements:
Statement I: Mycoplasma can pass through 1 micron filter size.
Statement II : Mycoplasma are bacteria with cell wall.
In the light of the above statements, choose the most appropriate answer from the options given below.
(a) Both statement I and statement II are correct.
(b) Both statement I and statement II are incorrect.
(c) Statement I is correct but statement II is incorrect.
(d) Statement I is incorrect but statement II is correct.

57. Which is the most correct statement with reference to blood circulation in humans?
(a) Arteries always carry oxygenated blood while veins always carry deoxygenated blood.
(b) Arteries are provided with valves while veins are devoid of valves.
(c) Arteries always carry blood away from the heart, while veins always carry blood towards the heart.
(d) Pulmonary vein carries deoxygenated blood from right ventricles to lungs.

58. Which of the following hormones is a steroid?
(a) Estrogen (b) Insulin
(c) Glucagon (d) Thyroxine

59. The blood cell that secretes histamine, serotonin and heparin is
(a) neutrophil (b) T-lymphocyte
(c) killer cell (d) basophil.

60. Juxtaglomerular cells secrete A when there is a fall in B ion concentration.
Choose the correct pair labelled as A and B.
(a) A : renin B : chloride
(b) A : carbonic anhydrase B : sodium
(c) A : ATPase B : potassium
(d) A : renin B : sodium

61. Read the given statement and select the correct option.
Statement I : Antibiotics are effective against all pathogens.
Statement II : Antibiotics are used to treat plague, whooping cough, diphtheria.
(a) Both statements I and II are correct.
(b) Statement I is correct but statement II is incorrect.
(c) Statement I is incorrect but statement II is correct.
(d) Both statements I and II are incorrect.

62. Match column I with column II and select the correct option.

Column I		Column II	
A.	Tetany	(i)	Autoimmune disorder
B.	Osteoporosis	(ii)	Progressive degeneration of skeletal muscle
C.	Muscular dystrophy	(iii)	Inflammation of joints
D.	Arthritis	(iv)	Rapid spasms in muscle
E.	Myasthenia gravis	(v)	Bone mass decreased

(a) A-(i), B-(ii), C-(iii), D-(iv), E-(v)
(b) A-(iv), B-(v), C-(i), D-(iii), E-(ii)
(c) A-(iv), B-(v), C-(ii), D-(iii), E-(i)
(d) A-(ii), B-(iii), C-(i), D-(v), E-(iv)

63. The adult animal in this phylum is radially symmetrical, but its larva exhibits bilateral symmetry. Identify the animal.
(a) Echinodermata (b) Coelenterata
(c) Arthropoda (d) Protozoa

64. Read the following statements and select the correct option.
Statement I : Fibrinogens are required for blood clotting.
Statement II : Thrombin catalyse the formation of fibrin from fibrinogen.
(a) Both statement I and statement II are correct.
(b) Both statement I and statement II are incorrect.
(c) Statement I is correct but statement II is incorrect.
(d) Statement I is incorrect but statement II is correct.

65. The ancestors of modern day frogs and salamanders are
(a) *Ichthyophis* (b) jawless fish
(c) *Amphioxus* (d) Coelacanth.

66. Match the columns and select the correct option from the codes given below.

Column I		Column II	
(A)	TV + ERV	(i)	Expiratory capacity
(B)	RV + ERV + TV + IRV	(ii)	Total lung capacity
(C)	ERV + RV	(iii)	Functional residual capacity

(a) A-(i), B-(ii), C-(iii) (b) A-(iii), B-(i), C-(ii)
(c) A-(iii), B-(ii), C-(i) (d) A-(ii), B-(iii), C-(i)

67. The condition of erythroblastosis fetalis occurs only when
(a) the husband is Rh^+ and wife is Rh^-
(b) the husband is Rh^- and wife is Rh^+
(c) the mother is Rh^+ and fetus is Rh^-
(d) the mother is Rh^- and fetus is Rh^+.

68. Choose the wrong statements regarding Gause's principle,
I. Two species cannot live in same habitat.
II. Two species competing for same resources can avoid competition.
III. Totally unrelated species could have high probability of competing for same resources.
IV. In presence of limited resources, competition occurs.
(a) I and III (b) II and III
(c) I, II, III and IV (d) III and IV

69. **Assertion (A) :** Codominant alleles lack dominant recessive relationship.
Reason (R) : Codominant alleles show incomplete dominance.
(a) Both (A) and (R) are correct and (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct but (R) is not the correct explanation of (A).
(c) (A) is correct but (R) is not correct.
(d) (A) is not correct but (R) is correct.

70. Match the following columns and find out the correct combination.

Column I		Column II	
A.	Stable population	I.	Triangular shaped pyramid
B.	Declining population	II.	Urn shaped pyramid
C.	Growing population	III.	Bell shaped pyramid
D.	Migration	IV.	Inward and outward movement of individuals

(a) A - III, B - II, C - I, D - IV
(b) A - III, B - II, C - IV, D - I
(c) A - III, B - I, C - II, D - IV
(d) A - II, B - III, C - I, D - IV

71. Which is the most feared property of malignant tumor?
(a) Neoplasty
(b) Metastasis
(c) Rapid invasive growth
(d) Loss of contact inhibition

72. *rop* gene which codes for the proteins involved in the replication of the plasmid pBR322 in *E. coli* is located at restriction site of
(a) *Hind* III (b) *Eco*RI
(c) *Pvu*II (d) *Bam*HI.

