

Subject : Biology (Set-A)

Total Time Allowed : 45 minutes	Maximum Marks : 200	Total Questions : 50	Questions to be answered : 40
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1. Who performed experiments on *Vicia faba* to prove that the DNA replicates semiconservatively?

- (1) Taylor and colleagues
- (2) Matthew Meselson
- (3) Stahl
- (4) Hershey and Chase

Correct Answer: (1) Taylor and colleagues

Solution: The experiment conducted by Taylor and his team involved using the root tips of *Vicia faba* (broad bean) to illustrate that during DNA replication, each newly formed DNA molecule consists of one strand from the original DNA and one newly synthesized strand. This experiment was pivotal in elucidating the mechanism of DNA replication as semiconservative.

💡 Quick Tip

Remember that Taylor's experiments with plant cells like *Vicia faba* established the semiconservative nature of DNA replication, contrasting with Meselson and Stahl's bacterial studies.

2. A thermostable DNA polymerase is isolated from:

- (1) *Thermus aquaticus*
- (2) *Agrobacterium tumefaciens*
- (3) *E. coli*
- (4) *Salmonella typhimurium*

Correct Answer: (1) *Thermus aquaticus*

Solution: Taq polymerase, a thermostable DNA polymerase used extensively in PCR, is derived from the bacterium *Thermus aquaticus*, which thrives in high-temperature environments. This enzyme is critical for amplifying DNA due to its stability at elevated temperatures, essential for the denaturation step of PCR.

💡 Quick Tip

In molecular biology techniques, remember that Taq polymerase is key for PCR applications due to its heat stability, which allows for effective DNA amplification.

3. ELISA is based on the principle of:

- (1) Antigen – Antigen interaction
- (2) B-cells and T-cells interaction
- (3) Antigen – Antibody interaction
- (4) T-cell – Antibody interaction

Correct Answer: (3) Antigen – Antibody interaction

Solution: ELISA (Enzyme-Linked Immunosorbent Assay) is founded on the specific binding interactions between antigens and antibodies, facilitating the detection and quantification of various biomolecules in a sample. The binding triggers a measurable enzymatic reaction, often visualized as a color change.

💡 Quick Tip

Keep in mind that ELISA is a crucial diagnostic tool often used in medical labs for detecting diseases and conditions through antigen-antibody interactions.

4. Which of the following represents a test cross in which half the offspring is heterozygous and half would be homozygous recessive?

- (1) $TT \times tt$
- (2) $Tt \times tt$
- (3) $Tt \times Tt$
- (4) $tt \times tt$

Correct Answer: (2) $Tt \times tt$

Solution: In a test cross involving a heterozygous individual (Tt) crossed with a homozygous recessive individual (tt), the offspring will display a 1:1 phenotypic ratio. This allows the determination of the genotype of the dominant phenotype. Half of the offspring will exhibit the dominant trait, while the other half will show the recessive trait.

💡 Quick Tip

In genetics, remember that a test cross with a homozygous recessive individual helps clarify the genotype of a dominant individual.

5. In which phase of the cell cycle does replication of DNA take place?

- (1) G1 phase
- (2) M phase
- (3) S phase
- (4) G2 phase

Correct Answer: (3) S phase

Solution: DNA replication occurs exclusively during the S phase (Synthesis phase) of the cell cycle. During this phase, the cell duplicates its DNA, ensuring that each daughter cell receives a complete set of chromosomes during division.

💡 Quick Tip

Memorize that DNA replication is a key event in the S phase of the cell cycle, distinguishing it from the other phases where growth and preparation occur.

6. In Hershey and Chase experiment, some viruses grew on medium that contained:

- (1) ^{35}S , ^{32}P
- (2) ^{36}S , ^{34}P
- (3) ^{32}S , ^{36}P
- (4) ^{34}S , ^{36}P

Correct Answer: (1) ^{35}S , ^{32}P

Solution: In the groundbreaking Hershey and Chase experiment, ^{35}S was utilized to label the protein coats of the bacteriophage, while ^{32}P labeled the DNA. This experiment effectively demonstrated that it is the DNA that carries genetic information, as only the ^{32}P -labeled DNA entered the bacterial cells during infection.

