

KCET 2024 Biology Question Paper With Solutions

Time Allowed :70 Minutes

Maximum Marks :60

Total Questions :60

General Instructions

Read the following instructions very carefully and strictly follow them:

1. The question paper consists of **60 multiple-choice questions (MCQs)**.
2. Each correct answer carries **1 mark**, and there is **no negative marking**.
3. Use a **blue or black ballpoint pen** to mark answers.
4. Fill your **roll number, question paper code**, and other details accurately on the OMR sheet.
5. The total duration of this section is **70 minutes**. Manage your time effectively.
6. Only **pens, admit cards, and photo ID proofs** are allowed. **Electronic devices** like calculators and mobile phones are **prohibited**.

Question 1.

Which among the following is used to treat Emphysema?

Options:

- (A) Human Hormone - α -Antitrypsin
- (B) Human α -Interferon
- (C) Human protein - α -Antitrypsin
- (D) Human α -Lactalbumin

Correct Answer: (C) Human protein - α -Antitrypsin

Solution:

Emphysema is a chronic respiratory disease caused by damage to alveoli, often due to excessive enzymatic activity. Human protein α -Antitrypsin acts as a protease inhibitor and helps protect lung tissues by inhibiting elastase, an enzyme that breaks down lung elasticity.

Quick Tip

Understanding the mechanism of enzymes and inhibitors is crucial for identifying treatments for respiratory diseases.

Question 2.

Homeostasis is a condition where the organisms:

Options:

- (A) Maintain a constant internal environment in an ever-changing external environment
- (B) Do not maintain a constant internal environment
- (C) Change their internal environment according to their external environment
- (D) Change their internal environment when the external environment is constant

Correct Answer: (A) Maintain a constant internal environment in an ever-changing external environment

Solution:

Homeostasis is the ability of an organism to regulate its internal conditions, such as temperature, pH, and electrolyte balance, to maintain optimal physiological processes regardless of external changes. For example, humans regulate body temperature through sweating or shivering.

Quick Tip

Focus on the keywords "constant internal environment" to distinguish homeostasis from other biological phenomena.

Question 3.

Which of the following is not a parasitic adaptation?

Options:

- (A) Loss of unnecessary sense organs
- (B) Absence of adhesive organs or suckers
- (C) Loss of digestive system
- (D) High reproductive capacity

Correct Answer: (B) Absence of adhesive organs or suckers

Solution:

Parasites often develop specialized structures, such as adhesive organs or suckers, to attach to their host and ensure survival. Their adaptations include high reproductive rates and loss of organs unnecessary for a parasitic lifestyle. The absence of adhesive organs contradicts the typical features of parasites.

Quick Tip

Remember that parasitic adaptations always enhance survival and attachment to the host.

Question 4.

DNA polymerase of *Thermus aquaticus* is:

Options:

- (A) Thermolabile
- (B) Thermophobic
- (C) Exonuclease
- (D) Thermostable

Correct Answer: (D) Thermostable

Solution:

The DNA polymerase derived from *Thermus aquaticus* (Taq polymerase) remains active at high temperatures, making it essential for Polymerase Chain Reaction (PCR), where repeated heating cycles are required for DNA denaturation and synthesis.

Quick Tip

Focus on the relationship between "thermostable" enzymes and their application in high-temperature processes like PCR.

Question 5.

If a recombinant DNA bearing a gene for resistance to Ampicillin is transferred into *E.coli* cells, host cells become transformed into Ampicillin-resistant cells. What happens when these *E.coli* are grown on a medium containing Ampicillin?

Options:

- (A) Non-transformants will grow and transformants will die
- (B) Non-transformants will die and transformants will grow
- (C) Both non-transformants and transformants will die
- (D) Both non-transformants and transformants will grow

Correct Answer: (B) Non-transformants will die and transformants will grow

Solution:

Transformants have a plasmid containing the Ampicillin-resistance gene, enabling them to produce proteins that neutralize Ampicillin, allowing growth in its presence. Non-transformants lack this gene and are unable to survive in the Ampicillin medium.

Quick Tip

Understand that antibiotic resistance is a common marker for selecting transformed cells in genetic engineering experiments.

Question 6.

Which of the following is based on the principle of antigen-antibody interaction?

Options:

- (A) PCR
- (B) ELISA
- (C) rDNA technology
- (D) Gel Electrophoresis

Correct Answer: (B) ELISA

Solution:

ELISA (Enzyme-Linked Immunosorbent Assay) utilizes the specific binding of antigens and antibodies to detect the presence of pathogens, proteins, or other biomolecules. It is commonly used in medical diagnostics for conditions like HIV.

Quick Tip

Focus on keywords like "antigen-antibody interaction" to identify ELISA in diagnostic tools.

Question 7.

A strict protection of biodiversity hotspots could reduce the ongoing mass extinction by almost:

Options:

- (A) 20%
- (B) 25%
- (C) 30%
- (D) 35%

Correct Answer: (C) 30%

Solution:

Biodiversity hotspots are areas rich in unique species that are under threat. Strict protection measures, such as preventing habitat destruction and poaching, can significantly reduce the extinction rate of endemic species, potentially up to 30%.

Quick Tip

Associate biodiversity hotspots with species conservation strategies and their global significance.