73. Match the following columns and select the correct option.

Column I		Column II
(A)	*Clostridium butylicum*	(i) Cyclosporin-A
(B)	*Trichoderma polysporum*	(ii) Butyric acid
(C)	*Monascus purpureus*	(iii) Citric acid
(D)	*Aspergillus niger*	(iv) Blood cholesterol lowering agent

	(A)	(B)	(C)	(D)
(a)	(iii)	(iv)	(ii)	(i)
(b)	(ii)	(i)	(iv)	(iii)
(c)	(i)	(ii)	(iv)	(iii)
(d)	(iv)	(iii)	(ii)	(i)

74. Families like Felidae and Canidae are included under order
(a) Primata (b) Diptera
(c) Carnivora (d) Sapindales

75. Read the following statements and select the correct option.
Statement 1 : Thyrocalcitonin regulates blood calcium level.
Statement 2 : Thyrocalcitonin is a protein hormone.
(a) Both statements 1 and 2 are correct.
(b) Statement 1 is correct but statement 2 is incorrect.
(c) Statement 1 is incorrect but statement 2 is correct.
(d) Both statements 1 and 2 are incorrect.

76. Select the wrongly matched pair.
(a) Lungs of the planet – Amazon rainforest
(b) Endemism – Species confined to one region and also found in other regions
(c) Hotspots – Regions with species richness
(d) Alien species – *Clarias gariepinus*

77. The globular head of myosin contains
(a) ATPase enzyme
(b) calcium ions in large quantities
(c) ATP
(d) troponin.

78. Match column I with column II and select the correct option from the given codes.

	Column I		Column II
A.	Turner's syndrome	(i)	An additional sex chromosome
B.	Down's syndrome	(ii)	Absence of sex chromosome
C.	Klinefelter's syndrome	(iii)	Presence of an extra autosomes

(a) A-(i), B-(iii), C-(ii) (b) A-(ii), B-(i), C-(iii)
(c) A-(ii), B-(iii), C-(i) (d) A-(iii), B-(ii), C-(i)

79. Which disease shows the symptoms of stunted growth and mental retardation in a growing baby after birth?
(a) Cretinism (b) Grave's disease
(c) Acromegaly (d) Diabetes mellitus

80. Which of the following is an invasive alien species in the Indian continent?
(a) *Lantana* (b) *Eichhornia*
(c) *Parthenium* (d) All of these

81. The allele frequency of '*A*' and '*a*' in a population are 0.6 and 0.4 respectively. The expected frequency of heterozygous individuals is
(a) 48% (b) 36% (c) 16% (d) 24%.

82. Match column I (enzyme) with column II (characteristic/ activity) and select the correct answer from the given codes.

	Column I		Column II
A.	*Taq* DNA polymerase	(i)	Cleaves the ends of linear DNA
B.	Exonuclease	(ii)	Breakdown of fungal cell wall
C.	Protease	(iii)	Stable above 90°C
D.	Chitinase	(iv)	Made only by eukaryotic cells
		(v)	Degradation of proteins

(a) A-(iii), B-(iv), C-(i), D-(ii)
(b) A-(iv), B-(iii), C-(i), D-(ii)
(c) A-(ii), B-(i), C-(v), D-(iii)
(d) A-(iii), B-(i), C-(v), D-(ii)

83. ADA deficiency results in
(a) chromosomal disorders
(b) increased risk of infertility
(c) silencing of a specific *m*RNA
(d) inability of the immune system to function normally.

84. Read the following statements (i) to (v) regarding uterus. Identify the correct characteristics feature and select the correct option.
(i) This structure is also called womb.
(ii) Its shape is like an inverted pear.
(iii) The process of fertilisation takes place in this structure.
(iv) The wall of this structure has three layers of tissue.
(v) It secretes several steroid hormones.
(a) (i) and (iv) (b) (iii) and (v)
(c) (i), (ii) and (iv) (d) All of these

85. Given below are four methods (A-D) and their modes of action (p-s) in achieving contraception. Select their correct matching from the four options that follow.

	Method		Mode of Action
A.	Pills	(p)	Prevents sperms reaching cervix
B.	Condom	(q)	Suppress sperm motility
C.	Vasectomy	(r)	Prevents ovulation
D.	Copper-T	(s)	Semen contains no sperms

(a) A – (q), B – (r), C – (p), D – (s)
(b) A – (r), B – (p), C – (s), D – (q)
(c) A – (s), B – (p), C – (q), D – (r)
(d) A – (r), B – (s), C – (p), D – (q)

SECTION - B

Attempt any 10 questions out of 15.

86. **Assertion (A) :** Spermatogenesis begins at puberty in human males.
Reason (R) : Sperms are produced from mature germ cells in prostate gland.
(a) Both (A) and (R) are correct and (R) is the correct explanation of (R).
(b) Both (A) and (R) are correct but (R) is not the correct explanation of (A).
(c) (A) is correct but (R) is incorrect.
(d) (A) is incorrect but (R) is correct.

87. Which one of the following theories on the origin of life is mostly accepted?
(a) Special creation
(b) Spontaneous generation
(c) Panspermia
(d) Chemical evolution

88. Select the correct statements regarding honeybees.
(i) The queen bee and the worker bees develop from fertilised eggs and are sexually females.
(ii) Males (drones) develop parthenogenetically from unfertilised eggs.
(iii) Females have half the number of chromosomes than that of males.
(a) (i) and (ii) only (b) (ii) and (iii) only
(c) (i) and (iii) only (d) (i), (ii) and (iii)

89. Match the following columns and select the correct option.

	Column I		Column II
A.	Mons pubis	I.	Fleshy folds of tissue surrounding vagina
B.	Labia majora	II.	Cushion of fatty tissue covered by skin and pubic hair
C.	Labia minora	III.	Membrane that partially covers the opening of vagina
D.	Hymen	IV.	Paired folds of tissue under the labia majora

(a) A-I, B-II, C-III, D-IV (b) A-II, B-I, C-IV, D-III
(c) A-III, B-I, C-II, D-IV (d) A-IV, B-III, C-I, D-II

90. Read the given statements and select the correct option.
Statement I : MTP is considered relatively safe during the first trimester of pregnancy.
Statement II : Fetus becomes intimately associated with the maternal tissues after the first trimester.
(a) Both statement I and statement II are correct.
(b) Both statement I and statement II are incorrect.
(c) Statement I is correct but statement II is incorrect.
(d) Statement I is incorrect but statement II is correct.