💡 Quick Tip

Remember that in studies of genetic material, ^{32}P is linked to DNA while ^{35}S is associated with protein, helping to clarify their roles in heredity.

7. Which one of the following is not a process of DNA recombinant technology?

- (1) Isolation of DNA
- (2) RNA interference (RNAi)
- (3) Introduction of Restriction endonucleases
- (4) Culturing the host cells in a medium at a large scale

Correct Answer: (2) RNA interference (RNAi)

Solution: RNA interference (RNAi) is a regulatory biological process involving RNA molecules that down-regulate gene expression, and it does not constitute a direct method used in recombinant DNA technology, which involves techniques such as DNA isolation and transformation.

 Quick Tip

In recombinant DNA technology, focus on DNA manipulation and transformation, and remember that RNAi is a separate mechanism of gene regulation.

8. Which of the following gas is found in the Stratosphere?

- (1) Ozone
- (2) Carbon dioxide
- (3) Methane
- (4) Hydrogen

Correct Answer: (1) Ozone

Solution: The ozone layer, located in the stratosphere, is critical for absorbing harmful ultraviolet radiation from the sun, thus protecting life on Earth. Ozone (O₃) is the primary gas found in this layer.

 Quick Tip

Always remember that the ozone layer in the stratosphere plays a vital role in protecting against UV radiation, a crucial aspect of atmospheric science.

9. In which of the following units is thickness of ozone layer measured?

- (1) Dobson
- (2) Joule
- (3) Newton
- (4) Decibel

Correct Answer: (1) Dobson

Solution: The thickness of the ozone layer is quantified in Dobson units (DU), which measure the total amount of ozone in a column of the atmosphere. This unit honors G.M.B. Dobson, who was pivotal in studying atmospheric ozone levels.

 Quick Tip

Remember: Dobson units are the standard for measuring ozone thickness, reflecting the concentration of ozone in the atmosphere.

10. Ex-situ conservation includes:

- (1) Biosphere reserves
- (2) National parks
- (3) Wildlife sanctuaries
- (4) Seed banks

Correct Answer: (4) Seed banks

Solution: Ex-situ conservation strategies involve preserving biological diversity outside of natural habitats, such as in seed banks, botanical gardens, and zoos. These facilities aim to protect genetic diversity and provide resources for research and restoration efforts.

 Quick Tip

Ex-situ conservation focuses on preserving species in controlled environments, whereas in-situ conservation takes place within their natural habitats.

11. In a velvet grass seed, the cotyledon is called:

- (1) Scutellum
- (2) Coleorrhiza
- (3) Coleoptile
- (4) Testa

Correct Answer: (1) Scutellum

Solution: In monocot seeds like that of velvet grass, the cotyledon is termed the scutellum. This structure is crucial for nutrient transfer from the endosperm to the embryo during seed germination.

💡 Quick Tip

In the context of monocot seeds, remember that the cotyledon functions as a scutellum, aiding in the seed's development.

12. Which of the following is a recessive trait for garden pea plant?

- (1) Round seed
- (2) Constricted pod
- (3) Tall plant
- (4) Violet flower

Correct Answer: (2) Constricted pod

Solution: In Mendelian genetics, constricted pods are considered a recessive trait, whereas round seeds, tall plants, and violet flowers are dominant traits observed in pea plants. This highlights the inheritance patterns established by Mendel.

💡 Quick Tip

In Mendel's experiments, dominant traits overshadow recessive ones, making it essential to differentiate between them in genetic studies.

13. Nucleosome is:

- (1) Positively charged DNA wrapped around negatively charged histone octamer
- (2) Negatively charged DNA wrapped around positively charged histone octamer
- (3) Positively charged DNA wrapped around positively charged histone octamer
- (4) Negatively charged DNA wrapped around negatively charged histone octamer

Correct Answer: (2) Negatively charged DNA wrapped around positively charged histone octamer

Solution: Nucleosomes consist of negatively charged DNA coiled around positively charged histone proteins. This structural organization is crucial for DNA compaction in the nucleus, facilitating gene regulation and chromatin organization.