Question 8.

Identify the incorrect match with respect to recently extinct animals and their place of

extinction according to the IUCN Red List:

Options:

- (A) Dodo - Mauritius
- (B) Quagga - Africa
- (C) Thylacine - Australia
- (D) Steller's Sea Cow - North America

Correct Answer: (D) Steller's Sea Cow - North America

Solution:

Steller's Sea Cow was last seen in the Bering Sea and is native to the Arctic region, not North America. The other matches are accurate based on historical records.

Quick Tip

Learn extinction locations to identify incorrect associations for animal species.

Question 9.

According to the hypothesis proposed by environmental biologists, a relatively constant environment in tropics promotes:

Options:

- (A) Niche specialization and lesser species diversity
- (B) Niche specialization and greater species diversity
- (C) Niche diversity and lesser species specialization
- (D) Niche diversity and greater species specialization

Correct Answer: (B) Niche specialization and greater species diversity

Solution:

Stable tropical climates promote the evolution of highly specialized ecological niches, allowing greater coexistence of diverse species without competition, thereby increasing species diversity.

Quick Tip

Link constant environments with increased niche specialization to explain tropical biodiversity.

Question 10.

In the prevention of air pollution, the role of a scrubber is to remove:

Options:

- (A) Particulate SO_2
- (B) Liquid SO_2
- (C) Gaseous SO_2
- (D) Liquid SO_3

Correct Answer: (C) Gaseous SO_2

Solution:

Scrubbers are air pollution control devices that trap harmful gases like sulfur dioxide (SO_2) from industrial emissions. These devices use water or chemical solutions to neutralize and remove pollutants, ensuring cleaner air.

Quick Tip

Relate scrubbers to controlling gaseous emissions from industrial sources.

Question 11.

Match List-I with List-II and choose the correct answer.

List-I:

- 1) Nitrogen rich fertilizers
- 2) Carbon dioxide
- 3) Carbon monoxide
- 4) CFC's

List-II:

- p) Ozone depletion
- q) Eutrophication
- r) Greenhouse effect
- s) Air pollutant

Options:

- (A) 1-p, 2-q, 3-r, 4-s
- (B) 1-q, 2-r, 3-s, 4-p
- (C) 1-r, 2-s, 3-p, 4-q
- (D) 1-s, 2-p, 3-q, 4-r

Correct Answer: (B) 1-q, 2-r, 3-s, 4-p

Solution:

- Nitrogen-rich fertilizers contribute to eutrophication in water bodies, leading to excessive algal growth.
- Carbon dioxide is a key contributor to the greenhouse effect, trapping heat in the Earth's atmosphere.
- Carbon monoxide is an air pollutant that binds to hemoglobin, reducing oxygen transport in the body.
- CFCs (Chlorofluorocarbons) cause ozone depletion by releasing chlorine atoms that

degrade ozone molecules in the stratosphere.

Quick Tip

Focus on how specific chemicals affect ecosystems and global climate to link causes and effects accurately.

Question 12.

Following representations P, Q, and R denote a few steps of Griffith's Experiment. Identify the correct one(s).

Steps:

P. R strain \rightarrow Inject into mice \rightarrow Mice die

Q. S strain (Heat killed) \rightarrow Inject into mice \rightarrow Mice die

R. R strain \rightarrow Inject into mice \rightarrow Mice live

Options:

(A) P only

(B) R only

(C) P and R

(D) Q and R

Correct Answer: (B) R only

Solution:

Griffith's experiment demonstrated transformation by showing that non-virulent R strain bacteria do not kill mice unless combined with heat-killed virulent S strain bacteria. R strain alone is harmless, as seen in step R. Steps P and Q are incorrect representations of Griffith's findings.

Quick Tip

Remember that Griffith's experiment highlighted the process of transformation but did not identify DNA as the genetic material.

Question 13.

In tRNA, the region that binds with mRNA is:

Options:

- (A) Anticodon loop of tRNA
- (B) Amino acid acceptor end of tRNA
- (C) Amino acyl synthetase loop of tRNA
- (D) Ribosomal binding loop of tRNA

Correct Answer: (A) Anticodon loop of tRNA

Solution:

The anticodon loop of tRNA contains a sequence of three nucleotides that pairs specifically with the complementary codon on mRNA during translation. This ensures that the correct amino acid is incorporated into the growing polypeptide chain.

Quick Tip

Focus on the role of the anticodon in maintaining the accuracy of genetic translation.

Question 14.

The mRNA has Untranslated Regions (UTRs):

Options:

- (A) At 3' -end beyond Terminator codon
- (B) At 5' -end before AUG
- (C) At both 3' -end and 5' -end beyond Terminator codon and before AUG respectively
- (D) AUG and Terminator codon flank the UTR

Correct Answer: (C) At both 3' -end and 5' -end beyond Terminator codon and before AUG respectively

Solution:

Untranslated regions (UTRs) are non-coding sequences at the 5' and 3' ends of mRNA. The 5' UTR regulates translation initiation, while the 3' UTR influences mRNA stability, localization, and translation efficiency. These regions are crucial for post-transcriptional control.

Quick Tip

UTRs are important for fine-tuning protein synthesis beyond coding regions.

Question 15.