91. The human protein α-1 antitrypsin is obtained from
(a) transformed bacteria
(b) transgenic animal
(c) transgenic plant
(d) transformed fungus.

92. Which organ helps cockroach to grind food particles?
(a) Labium (b) Maxillary palp
(c) Gizzard (d) Labrum

93. The trachea terminates into
(a) pharynx (b) atrium
(c) bronchi (d) alveoli.

94. Consider the following statements regarding common cold.
I. Rhinovirus is responsible for common cold.
II. Common cold affects the nasal epithelium, respiratory passage and lungs.
III. The symptoms of common cold include nasal congestion and discharge, sore throat, hoarseness, cough, headache and tiredness.

Which of the statements given is/are correct?

(a) I only (b) II and III only
(c) I and III only (d) I, II and III

95. Walls of blood vessels are made up of
(a) simple cuboidal epithelium
(b) simple squamous epithelium
(c) simple columnar epithelium
(d) simple non-ciliated columnar epithelium.

96. The sensory papillae in frogs are associated with
(a) smell (b) hearing
(c) respiration (d) touch.

97. Tyrosine and valine respectively are
(a) acidic and basic amino acids
(b) acidic and neutral amino acids
(c) aromatic and neutral amino acids
(d) aromatic and basic amino acids.

98. Limbic system in human brain is primarily concerned with
(a) memory
(b) communication
(c) body temperature
(d) regulation of sexual behaviour.

99. The pyramid of energy in a terrestrial and pond ecosystem respectively are
(a) upright, inverted (b) inverted, upright
(c) upright, upright (d) inverted, inverted.

100. Which of the following statements are correct?
I. ECG is of a great clinical significance.
II. A single lead is attached to chest region to evaluate heart's function.
III. To obtain a standard ECG, a patient is connected to the machine with 3 electrical leads (one to each wrist and to the left ankle).
IV. Electrocardiogram is the graphical representation of electrical activity of heart.

The option with correct statements is
(a) I, II and III (b) I, III and IV
(c) II, III and IV (d) I, II and IV.

SOLUTIONS

1. (c) : If the pea plant is heterozygous for round shape then its genotype would be Rr.

Parents : Rr × Rr
↓ (selfing)
Progeny : RR Rr Rr rr

Phenotypically, the ratio will be 3 : 1, *i.e.*, only rr seedlings will show wrinkled phenotype, rest will show round shape.

∴ No. of seedlings having round shape (RR or Rr)

$= \frac{3}{4} \times 1600 = 1200$

2. (a) **3. (a)**

4. (d) : Tryptophan is coded only by codon UGG.

5. (b) **6. (b)**

7. (b) : Respiratory quotient, also known as the respiratory ratio (RQ), is defined as the volume of carbon dioxide released over the volume of oxygen consumed.

$$RQ = \frac{\text{Volume of } CO_2 \text{ released}}{\text{Volume of } O_2 \text{ consumed}} = \frac{102}{145} = 0.73$$

8. (b) : In C_3 pathway, the first product of CO_2 fixation is a PGA whereas in the C_4 pathway, OAA is the first stable product.

9. (a)

10. (b) : Crossing over is an enzyme-mediated process and the enzyme involved in this process is called recombinase.

11. (b) : Plant growth regulators PGRs are small, simple molecules of diverse chemical composition. They could be indole compounds (Indole-3-Acetic acid, IAA); Adenine derivatives (N^6– furfurylamine purine, kinetin); derivatives of carotenoids (Abscisic Acid, ABA); terpenes (Gibberellic Acid, GA_3) or gases (Ethylene C_2H_4). Plant growth regulators are variously described as plant growth substances, plant hormone or phytohormone

12. (d) : The restriction endonuclease enzyme *Eco*RI was isolated from bacterium *Escherichia coli* RY13. The letter 'R' is derived from the name of strain and it results in complementary sticky ends.

13. (a)

14. (d) : RuBisCO is the most abundant protein in whole of the biosphere.

15. (a)

16. (c) : *Ex situ* conservation is the conservation of selected rare plants / animals in places outside their natural homes. *Ex situ* conservation includes offsite collections (like botanical gardens, zoological parks etc.), seed banks, tissue culture, cryopreservation, etc.

17. (c) : ABA stimulates the closing of stomata and ABA is antagonistic to GA.

18. (c) **19. (a)** **20. (c)**

21. (d) : Quiescent stage is the reversible stage of the cell cycle in which cell does not divide but retains the ability to re-enter cell proliferation and thus is metabolically active.

22. (d) : Soil bacterium *Bacillus thuringiensis* produces proteins that kill certain insects. *Bt*-toxin genes are being isolated from *Bacillus thuringiensis* (*Bt* for short) and incorporated into several crop plants like brinjal, cotton.

23. (a) : Enzymes get denatured at high temperature, *i.e.*, above 40°C.

24. (a) **25. (d)**

26. (a) : In some seeds the endosperm persists in the seed as food storage tissue. Such seeds are called endospermic or albuminous, *e.g.*, castor, maize, wheat, barley, rubber, coconut, etc.

27. (b)

28. (a) : Total DNA = 3.2 kbp = 3200 bp
Adenine = 820
According to Chargaff's rule, [A] = [T], [G] = [C]
So, Thymine = 820
Therefore, total A + T content = 820 + 820 = 1640
Also, A + T = 3200 – (G + C)
So, G + C content = 3200 – 1640 = 1560

So, cytosine = $\frac{1560}{2}$ = 780

29. (d) : During double fertilisation in angiosperms, one male gamete fuses with the egg to form the diploid zygote by the process called syngamy or generative fertilisation. The diploid zygote finally develops into embryo. The other male gamete fuses with the two polar nuclei (or secondary nucleus) to form the triploid primary endosperm nucleus (PEN) by the process called triple fusion or vegetative fertilisation.