💡 Quick Tip

Understanding the nucleosome structure is fundamental in genetics and molecular biology, as it relates to DNA packaging and gene expression.

14. "Transforming Principle" was given by:

- (1) Maclyn McCarty
- (2) Frederick Griffith
- (3) Alfred Hershey
- (4) Watson and Crick

Correct Answer: (2) Frederick Griffith

Solution: Frederick Griffith's experiments with *Streptococcus pneumoniae* in 1928 led to the identification of the "Transforming Principle," demonstrating that genetic material could be transferred from dead to live bacteria, resulting in a change in phenotype. This was foundational in identifying DNA as the genetic material.

 Quick Tip

Griffith's work is pivotal in genetics, laying the groundwork for the discovery of DNA as the hereditary material in subsequent experiments.

15. Which disorder is caused by the substitution of Glutamic acid (Glu) by Valine (Val) at the sixth position of the beta globin chain of the hemoglobin?

- (1) Phenylketonuria
- (2) Sickle-cell Anemia
- (3) Hemophilia
- (4) Thalassemia

Correct Answer: (2) Sickle-cell Anemia

Solution: Sickle-cell anemia is a genetic disorder resulting from a single nucleotide mutation in the hemoglobin beta gene, leading to the replacement of Glutamic acid with Valine at the sixth position. This mutation alters the hemoglobin structure, causing red blood cells to deform into a sickle shape, which can result in various health complications.

 Quick Tip

Point mutations can lead to significant health issues, as seen in sickle-cell anemia, where a single amino acid change affects red blood cell morphology.

16. Arrange the following steps of DNA fingerprinting in proper sequence:

- (A) Hybridization using labeled VNTR probe
- (B) Separation of DNA fragments by electrophoresis
- (C) Digestion of DNA by restriction endonucleases
- (D) Blotting of separated DNA fragments to nylon

(E) Isolation of DNA

Correct Answer: (2) (E), (C), (B), (D), (A)

Solution: The steps for DNA fingerprinting occur in this order: (E) Isolation of DNA, (C) Digestion of DNA using restriction endonucleases, (B) Separation of the DNA fragments through electrophoresis, (D) Blotting these fragments onto a nylon membrane, and finally (A) Hybridization with a labeled probe. This procedure is fundamental for forensic analysis and genetic studies.

 Quick Tip

To memorize the sequence in DNA fingerprinting, remember: Isolation, Digestion, Separation, Blotting, Hybridization.

17. Match List-I with List-II:

List-I (Disease) List-II (Pathogen/Genera)

- (A) Amoebiasis (I) Wuchereria
(B) Filariasis (II) Entamoeba histolytica
(C) Ringworm (III) Haemophilus influenzae
(D) Pneumonia (IV) Epidermophyton

Correct Answer: (2) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)

Solution: The correct matches are: (A) Amoebiasis - (II) Entamoeba histolytica, (B) Filariasis - (I) Wuchereria, (C) Ringworm - (IV) Epidermophyton, and (D) Pneumonia - (III) Haemophilus influenzae. Understanding these relationships is crucial for diagnosing and treating infectious diseases.

 Quick Tip

Use associations like Amoebiasis with Entamoeba and Filariasis with Wuchereria for quick recall.

18. Streptokinase enzyme is used for:

- (1) Removing clot from blood vessels
(2) Clarifying fruit juices
(3) Synthesis of cholesterol
(4) Removing oily stains

Correct Answer: (1) Removing clot from blood vessels

Solution: Streptokinase, produced by certain bacteria, acts as a thrombolytic agent that converts plasminogen to plasmin, effectively dissolving blood clots. It is particularly utilized in emergency medicine for treating conditions like myocardial infarction (heart attacks).

 Quick Tip

Streptokinase is essential in emergency medical treatments to break down blood clots, especially during heart attacks.

19. Select the incorrect statement:

- (1) Chromosome 1 has the most genes and chromosome Y has the fewest.
- (2) Chromosome 21 has the most genes and chromosome Y has the fewest.
- (3) Less than 2 percent of the genome codes for proteins.
- (4) The functions of over 50 percent of discovered genes are unknown.

Correct Answer: (2) Chromosome 21 has the most genes and chromosome Y has the fewest.