In a structural gene, the template DNA strand has nucleotide sequences:

3' ATGCATGCATGCATGC 5'.

Find the correct and complementary nucleotide sequence on the coding strand.

Options:

- (A) 5' ATGCATGCATGCATGC 3'
- (B) 3' GCATGCATGCATGCAT 5'
- (C) 5' TACGTACGTACGTACG 3'

(D) 3' TACGTACGTACGTACG 5'

Correct Answer: (C) 5' TACGTACGTACGTACG 3'

Solution:

The coding strand of DNA has the same nucleotide sequence as the mRNA (except thymine is replaced with uracil). The complementary sequence to the given template strand is derived by base pairing: adenine with thymine and cytosine with guanine, maintaining antiparallel orientation.

Quick Tip

Use base-pairing rules carefully to ensure the correct orientation and sequence.

Question 16.

Read the following statements:

Statement I: All vertebrates develop a row of vestigial gill slits during the embryonic stage.

Statement II: Embryos always pass through the adult stages of other animals.

Options:

- (A) Statement I is correct, Statement II is incorrect.
- (B) Statement I is incorrect, Statement II is correct.
- (C) Both Statements I and II are correct.
- (D) Both Statements I and II are incorrect.

Correct Answer: (A) Statement I is correct, Statement II is incorrect.

Solution:

During embryonic development, all vertebrates exhibit vestigial gill slits, reflecting their

evolutionary ancestry. However, the idea that embryos pass through the adult stages of other animals (recapitulation theory) has been disproved. Embryonic development is better explained by shared evolutionary traits rather than a progression through adult forms of other species.

Quick Tip

Focus on embryological evidence as support for evolutionary relationships.

Question 17.

Which of the following exhibits a haplodiplontic lifecycle?

Options:

- (A) Fucus
- (B) Chlamydomonas
- (C) Gelidium
- (D) Ectocarpus

Correct Answer: (D) Ectocarpus

Solution:

Ectocarpus has a haplodiplontic lifecycle, where both haploid (gametophyte) and diploid (sporophyte) stages are multicellular and alternate during its lifecycle. This alternation provides genetic diversity and adaptation advantages. Other options either exhibit haplontic or diplontic lifecycles.

Quick Tip

Remember that haplodiplontic lifecycles include both multicellular gametophyte and sporophyte stages.

Question 18.

Identify the phylum which shows the following characteristics:

1. Animals are exclusively marine, radially symmetrical, and diploblastic.
2. Body bears eight external rows of ciliated comb plates which help in locomotion.
3. Digestion is both extracellular and intracellular.
4. Reproduction only by sexual modes.

Options:

- (A) Coelenterata
- (B) Mollusca
- (C) Arthropoda
- (D) Ctenophora

Correct Answer: (D) Ctenophora

Solution:

Ctenophora, commonly known as comb jellies, are marine organisms that use ciliary comb plates for locomotion. They are radially symmetrical, diploblastic, and rely on both extracellular and intracellular digestion. Reproduction in Ctenophora is typically sexual, and they exhibit bioluminescence, making them unique among marine animals.

Quick Tip

Ctenophora can be identified by their exclusive use of ciliary locomotion and bioluminescence.

Question 19.

When a flower has both stamens and carpels, it is described as:

Options:

- (A) Asexual
- (B) Unisexual
- (C) Bisexual
- (D) Dioecious

Correct Answer: (C) Bisexual

Solution:

A bisexual flower contains both stamens (male reproductive organs) and carpels (female reproductive organs) within the same flower. This structure enables self-pollination, though cross-pollination may still occur. Examples include flowers of hibiscus and mustard.

Quick Tip

Bisexual flowers are key to understanding self-pollination mechanisms in angiosperms.

Question 20.

Ciliated epithelial cells are present in:

Options:

- (A) Kidneys
- (B) Intestines
- (C) Blood Vessels
- (D) Bronchioles

Correct Answer: (D) Bronchioles

Solution:

Ciliated epithelial cells line the bronchioles of the respiratory system. These cells are equipped with hair-like structures (cilia) that beat rhythmically to move mucus and trapped particles out of the airways, maintaining clear passages for efficient gas exchange.

Quick Tip

Ciliated epithelium is crucial for protecting the respiratory system by clearing debris and pathogens.

Question 21.

Which of the following statements is correct with reference to vacuoles?

Options:

- (A) It is membrane bound and contains storage proteins and lipids.
- (B) It is membrane bound and contains water and excretory substances.
- (C) It lacks membrane and contains air.
- (D) It lacks membrane and contains water and excretory substances.

Correct Answer: (B) It is membrane bound and contains water and excretory substances.

Solution:

Vacuoles are large, membrane-bound organelles found primarily in plant cells. They store water, ions, excretory substances, and other molecules. In addition to maintaining turgor pressure (internal hydrostatic pressure), vacuoles play a key role in waste storage and cell elongation.

Quick Tip

Remember that vacuoles help maintain cell shape and regulate the internal osmotic balance.

Question 22.

Exoskeleton of Arthropods is made up of a unique complex polysaccharide known as:

Options:

- (A) Hyaluronic Acid
- (B) Chitin
- (C) Waxes
- (D) Cellulose

Correct Answer: (B) Chitin

Solution:

Chitin is a nitrogen-containing polysaccharide found in the exoskeleton of arthropods, such as insects, spiders, and crustaceans. It provides strength and protection while maintaining flexibility. Unlike cellulose, chitin includes nitrogen, which distinguishes it chemically.