30. (a) : Gel electrophoresis is a technique that uses differences in electrical charges to separate the molecules in a mixture. Since DNA molecules have negative charges, they migrate towards the positive electrode (anode) when placed in an electric field. This rate of migration depends on size. The smaller the DNA molecule, faster is the migration. So, the DNA band that is the farthest the well where it was loaded, is the smallest in size.

PUBLIC NOTICE

NEET 2024

The National Testing Agency has been conducting the NEET (UG) since 2019 with the approval of the Ministry of Health and Family Welfare and the Ministry of Education, in pursuance of the direction of the Hon'ble Supreme Court of India. As per Section 14 of the National Medical Commission Act, 2019, the NEET (UG) has to be conducted as a common and uniform National Eligibility-cum-Entrance Test [(NEET (UG)] for admission to **undergraduate medical education in all medical institutions.** Similarly, as per Section 14 of the National Commission for Indian System of Medicine Act, 2020, there shall be a uniform NEET (UG) for admission to undergraduate courses in each of the **disciplines, *i.e.* BAMS, BUMS,** and **BSMS** courses of the **Indian System of Medicine in all Medical Institutions governed under this Act.** NEET (UG) shall also be applicable to admission to the **BHMS course under the National Commission for Homeopathy.**

MNS (Military Nursing Service) aspirants seeking admission to **B.Sc. Nursing Courses** being conducted at Armed Forces Medical Service Hospitals for the year 2024 are required to qualify for NEET (UG). The NEET (UG) score will be used for shortlisting for selection to the four-year **B.Sc. Nursing course.** The Entrance Test shall consist of **200** multiple-choice questions (four options with a single correct answer) from **Physics, Chemistry, and Biology (Botany & Zoology).** 50 questions in each subject will be divided into **two Sections (A and B).** Drawing from the NEP 2020, the NEET (UG) – 2024 will be conducted in **13 languages** *i.e.*, **Assamese, Bengali, English, Gujarati, Hindi, Kannada, Malayalam, Marathi, Odia, Punjabi, Tamil, Telugu and Urdu.**

Online Submission of Application Form		**09 February 2024 to 09 March 2024 (up to 09:00 PM)**
Last date of successful transaction of fee through Credit/Debit Card/Net-Banking/UPI		**09 March 2024 (up to 11:50 PM)**
Correction in Particulars		To be intimated later on the website
Fee Payable by Candidate	**Category of Candidate**	**Centres in India (Fee in ₹)**
	General	**₹ 1700/-**
	General-EWS/ OBC-NCL*	**₹ 1600/-**
	SC/ST/PwBD/Third Gender	**₹ 1000/-**
	Processing charges & Goods and Services Tax (GST) are to be paid by the candidate, as applicable	

Announcement of the City of Examination	**To be intimated later on the website**
Downloading Admit Cards from the NTA website	**To be intimated later on the website**
Date of Examination	**05 May 2024 (Sunday)**
Duration and Timing of Examination	**200 minutes (03 hours 20 Minutes) from 02:00 PM to 05:20 PM (IST)**
Centre of NEET (UG) - 2024 Examination	As indicated on the Admit Card
Display of Recorded Responses and Answer Keys	To be announced later on the website
Website(s)	***www.nta.ac.in, https://exams.nta.nic.in/NEET***
Declaration of Result on the NTA website	**14 June 2024**

Important Instructions :

(i) Candidates can apply for NEET (UG) - 2024 through the ***"Online" mode only*** through the website ***https://exams.nta.ac.in/NEET***

(ii) Submission of the Online Application Form may be done by accessing the NTA website ***https://exams.nta.nic.in/NEET.*** The Application Form in any other mode will not be accepted.

(iii) Only one application is to be submitted by a candidate.

For further clarification related to **NEET (UG) – 2024,** the candidates can also contact 011-40759000 or email at ***neet@nta.ac.in.***

For more information, visit ***https://exams.nta.ac.in/NEET***

31. (a) : Geitonogamy is genetically similar to autogamy since the pollen grains come from the same plant.

32. (d) : Smack is an opioid narcotic, which is extracted from the latex of poppy plant ***Papaver somniferum***. It is also commonly called "Brown Sugar". Cocaine commonly called coke or crack is obtained from the coca plant ***Erythroxylum coca***. Crack is usually snorted.

33. (b) : It is mitosis, in which both diploid and haploid cells undergoes mitotic division. If a diploid cell undergoes mitosis, it results in two identical diploid cells. If a haploid cell undergoes mitosis, the result is two identical haploid cells ($n \rightarrow n$). In meiosis however, a diploid cell participates that divides twice to produce four haploid cells ($2n \rightarrow n$). Meiosis is responsible for the formation of new species or evolution of species as it allows crossing over and therefore variation.

34. (b) : In maize and castor plant, unisexual flowers are present, though both male and female flowers can be present on same plant. This prevents autogamy but not geitonogamy.

35. (c) : Morphine is obtained from latex of poppy plant (*Papaver somniferum*). They are analgesic and act on CNS to relieve pain. They are called painkillers also.

36. (c) : Pneumatophores help to get oxygen for respiration.

37. (b) : The *cry* gene of ***Bacillus thuringiensis*** produces a protein, that forms crystalline inclusions, *i.e.*, protein is crystal in nature in the bacterial spores. Due to their crystal nature, these proteins are named 'Cry' proteins and are responsible for the insecticidal activities of the bacterial strains. In alkaline environment of insect midgut, 'Cry' proteins are solubilised. Then to release core toxic fragments, these proteins undergo proteolytic digestion.