Quick Tip

Chitin also contributes to the rigidity of fungal cell walls, unlike cellulose in plants.

Question 23.

The enzyme Recombinase is required at which stage of Meiosis I?

Options:

- (A) Pachytene
- (B) Zygotene
- (C) Diplotene
- (D) Diakinesis

Correct Answer: (A) Pachytene

Solution:

During the Pachytene stage of Prophase I in Meiosis I, recombinase facilitates the process of homologous recombination. This process allows the exchange of genetic material between non-sister chromatids of homologous chromosomes, resulting in genetic variation in the offspring.

Quick Tip

Link "Pachytene" with crossing over, a key event ensuring genetic diversity.

Question 24.

The water potential of pure water is:

Options:

- (A) One
- (B) More than one
- (C) Zero
- (D) Less than zero

Correct Answer: (C) Zero

Solution:

Water potential (Ψ) is the measure of potential energy in water and its ability to move. Pure water at standard conditions has a water potential of zero. The addition of solutes decreases the water potential, making it negative, while pressure increases it.

Quick Tip

Remember: solutes lower water potential, while pressure can raise it.

Question 25.

Match the pigments given in List I with their colour in the chromatogram given in List II.

List I (Pigments):

1. Chlorophyll 'b'
2. Carotenoids
3. Chlorophyll 'a'
4. Xanthophylls

List II (Colour in chromatogram):

- p. Yellow orange
- q. Orange red
- r. Yellow
- s. Blue green
- t. Yellow green

Options:

- (A) 1-s, 2-t, 3-r, 4-q
- (B) 1-p, 2-q, 3-r, 4-t
- (C) 1-t, 2-p, 3-s, 4-r
- (D) 1-t, 2-p, 3-r, 4-s

Correct Answer: (B) 1-p, 2-q, 3-r, 4-t

Solution:

Plant pigments separate into distinct bands during chromatography due to their solubility and polarity. The correct matches are:

- Chlorophyll 'b' appears yellow-green (t).
- Carotenoids show yellow-orange (p).
- Chlorophyll 'a' appears blue-green (s).
- Xanthophylls show yellow (r).

Quick Tip

Chromatography is a visual method to separate plant pigments based on their chemical properties.

Question 26.

Which is the intermediate compound that links the end product of Glycolysis with TCA Cycle?

Options:

- (A) Acetyl CoA
- (B) Pyruvic Acid
- (C) OAA
- (D) Citric Acid

Correct Answer: (A) Acetyl CoA

Solution:

Pyruvic acid, the end product of glycolysis, is converted into Acetyl CoA by the enzyme pyruvate dehydrogenase in the presence of coenzyme A. Acetyl CoA then enters the

TCA cycle to participate in oxidative metabolism, generating ATP and electron carriers.

Quick Tip

Acetyl CoA acts as the gateway between glycolysis and aerobic respiration.

Question 27.

Auxins : Apical dominance : : Gibberellins :

Options:

- (A) Adventitious shoot formation
- (B) Accelerates abscission
- (C) Closure of stomata
- (D) Bolting

Correct Answer: (D) Bolting

Solution:

Gibberellins play a role in bolting, the rapid elongation of the stem and flowering in plants like cabbage under conditions such as exposure to long days or cold temperatures. Bolting involves cell elongation and division, which is regulated by gibberellins.

Quick Tip

Remember gibberellins' association with growth processes like stem elongation and bolting.

Question 28.

The term Uremia refers to:

Options:

- (A) Accumulation of Urea in blood.
- (B) Presence of Glucose in the urine.
- (C) Accumulation of Uric acid in blood.
- (D) Accumulation of Uric acid in kidneys.

Correct Answer: (A) Accumulation of Urea in blood.

Solution:

Uremia results from kidney dysfunction where urea and other nitrogenous waste products build up in the bloodstream. It can lead to symptoms like nausea, fatigue, and confusion. If untreated, it may progress to life-threatening conditions like uremic encephalopathy.

Quick Tip

Uremia is an indicator of severe renal failure and requires immediate medical attention.

Question 29.

The typical 'lub-dub' sounds heard during heartbeat are produced due to:

Options:

- (A) Closure of semilunar valves
- (B) Closure of bicuspid and tricuspid valves
- (C) Closure of bicuspid and tricuspid valves followed by semilunar valves
- (D) Opening of bicuspid and tricuspid valves followed by semilunar valves

Correct Answer: (C) Closure of bicuspid and tricuspid valves followed by semilunar valves

Solution:

The "lub" sound is produced by the closure of atrioventricular (bicuspid and tricuspid) valves during ventricular contraction, while the "dub" sound occurs due to the closure of semilunar valves during ventricular relaxation. These sounds are critical indicators of heart valve health.

Quick Tip

Heart sounds provide diagnostic insights into valve functionality and cardiac health.

Question 30.

The functional unit of contraction is a:

Options:

- (A) Portion of myofibril between two successive Z-lines
- (B) Portion of myofibril between two successive M-lines
- (C) Centre of the H-zone
- (D) Centre of the I-band

Correct Answer: (A) Portion of myofibril between two successive Z-lines

Solution:

The sarcomere is the structural and functional unit of muscle contraction. It is defined as the region between two Z-lines, where actin and myosin filaments overlap to facilitate contraction based on the sliding filament theory.

Quick Tip

Sarcomeres are key to understanding the mechanics of muscle movement and contraction.

Question 31.

Match the parts of the brain given in List I with their functions given in List II.

List I: (Parts of the brain)

1. Medulla oblongata
2. Hypothalamus
3. Cerebral cortex
4. Limbic system

List II: (Functions)

- p. Body temperature
- q. Olfaction
- r. Respiration
- s. Motor function

Options:

- (A) 1-p, 2-r, 3-s, 4-q
- (B) 1-q, 2-s, 3-r, 4-p
- (C) 1-s, 2-p, 3-q, 4-r
- (D) 1-r, 2-p, 3-s, 4-q

Correct Answer: (D) 1-r, 2-p, 3-s, 4-q

Solution:

The medulla oblongata controls vital autonomic functions like respiration and heart

rate. The hypothalamus regulates homeostatic processes such as body temperature and hunger. The cerebral cortex governs higher motor functions, decision-making, and voluntary movements. The limbic system is involved in emotions, memory, and olfaction (sense of smell).

Quick Tip

Link brain regions to their distinct functions for better understanding of the nervous system.

Question 32.

Hydra reproduces asexually by producing:

Options:

- (A) Zoospores
- (B) Conidia
- (C) Buds
- (D) Gemmule

Correct Answer: (C) Buds

Solution:

Hydra reproduces asexually by budding, where a new organism develops as an outgrowth from the parent's body. The bud matures, forms all necessary structures, and detaches to become a new individual under favorable environmental conditions.

Quick Tip

Budding ensures rapid reproduction without requiring genetic recombination.

Question 33.

When male and female gametes are morphologically distinct, the condition is known as:

Options:

- (A) Homogametes
- (B) Heterogametes
- (C) Hermaphrodites
- (D) Sexual Dimorphism

Correct Answer: (B) Heterogametes

Solution:

Heterogametes are gametes that differ in size, shape, or function. For example, in humans, the sperm is small and motile, while the ovum is large and non-motile. This distinction facilitates specialized roles in fertilization.

Quick Tip

Heterogamety increases efficiency in sexual reproduction by enhancing the roles of each gamete.

Question 34.

The role of Filiform apparatus in synergids is to:

Options:

- (A) Protect the egg apparatus
- (B) Endosperm formation
- (C) Guide the entry of pollen tube
- (D) Prevention of gamete entry

Correct Answer: (C) Guide the entry of pollen tube

Solution:

The Filiform apparatus in synergids secretes chemical signals to guide the pollen tube to the egg apparatus during fertilization. It ensures precise delivery of sperm cells to the egg for successful fertilization.

Quick Tip

The filiform apparatus is key to reproductive success in flowering plants.

Question 35.

Transfer of pollen grains from the anther to the stigma of another flower of the same plant is called:

Options:

- (A) Xenogamy
- (B) Autogamy
- (C) Cleistogamy
- (D) Geitonogamy

Correct Answer: (D) Geitonogamy

Solution:

Geitonogamy refers to the transfer of pollen between flowers of the same plant. While it appears similar to cross-pollination, it is genetically equivalent to self-pollination since the genetic material originates from the same plant.

Quick Tip

Distinguish Geitonogamy from Autogamy by remembering it occurs between flowers, not within one flower.

Question 36.

Match the content of List I with List II:

List I:

1. Polyembryony
2. Perisperm
3. False fruit
4. Parthenocarpy

List II:

- p. Black pepper
- q. Banana
- r. Lemon
- s. Apple

Options:

- (A) 1-r, 2-p, 3-s, 4-q
- (B) 1-p, 2-r, 3-s, 4-q
- (C) 1-q, 2-p, 3-s, 4-r
- (D) 1-r, 2-s, 3-p, 4-q

Correct Answer: (A) 1-r, 2-p, 3-s, 4-q

Solution:

- Polyembryony, seen in lemon, refers to the development of multiple embryos from a

single fertilized egg.

- Perisperm, the persistent nucellus, is found in black pepper.
- False fruits like apple develop from floral parts other than the ovary.
- Parthenocarpy, as in banana, involves the development of fruit without fertilization.

Quick Tip

Understanding unique plant adaptations helps in identifying economic and ecological importance.

Question 37.

Which of the following hormones is not secreted by human placenta?

Options:

- (A) Progestogen
- (B) HCG
- (C) Estrogen
- (D) LH

Correct Answer: (D) LH

Solution:

The human placenta produces hormones like HCG, progestogen, and estrogen, which support pregnancy and fetal development. However, LH (Luteinizing Hormone) is secreted by the anterior pituitary gland and plays a role in ovulation, not pregnancy maintenance.

Quick Tip

Placental hormones are essential for sustaining pregnancy and preparing the mother's body for childbirth.

Question 38.