38. (d) : Sclereids are highly thickened dead sclerenchyma cells with very narrow cavities. Sclereids may occur singly or in groups. They provide stiffness to the parts in which they occur.

39. (d) **40. (c)**

41. (c) : Chromosome number remains same during S-phase.

42. (a)

43. (a) : Net primary productivity is the rate of organic matter built up or stored by producers in their bodies in a unit area/volume per unit time. Net productivity is equal to gross primary productivity minus loss due to respiration and other reasons. Rate of assimilation of the food energy as organic matter or biomass by heterotrophs or consumers per unit time and area is known as secondary productivity.

44. (b) **45. (b)** **46. (b)**

47. (b) : Round seed shape, violet flower colour, green pod colour, inflated pod shape, axial flower position, yellow seed colour and tall stem height are dominant traits studied by Mendel.

48. (d) : Heroin or smack is a central nervous system depressant, which means it slows down brain function and affects breathing which can slow down or even stop.

49. (b) : In wheat field, ***Rhizobium*** bacteria will not fix nitrogen because ***Rhizobium*** bacteria live symbiotically in root nodules of legumes and some non-legumes.

50. (c) : Current number of lotus plants = 20
New plants added = 8

$$\text{Birth Rate} = \frac{8}{20} = 0.4 \text{ offspring per lotus plant per year.}$$

51. (a) : In secondary treatment aerobic microbes aerobically decompose organic matter. Therefore, it is also known as biological treatment.

52. (b)

53. (b) : Lactose or allolactose can bind with repressor protein, to set operon switched on. Hence, they are inducer.

54. (a) : The spermatids are transformed into spermatozoa by process called spermiogenesis.

55. (c)

56. (c) : Mycoplasma are organisms that completely lack a cell wall.

57. (c) **58. (a)**

59. (d) : Basophil secrete histamine, serotonin and heparin, etc., and are involved in inflammatory reactions.

60. (d) : Juxtaglomerular apparatus (JGA) operates a multi hormonal Renin-angiotensin-aldosterone system (RAAS). JGA release an enzyme renin in the blood, which initiates chemical reactions that produces angiotensin-II, a potential stimulator of aldosterone (mineralocorticoids) released by the adrenal cortex. It causes reabsorption of Na^+ and water from the distal pats of tubule. This leads to an increase in blood pressure and GFR.

61. (c) : Antibiotics are not effective against all pathogens. Antibiotics have greatly improved our capacity to treat deadly diseases such as plaque, whooping cough, diphtheria and leprosy.

62. (c) : Arthritis is inflammation of joints. Tetany is a muscular disorder that causes rapid spasms in muscles, which occur due to less calcium in body fluid. Myasthenia gravis is an autoimmune disorder affecting neuromuscular junction leading to fatigue, weakening and paralysis of skeletal muscle. Muscular dystrophy is the progressive degeneration of skeletal muscle mostly due to genetic disorder.

63. (a)

64. (a) : Fibrinogens are needed for clotting or coagulation of the blood. Thrombin acts as enzyme and converts inactive fibrinogens into fibrins.

65. (d) : In 1938, fish caught in South Africa happened to be a coelacanth which was thought to be extinct. These animals evolved into the first amphibians that lived on land and water. These were ancestors of modern-day frogs and salamanders.

66. (a)

67. (d) : A special case of Rh incompatibility has been observed between Rh –ve blood of pregnant mother with Rh +ve blood of fetus. During the delivery of the first child there is a possibility of exposure of the maternal blood to small amount of Rh +ve blood from fetus. In such cases, the mother starts preparing antibodies against Rh antigen in her blood. In the case of her subsequent pregnancies, the Rh antibody from the mother can leak to blood of fetus and destroy fetal RBC. This could be fatal to fetus or could cause severe anaemia and jaundice to the foetus. This condition in called erythroblastosis fetalis.

68. (a)

69. (c) : In case of codominant alleles, both alleles express and the progeny resembles both parents.

70. (a)

71. (b) : Cancerous tumours also called malignant tumour show metastasis. It is the ability of cancerous cells to migrate to other body organs through body fluids.

72. (c)

73. (b) : *Clostridium butylicum* is used in the commercial production of butyric acid. *Trichoderma polysporum*, a fungus, is used to produce a bioactive molecule cyclosporin A which is used as an immunosuppressant in organ transplant surgery. *Monascus purpureus* is a yeast used in the production of statins which are used in lowering blood cholesterol. Citric acid is obtained through the fermentation carried out by *Aspergillus niger* on sugary syrups.

74. (c)

75. (a) : Thyrocalcitonin is secreted by thyroid gland which regulates blood calcium level.

76. (b) : Some species are found only in some particular area and not found anywhere else. It is called endemism.

77. (a) : The globular head is an active ATPase enzyme and has binding sites for ATP and active sites for actin.

78. (c)

79. (a) : Cretinism is caused by deficiency of thyroid hormone in infants. This person has slow body growth and mental development with reduced metabolic rate.

80. (d) **81. (a)** **82. (d)**

83. (d) : Adenosine deaminase deficiency (ADA) caused due to deletion of the gene for enzyme adenosine deaminase causes SCID which results in dysfunctioning of immune system.

84. (c) **85. (b)** **86. (c)**

87. (d) : Most accepted theory for origin of life is Oparin theory of chemical evolution. According to this hypothesis, primitive atmosphere consists of methane, ammonia, water vapour, hydrogen gas. So, primitive atmosphere was reducing in nature.

88. (a)

89. (b) : Mons pubis is a cushion of fatty tissue covered by skin and pubic hair. Labia majora are the fleshy folds of tissue which extend down from the mons pubis and surrounds the vaginal opening. Labia minora are paired folds of tissue under the labia majora. Hymen, membrane partially covers the opening of vagina.

90. (a) : MTP is the termination of pregnancy before the fetus becomes viable. It is done to get rid of unwanted pregnancies and is comparatively safe upto first trimester (12 weeks) of pregnancy. After the first trimester, MTP becomes riskier as the fetus becomes intimately associated with the maternal tissues.

91. (b) : Transgenic animals that produce useful biological products can be created by the introduction of the portion of DNA (or genes) which codes for a particular product e.g., human protein (α-1 antitrypsin) is used to treat emphysema.

92. (c) : The two mandibles in the mouth part of cockroach bear teeth which cut and masticate the food into fine particles. Gizzard is a part of alimentary canal which is used for grinding the food as it bears six muscular folds covered by chitinous conical plates, the teeth.

93. (c) : Trachea is a straight tube extending upto mid-thoracic cavity, which divides at level of 5^{th} thoracic vertebra into right and left primary bronchi.

94. (c) : Rhinovirus represents one such group of viruses, which causes one of the most infectious human ailments-the common cold. They infect the nose and respiratory passage but not the lungs.

95. (b)

96. (d) : Frog has organs of touch (sensory papillae), taste (taste buds), smell (nasal epithelium), vision (eyes) and hearing (tympanum with internal ears).

97. (c) : Tyrosine and valine are aromatic and neutral amino acids respectively.

98. (d) : Along with hypothalamus, limbic system is involved in the regulation of sexual behaviour, expression of emotional reactions, (*e.g.*, excitement, pleasure, rage and fear) and motivation.

99. (c) **100. (b)**

WORD GRID

Readers are requested to send their responses of word grid to be the winner.

Find and encircle the words in the given grid, running in one of the possible directions; horizontal, vertical or diagonal by reading the clues given below.

Clues

1. The capacity to generate a whole plant from explant.
2. Biological substances that contains microbes and promotes growth of the plants.
3. A file-like rasping organ for feeding in molluscs.
4. The region of stem where leaves are borne.
5. Variation at genetic level due to mutation that forms the basis of DNA fingerprinting.
6. The type of leucoplast that store protein.
7. A leaf-like photosynthetic organ of brown algae.
8. Cell fragment produced from megakaryocyte.
9. The flat bone on the ventral midline of the thorax.
10. The dead and decayed remain of plants and animals.
11. Filamentous cyanobacteria known for nitrogen-fixation.
12. A part of hindbrain that consists of fibre tracts that interconnect different regions of brain.
13. The only type of pollination in which genetically different types of pollens are brought to the stigma.
14. The longest bone in human body.
15. Structural and functional unit between developing embryo and maternal body.
16. The red coloured iron containing complex protein.
17. The process in which glucose is broken down to produce energy.
18. It is the number of individuals of the same species that have come into the habitat from elsewhere during particular time period.
19. A fall in GFR activate JG cells to release this enzyme.
20. The group of enzymes responsible for breaking down of peptide bond.

A	B	P	F	E	M	U	R	C	H	E	P	R	K	L
B	I	O	O	S	L	D	A	H	I	M	L	E	Q	O
H	O	N	G	U	T	H	E	S	A	N	A	N	P	R
K	F	S	S	L	B	E	N	T	H	I	C	I	R	P
T	E	A	T	K	Y	S	R	U	R	Y	E	N	O	H
O	R	L	H	R	I	C	M	N	C	I	N	P	T	A
T	T	E	R	B	G	K	O	A	U	O	T	R	E	E
I	I	U	O	R	A	D	U	L	A	M	A	U	A	M
P	L	R	M	F	R	O	N	D	Y	M	P	H	S	O
O	I	O	B	V	U	N	K	A	A	S	M	S	E	G
T	S	P	O	L	Y	M	O	R	P	H	I	S	M	L
E	E	L	C	J	K	I	Q	D	O	T	M	S	S	O
N	R	A	Y	A	N	A	B	A	E	N	A	S	M	B
C	P	S	T	S	H	X	E	N	O	G	A	M	Y	I
Y	Q	T	E	I	M	M	I	G	R	A	T	I	O	N

***Please send entries of solutions both with words and scanned copy of the grid within 10th of every month.**

UCD
Unique Career in Demand

Explore the available Unique Career Options!

B.Sc. in Microbiology

B.Sc in Microbiology is a 3-year undergraduate course, which includes the study of various types of microorganisms, such as bacteria, viruses, fungi and protozoa. This course focusses on the study of microbes in terms of their morphology, growth pattern and environmental impact.

At the undergraduate degree level, this course includes laboratory work, providing practical knowledge in microbiological techniques and experimentation.

Selection Criteria

- Some colleges take admission on the basis of merit obtained in the qualifying exam.
- Some colleges take admission on the basis of a National level, Institute level or state level entrance exam.Candidates qualified in the entrance exam can attend counselling conducted by various universities.
- CUET UG or Common University Entrance Test (UG) is a National entrance examination, conducted by the National Testing Agency (NTA). The CUET 2024 exam is set to be held from May 15 to May 31, 2024

Job Perspectives

- Following graduation, students can choose from a variety of Masters and Ph.D course in microbiology and other fields.
- Generally, the concerned colleges provide internships, such as in laboratories, hospitals, clinics and so forth with a variety of profiles including bacteriology, virology, mycology and cell biology.
- Various healthcare industries including government and private hospitals like FORTIS, APOLLO provide many job opportunities in lab as pathologist for sample processing.
- Students can also work as microbiologist, food technologist, pharmacologist, research scientist, technical brewer, water quality scientist in various sectors.

Eligibility

The eligibility criteria to get admission in this course are as follows:

- Candidate must have passed class 12th with minimum of 60% marks in science stream from a recognised board with chemistry, biology and physics as compulsory subjects.