In human females, the endometrium of the uterus consists of:

Options:

- (A) Smooth muscle
- (B) Glandular layer
- (C) Adipose layer
- (D) Cartilaginous layer

Correct Answer: (B) Glandular layer

Solution:

The endometrium is the innermost layer of the uterus, rich in glands and blood vessels. It thickens cyclically in response to hormonal changes, preparing for potential implantation of a fertilized egg. If implantation does not occur, it sheds during menstruation.

Quick Tip

The endometrium is a dynamic tissue crucial for implantation and successful pregnancy.

Question 39.

If two primary spermatocytes and two primary oocytes undergo meiosis simultaneously, what will be the ratio of spermatozoa and ova produced at the end of gametogenesis?

Options:

- (A) 2:1
- (B) 4:1
- (C) 6:2
- (D) 1:2

Correct Answer: (B) 4:1

Solution:

Each primary spermatocyte undergoes two meiotic divisions to form four sperm cells, while each primary oocyte produces only one ovum due to unequal cytokinesis, with other cells becoming polar bodies. For two spermatocytes and oocytes, the ratio is 4 spermatozoa to 1 ovum.

Quick Tip

Male gametogenesis produces multiple gametes, while female gametogenesis focuses on one functional ovum.

Question 40.

The Government of India legalized MTP with some strict regulations in the year:

Options:

- (A) 1951
- (B) 1961
- (C) 1971
- (D) 2001

Correct Answer: (C) 1971

Solution:

The Medical Termination of Pregnancy (MTP) Act, 1971, legalized abortion under specific circumstances, such as risks to the mother's health or fetal abnormalities, to ensure safe medical practices. This act reflects India's effort to balance ethical considerations with public health.

Quick Tip

Legislation like the MTP Act emphasizes the importance of regulated healthcare interventions.

Question 41.

The process in which a small part of the vas deferens is removed or tied up through a small incision, is called:

Options:

- (A) MTP
- (B) Vasectomy
- (C) Tubectomy
- (D) GIFT

Correct Answer: (B) Vasectomy

Solution:

Vasectomy is a surgical method of male sterilization used as a permanent contraceptive measure. It involves cutting or blocking the vas deferens, preventing sperm from mixing with semen during ejaculation. This procedure does not affect testosterone production or sexual performance.

Quick Tip

Vasectomy is a simple and effective method for long-term contraception in men.

Question 42.

Test cross in pea plant is:

Options:

- (A) A cross between F2 tall plant and recessive parent.
- (B) A cross between F2 dwarf plant and recessive parent.
- (C) A cross between F2 tall plant with dominant parent.
- (D) A cross between two F1 plants.

Correct Answer: (A) A cross between F2 tall plant and recessive parent.

Solution:

A test cross is used to determine the genotype of an organism showing a dominant phenotype. In Mendelian experiments, the organism is crossed with a homozygous recessive parent. For example, in a tall pea plant, this test reveals whether the tall plant is homozygous (TT) or heterozygous (Tt).

Quick Tip

Always pair dominant phenotype individuals with a recessive genotype in a test cross.

Question 43.

The genotype ratio of incomplete dominance is:

Options:

- (A) 3:1
- (B) 1:2:1
- (C) 1:1:2
- (D) 9:3:3:1

Correct Answer: (B) 1:2:1

Solution:

In incomplete dominance, the heterozygous phenotype is intermediate between the two homozygous phenotypes. This results in a genotypic ratio of 1:2:1 in the offspring, as seen in cases like the cross between red and white flowers producing pink flowers in heterozygotes.

Quick Tip

Incomplete dominance shows blending inheritance but retains distinct parental genotypes.

Question 44.

Find the incorrect statement among the following:

Options:

- (A) In sex-linked recessive traits, the gene is transmitted from an unaffected carrier female to some of the male progeny.
- (B) Accumulation of phenylpyruvic acid in the brain results in mental retardation.
- (C) Individuals affected by Down's Syndrome will have congenital heart defects and are more intelligent.
- (D) Turner's Syndrome is caused due to the absence of one X chromosome.

Correct Answer: (C) Individuals affected by Down's Syndrome will have congenital heart defects and are more intelligent.

Solution:

Down's Syndrome is caused by trisomy of chromosome 21, leading to developmental and intellectual disabilities, as well as congenital heart defects. The statement about increased intelligence is incorrect. Turner's Syndrome, on the other hand, results from a missing X chromosome (45, X).

Quick Tip

Familiarity with symptoms and genetic causes helps in diagnosing chromosomal disorders.

Question 45.

In a dihybrid cross between a true breeding round yellow seeded and true breeding wrinkled green seeded pea plant, the ratio of segregation of round and wrinkled seed traits in F₂ is:

Options:

- (A) 9:1
- (B) 3:1
- (C) 9:3
- (D) 3:3

Correct Answer: (B) 3:1

Solution:

Mendel's dihybrid cross demonstrated the independent assortment of traits. For seed shape (round vs. wrinkled), the segregation in F₂ follows a phenotypic ratio of 3:1. This

highlights Mendel's principle of segregation.

Quick Tip

Analyze each trait in dihybrid crosses independently to identify phenotypic ratios.

Question 46.

Stanley Miller simulated the conditions of pre-biotic Earth using a spark-discharge apparatus. Which organic compounds were observed by him on analyzing the end product of his experiment?