Top Colleges offering B.Sc. Microbiology

	Name of the University/College	City/State
I.	**Gargi College**	**New Delhi**
II.	Madras Christian College (MCC)	Chennai, Tamil Nadu
III.	St. Xavier's College	Mumbai, Maharashtra
IV.	PSG College of Arts and Science	Coimbatore, Tamil Nadu
V.	Ramaiah College of Arts, Science and Commerce	Bengaluru Karnataka
VI.	Ramakrishna Mission Vidyamandira	Howrah, West Bengal
VII.	St. Xavier's College	Kolkata, West Bengal
VIII.	JSS Academy of Higher Education & Research	Mysore, Karnataka
IX.	Fergusson College	Pune, Maharashtra
X.	IIMT University	Meerut, U.P.

College Info

Gargi College, New Delhi

Gargi College was established in the year 1967 and is a leading South Campus college of the University of Delhi. It is one of the leading colleges for women. Gargi College is accredited by the NAAC with a grade 'A' and is similarly approved by the UGC. The college offers various UG and PG courses.

This college has been awarded by Certificate of Recognition 2020, which is given to identify exemplary leadership in education and for the development of strong career learning environment presented by World Education Review and India International Education Council.

SELECTION CRITERIA

Admission into the UG program is now based on the Common University Entrance Test (CUET), followed by counselling.

Candidates must appear in CUET in the following subject combinations:

- Physics + Chemistry + Biology/ Biological Studies/ Biotechnology/ Biochemistry.
- Merit will be based on the CUET scores obtained from the above-mentioned combination of subjects.
- Candidates must have obtained a minimum of 30% score in any one language mentioned in List A* in CUET.

* https://admission.uod.ac.in

GK CORNER

Enhance Your General Knowledge with Current Updates!

ENVIRONMENT AND ECOLOGY

- The Wildlife Institute of India (WII) has conducted a first ever snow leopard census. On 30 January 2024, Union Minister for Environment, Forest and Climate Change, Bhupender Yadav unveiled the information about census that India is home to an estimated **718 snow leopards** across various states. The state-wise breakdown of their estimated population is Ladakh (477), Uttarakhand (124), Himachal Pradesh (51), Arunachal Pradesh (36), Sikkim (21), and Jammu and Kashmir (9).
- **Copernicus Climate Change Service (C3S)** reported that global temperature has reached exceptionally high levels in 2023 and the year 2024 is going to be even hotter. The agency has confirmed that the 12 months from February 2023 to January 2024 observed warming of 1.52°C above pre-industrial levels, crossing the critical 1.5°C threshold set out in the Paris Agreement for the first time.
- The 23rd edition of the annual flagship event of The Energy and Resources Institute (TERI)–the World Sustainable Development Summit (WSDS)–held from February 7 to February 9, 2024 in New Delhi. The Summit deliberations was focussed on the umbrella theme: **Leadership for Sustainable Development and Climate Justice**.
- A proposal by the government of Bengaluru, for the construction of a six-lane elevated highway through **Bannerghatta National Park (BNP)**, has evoked protests by environmental activists over its potential adverse impacts on the ecologically sensitive park. The intended purpose of the flyover is to alleviate traffic congestion between Bannerghatta and Jigani. This park serves as a vital biodiversity hotspot, housing endangered species like Asian elephants, Indian gaurs and sambar deer. The project will reduce the habitat available for elephants and increase human-wildlife conflict in the long run.
- The population of saltwater or estuarine crocodiles (*Crocodylus porosus*) in and around Odisha's Bhitarkanika National Park has seen slight increase in 2024. There are 1,811 crocodiles in the park located in Kendrapara district, according to forest officials who conducted the annual census from January 10-12, 2024. The numbers increased from 1,793 crocodiles counted last year through an extensive survey effort.
- A new study utilising advanced microscopy techniques has detected extremely high levels of **micro and nano-plastic particles** in several popular brands of bottled water. On an average, each litre was found to contain over 110,000 to 370,000 plastic particles, with around 90% sized in the nanoscale range below 1 micrometres. Unlike microplastics (ranging between 5 millimeters and 1 micrometer), nanoplastics can move from the intestines and lungs directly into the bloodstream before reaching the heart and brain. This raises concern over the potential health impacts. Results were reported on January 8, 2024, in the journal proceedings of the National Academy of Sciences.
- A new study finds that shark and ray meat has grown popular at restaurants catering to tourists and middle-class consumers. Around 251.6 tonnes of shark meat are sold every year in Indian restaurants with Goa selling the most (35.8%), followed by Tamil Nadu (34.6%) and Maharashtra (4.6%). With over a third of global **shark and ray** species threatened and 95% jeopardized by overfishing, this surging demand for their meat raises conservation alarms. India already ranks among the world's top three shark fishing nations.
- Denmark has announced its **Green Fuels Alliance India** (GFAI) initiative to boost collaborative efforts between the two countries in the sustainable energy solutions sector and advance their joint global goal towards carbon neutrality. GFAI's primary objective is to promote sustainable energy growth in India by establishing an ecosystem that encourages collaboration among businesses, government entities, research institutions, and financial stakeholders from both the Indian and Danish sectors.

- The Sepahijala Wildlife Sanctuary of Tripura has recently welcomed two Royal Bengal tigers, two leopards and four golden pigeons. The **animal exchange program** between Sepahijala Wildlife Sanctuary in Tripura and North Bengal Zoo is a positive initiative that took under the guidance of central zoo authority that contributes to biodiversity enrichment and collaboration in conservation efforts.
- *Thrips parvispinus*, an invasive pest species, might have replaced the native chilli thrips known as *Scirtothrips dorsalis* in Telangana and Andhra Pradesh as published in "The New Indian Express" on 5th February 2024.
- As per the report published in "Down to Earth" on 5th February 2024, the Aldabra giant tortoise reintroduction project is heading towards success as it has led to thousands of mega-herbivores, (Aldabra giant tortoises), repopulating the Madagascar island for the first time in 600 years. This project was started in 2018 to reintroduce the animal in the island.
- As per the press release posted on 5th February 2024, the Wildlife Institute of India and the Zoological Survey of India have been carrying out assessment of the black-necked cranes. As per the survey conducted by Wildlife Institute of India in 2016-2017 in Ladakh region, the population size of black necked crane was around 66-69 individuals. In Arunachal Pradesh, a small population of approximately 11 individuals arrives during winter months. The important habitats of black-necked crane have been notified as a protected areas.