Options:

- (A) Pigments
- (B) Fats
- (C) Nitrogen bases
- (D) Amino acids

Correct Answer: (D) Amino acids

Solution:

Stanley Miller's experiment demonstrated the spontaneous formation of amino acids from basic chemicals (like methane, ammonia, and water vapor) when exposed to energy sources such as electric sparks, simulating lightning. This experiment supported theories of chemical evolution of life.

Quick Tip

Miller's experiment shows how basic life-building molecules could form in Earth's primitive environment.

Question 47.

The most ape-like ancestral primate was:

Options:

- (A) Dryopithecus
- (B) Ramapithecus
- (C) Australopithecus
- (D) Neanderthal man

Correct Answer: (A) Dryopithecus

Solution:

Dryopithecus is an early primate ancestor that exhibited features similar to modern apes. It lived around 15 million years ago and is considered a common ancestor to both apes and humans.

Quick Tip

Studying fossil records like Dryopithecus helps trace evolutionary relationships.

Question 48.

The principle of vaccination is based on which property of the immune system?

Options:

- (A) Memory
- (B) Specificity
- (C) Diversity
- (D) Plasticity

Correct Answer: (A) Memory

Solution:

Vaccination stimulates the immune system to produce memory cells specific to a pathogen. These cells "remember" the pathogen and respond rapidly during future exposures, preventing disease development.

Quick Tip

Vaccination leverages immune memory to provide long-term protection against infections.

Question 49.

The genome of HIV replicates in the macrophages with the help of an enzyme called:

Options:

- (A) DNA Polymerase
- (B) RNA Polymerase
- (C) Reverse Transcriptase
- (D) DNA Ligase

Correct Answer: (C) Reverse Transcriptase

Solution:

HIV uses reverse transcriptase to convert its RNA genome into DNA within host macrophages. This DNA integrates into the host genome, allowing viral replication and infection. Reverse transcriptase is a key target in antiretroviral therapy.

Quick Tip

Reverse transcriptase inhibitors are effective in managing HIV by blocking viral replication.

Question 50.

Read the following statements:

Statement I: Morphine is obtained by acetylation of Heroin.

Statement II: Cannabinoids are known for their effect on the cardiovascular system.

Which of the following options is correct with reference to these statements?

Options:

- (A) Both Statements I and II are correct.
- (B) Statement I is correct and Statement II is incorrect.
- (C) Statement I is incorrect and Statement II is correct.
- (D) Both Statements I and II are incorrect.

Correct Answer: (C) Statement I is incorrect and Statement II is correct.

Solution:

Morphine is a naturally occurring opiate derived from the poppy plant, whereas heroin is synthesized by acetylation of morphine. Cannabinoids, derived from cannabis plants, affect multiple systems in the body, including the cardiovascular system, where they influence blood pressure and heart rate.

Quick Tip

Understanding pharmacological origins clarifies the effects and uses of medicinal compounds.

Question 51.

Mule is the result of:

Options:

- (A) Out-crossing
- (B) Cross-breeding
- (C) Interspecific hybridization
- (D) Out-breeding

Correct Answer: (C) Interspecific hybridization

Solution:

A mule is an offspring of a male donkey and a female horse, resulting from interspecific hybridization. This process involves mating between individuals of two different species, leading to offspring with a mix of traits from both parents. Mules inherit strength and endurance from both parents but are usually sterile due to differences in chromosome numbers between the species.

Quick Tip

Interspecific hybrids often exhibit vigor and adaptability but may face reproductive challenges.

Question 52.

Identify the bacterial disease among the following:

Options:

- (A) Brown rust of wheat
- (B) Tobacco mosaic disease
- (C) Black rot of crucifers

(D) Late blight of potato

Correct Answer: (C) Black rot of crucifers

Solution:

Black rot of crucifers is caused by the bacterium *Xanthomonas campestris*. This disease affects cruciferous crops such as cabbage and cauliflower, leading to significant agricultural losses. It spreads through infected seeds and soil, causing yellowing and wilting of leaves.

Quick Tip

Effective seed treatment and crop rotation can help manage bacterial diseases like black rot.

Question 53.

Match the nutrients given in List-I with the source in List-II:

List-I:

1. Vitamin A
2. Single cell protein
3. Vitamin C
4. Protein

List-II:

- p. Bitter gourd
- q. Beans
- r. Carrots
- s. Spirulina spp

Options:

- (A) 1-p, 2-q, 3-r, 4-s
- (B) 1-r, 2-s, 3-p, 4-q
- (C) 1-p, 2-r, 3-s, 4-q
- (D) 1-q, 2-s, 3-p, 4-r

Correct Answer: (B) 1-r, 2-s, 3-p, 4-q

Solution:

- Vitamin A, crucial for vision and immune health, is abundant in carrots (r).
- Single-cell proteins, a sustainable protein source, are derived from microorganisms like *Spirulina* (s).
- Bitter melon (p) is rich in Vitamin C, an antioxidant supporting immunity.
- Beans (q) provide plant-based protein, essential for body repair and growth.

Quick Tip

Integrating diverse food sources ensures a balanced intake of essential nutrients.

Question 54.