Test Yourself!

1. Which organisation(s) has recently reported new arrivals of black-necked cranes?
   (a) Wildlife Institute of India
   (b) Centre for Environment Education (CEE)
   (c) Zoological Survey of India
   (d) Both (a) and (c)
2. Which institute organised the 23rd edition of the 'World Sustainable Development Summit'?
   (a) Environment Assessment Institute (EAI)
   (b) Centre for Environmental Planning and Technology (CEPT)
   (c) The Energy and Resources Institute (TERI)
   (d) Wildlife Institute of India (WII)
3. Which of the following is not included recently in the new batch of animals that were welcomed by Sepahijala Wildlife Sanctuary?
   (a) Royal Bengal Tigers (b) Golden Pigeons
   (c) Leopards (d) Giraffe
4. How many estuarine crocodiles has increased in 2024 in Bhitarkanika National Park as compared to 2023?
   (a) 17 (b) 18
   (c) 19 (d) 20
5. At what altitude the rare high altitude butterfly Dusted Apollo sighted in Himachal Pradesh fly?
   (a) 2500-3800 meters (b) 4000-5200 meters
   (c) 5000-6200 meters (d) 3500-4800 meters
6. Which institute has conducted a first ever snow leopard census in India?
   (a) Centre for Environment Education (CEE)
   (b) Wildlife Trust of India (WTI)
   (c) Wildlife Institute of India (WII)
   (d) Centre for Environmental Planning and Technology (CEPT)
7. Which country has announced its GFAI initiative with India recently?
   (a) Finland (b) Denmark
   (c) Sweden (d) Norway
8. Which Indian coastal state has the highest percentage of shark and ray meat selling restaurants?
   (a) Goa (b) Maharashtra
   (c) Kerala (d) Tamil Nadu
9. In which year the 'Aldabra giant tortoise reintroduction project' was started?
   (a) 2016 (b) 2017 (c) 2018 (d) 2019
10. Where is Bannerghatta National Park situated?
    (a) Karnataka (b) Gujarat
    (c) Uttarakhand (d) Tamil Nadu

☺☺

Answer Key

1.	(d)	2.	(c)	3.	(c)	4.	(b)	5.	(p)
6.	(c)	7.	(b)	8.	(e)	9.	(c)	10.	(a)

ANSWERS FEBRUARY 2024

The three letter sequence is **D I O**.

BASIDIOCARP

DIOECIOUS

ESTRADIOL

DIONAEA

Winner : *Nilimoy Choudhury, Cooch Behar (West Bengal)*

Quiz CLUB

Unlock Your Knowledge!

1. Which of the following is correct term for the cells of trophoblast which are in contact with inner cell mass of blastocyst?
   (a) Cells of Ranvier
   (b) Cells of Rauber
   (c) Amniogenic cells
   (d) Langherhans cell

2. What is the theme for World Tuberculosis Day, 2024?
   (a) Yes! We can end TB
   (b) Invest to End TB. Save Lives
   (c) The clock is ticking
   (d) It's time to end TB

3. World Wildlife Day is celebrated on which date?
   (a) 5th March (b) 3rd March
   (c) 3rd February (d) 5th February

4. Who is regarded as 'Founder of experimental Embryology'?
   (a) Nicolaus Steno (b) Aristotle
   (c) Robert J. Van de Graff (d) Wilhelm Roux

5. The term 'Paurometabolous' is associated with which of the following?
   (a) Moths (b) Silver fish
   (c) Cockroach (d) Sea squirts

6. Which of the following is connecting link between reptiles and mammals?
   (a) *Neopilina* (b) *Tachyglossus*
   (c) *Balanoglossus* (d) *Peripatus*

7. Which of the following is the main cause of 'meningitis'?
   (a) Viroids (b) Bacteria
   (c) Prions (d) Bacteriophage

8. In which stage of meiotic prophase-I lampbrush chromosomes are found?
   (a) Leptotene (b) Zygotene
   (c) Pachytene (d) Diplotene

9. Which of the following is used in testing of kidney function?
   (a) Insulin (b) Creatinine
   (c) Amylose (d) Xylan

10. The protofilaments of microtubules is made up of which protein?
    (a) β-myosin (b) α-myosin
    (c) Actin (d) Tubulin

11. Which one of the following fruit is drupe?
    (a) Apple (b) Peach
    (c) Grapes (d) Watermelon

12. Which of the following is the major protein of egg white?
    (a) Casein (b) Livetin
    (c) Zein (d) Ovalbumin

13. What is the term used for excessive menstruation?
    (a) Amenorrhea
    (b) Dysmenorrhea
    (c) Oophoritis
    (d) Menorrhagia

14. Which of the following is guanotelic organism?
    (a) Frog (b) Lizard
    (c) Starfish (d) Spider

15. In which of the following lobe Wernicke's area is situated?
    (a) Right temporal lobe
    (b) Left temporal lobe
    (c) Occipital lobe
    (d) Parietal lobe

Answer Key

1. (b) 2. (a) 3. (b) 4. (d) 5. (c)
6. (d) 7. (a) 8. (b) 9. (b) 10. (d)
11. (d) 12. (d) 13. (b) 14. (b) 15. (d)

☺☺

Registered R.N.I. No. 71810/1999 *Published on 1st of every month* Postal Regd. No. DL-SW-01/4046/2024-26
Lic. No. U(SW)-32/2024-26 to post without prepayment of postage LPC Delhi RMS, Delhi-06 on 2-3rd same month