The chemical substances produced by some microbes which can kill or retard the growth of other microbes are known as:

Options:

- (A) Statins
- (B) Streptokinases
- (C) Cyclosporins
- (D) Antibiotics

Correct Answer: (D) Antibiotics

Solution:

Antibiotics, such as penicillin, are bioactive compounds produced by microorganisms like fungi and bacteria. They inhibit or kill other microbes by targeting specific pathways, such as cell wall synthesis or protein production. This property makes them vital in treating bacterial infections.

Quick Tip

Responsible antibiotic use prevents the emergence of resistant bacterial strains.

Question 55.

Select the correct statement from the following:

Options:

- (A) *Methanobacterium* is an aerobic bacterium found in the rumen of cattle.
- (B) Biogas is produced by the activity of aerobic bacteria.
- (C) Biogas is pure methane.
- (D) Activated sludge in sediment tanks is a rich source of aerobic bacteria.

Correct Answer: (D) Activated sludge in sediment tanks is a rich source of aerobic bacteria.

Solution:

Activated sludge, formed during wastewater treatment, contains aerobic bacteria that degrade organic matter in sewage. These bacteria play a crucial role in reducing pollution and recycling nutrients. *Methanobacterium*, an anaerobic bacterium, is involved in biogas production but is not aerobic. Biogas is not pure methane; it contains a mixture of gases, including CO₂ and traces of other compounds.

Quick Tip

Wastewater treatment uses aerobic and anaerobic bacteria to clean and recycle water efficiently.

Question 56.

Which of these enzymes is required to cleave a plasmid?

Options:

- (A) Ligase
- (B) Endonuclease
- (C) Exonuclease
- (D) Polymerase

Correct Answer: (B) Endonuclease

Solution:

Endonucleases, like restriction enzymes, cleave DNA at specific recognition sites. This ability makes them indispensable in genetic engineering, allowing scientists to cut and manipulate plasmid DNA for recombinant DNA technology.

Quick Tip

Use endonucleases to create DNA fragments with precise ends for cloning applications.

Question 57.

The natural reservoir of phosphorus is:

Options:

- (A) Rocks
- (B) Soil solution
- (C) Detritus
- (D) Atmosphere

Correct Answer: (A) Rocks

Solution:

Phosphorus originates from the weathering of phosphate-containing rocks. It is released into soil and water and becomes available to plants, forming the basis of the phosphorus cycle. Unlike nitrogen and carbon, phosphorus does not have a gaseous phase in its biogeochemical cycle.

Quick Tip

Phosphorus is vital for energy transfer in cells, forming ATP and nucleic acids.

Question 58.

The sequence of communities of primary succession in water is:

Options:

- (A) Phytoplanktons → Scrubs → Free floating hydrophytes → Rooted hydrophytes → Grasses → Trees.
- (B) Phytoplanktons → Free floating hydrophytes → Rooted hydrophytes → Trees → Scrubs.
- (C) Free floating hydrophytes → Scrubs → Phytoplanktons → Rooted hydrophytes → Grasses → Trees.
- (D) Phytoplanktons → Rooted hydrophytes → Free floating hydrophytes → Reed swamps → Marsh meadows → Scrubs → Trees.

Correct Answer: (D) Phytoplanktons → Rooted hydrophytes → Free floating hydrophytes → Reed swamps → Marsh meadows → Scrubs → Trees.

Solution:

Primary succession in aquatic ecosystems begins with phytoplanktons colonizing the water body. Over time, rooted hydrophytes and free-floating plants establish, followed by transitional stages like reed swamps, marsh meadows, scrubs, and finally, terrestrial forests (trees).

Quick Tip

Succession transforms aquatic ecosystems into stable terrestrial environments.

Question 59.

Match the type of adaptation given in List-I with their examples given in List-II:

List-I (Types of adaptation):

1. Biochemical adaptation
2. Behavioural adaptation
3. Physiological adaptation
4. Morphological adaptation

List-II (Examples):

- p. Desert lizards
- q. Deep sea fishes
- r. *Opuntia*
- s. Kangaroo rats

Options:

- (A) 1-q, 2-r, 3-s, 4-p
- (B) 1-p, 2-q, 3-r, 4-s
- (C) 1-q, 2-p, 3-s, 4-r
- (D) 1-s, 2-r, 3-q, 4-p

Correct Answer: (C) 1-q, 2-p, 3-s, 4-r

Solution:

- Biochemical adaptations are observed in deep-sea fishes (q) to survive high pressure.
- Behavioral adaptations in desert lizards (p) include basking to regulate body temperature.
- Physiological adaptations, like water conservation in kangaroo rats (s), help in arid environments.
- Morphological adaptations in *Opuntia* (r) include spines replacing leaves to reduce water loss.

Quick Tip

Adaptations reflect an organism's strategies to survive specific environmental challenges.

Question 60.

The annual net primary productivity of the biosphere is approximately:

Options:

- (A) 170 billion tons
- (B) 55 billion tons
- (C) 170 million tons
- (D) 55 million tons

Correct Answer: (A) 170 billion tons

Solution:

Net primary productivity (NPP) is the energy accumulated by plants after respiration. On a global scale, terrestrial and aquatic ecosystems contribute to an estimated annual NPP of 170 billion tons of organic material.

Quick Tip

High NPP areas, like tropical rainforests, play a critical role in supporting global biodiversity.