Solution: Chromosome 1 does indeed have the most genes, while chromosome Y has the least. Chromosome 21 contains fewer genes compared to chromosome 1. The statement claiming that chromosome 21 has the most genes is inaccurate.

 Quick Tip

Remember that Chromosome 1 has the highest gene count, while the Y chromosome has the least.

20. Which of the following is not a step of Polymerase Chain Reaction?

- (1) Extension
- (2) Downstream processing
- (3) Annealing
- (4) Denaturation

Correct Answer: (2) Downstream processing

Solution: The Polymerase Chain Reaction (PCR) consists of three primary steps: denaturation, annealing, and extension. Downstream processing refers to purification and other post-synthesis processes, which are not part of the PCR steps.

💡 Quick Tip

PCR involves only denaturation, annealing, and extension; downstream processing occurs afterward.

21. Which of the following equation is correct about Verhulst-Pearl Logistic Growth?

- (1) $\frac{dN}{dt} = (h - d) \frac{K-N}{K}$
 (2) $\frac{dN}{dt} = rN \frac{N-K}{K}$
 (3) $\frac{dN}{dt} = rN \frac{K-N}{K}$
 (4) $\frac{dN}{dt} = (h - d) \frac{N-K}{K}$

Correct Answer: (3) $\frac{dN}{dt} = rN \frac{K-N}{K}$

Solution: The Verhulst-Pearl logistic growth model equation is given by $\frac{dN}{dt} = rN \frac{K-N}{K}$, where N is the population size, r is the intrinsic growth rate, and K is the carrying capacity. This equation describes how population growth slows as resources become limited.

💡 Quick Tip

In logistic growth, as the population approaches the carrying capacity K , growth rate decreases, leading to an S-shaped curve.

22. Match List-I with List-II:

List-I (Genes) List-II (Proteins – Codes for lac operon)

- (A) i (I) permease
 (B) a (II) -galactosidase
 (C) y (III) transacetylase
 (D) z (IV) repressor

Correct Answer: (2) (A) - (IV), (B) - (III), (C) - (I), (D) - (II)

Solution: In the lac operon: gene i codes for the repressor protein, gene a codes for transacetylase, gene y codes for permease, and gene z codes for -galactosidase. This operon is a well-known example of gene regulation in prokaryotes.

💡 Quick Tip

For the lac operon: remember that z is for -galactosidase, y for permease, a for transacetylase, and i for repressor.

23. Analogous structures are a result of:

- (1) Divergent evolution
- (2) Convergent evolution
- (3) Genetic drift
- (4) Point mutations

Correct Answer: (2) Convergent evolution

Solution: Analogous structures arise from convergent evolution, where unrelated species evolve similar traits due to adapting to similar environmental challenges. An example includes the wings of birds and insects, which serve similar functions but have different evolutionary origins.

💡 Quick Tip

Analogous structures are a result of convergent evolution; in contrast, homologous structures result from divergent evolution.

24. Amino acid is attached to which site of tRNA?

- (1) Anticodon loop
- (2) 3' end
- (3) 5' end
- (4) D-loop

Correct Answer: (2) 3' end

Solution: Amino acids attach to the 3' end of the tRNA molecule, specifically at the CCA sequence where the amino acid is linked. This allows the tRNA to deliver the correct amino acid during protein synthesis.

💡 Quick Tip

Remember: Amino acids bind to the 3' end of tRNA, while the anticodon is located on the anticodon loop.

25. Which one of the following lymphoid organs is large at birth but reduces with age?

- (1) Bone marrow
- (2) Thymus
- (3) Spleen

(4) Peyer's patches

Correct Answer: (2) Thymus

Solution: The thymus gland is a lymphoid organ that is prominent at birth, playing a critical role in the development of T-cells essential for the immune system. However, it gradually shrinks in size and functionality after puberty, a phenomenon known as thymic involution.

 Quick Tip

The thymus shrinks with age; it is most active during childhood when T-cell development is crucial.

26. Which of the following plays a significant role in our stomach in checking disease-causing microbes?

- (1) *Penicillium notatum*
- (2) *Monascus purpureus*
- (3) *Trichoderma polysporum*
- (4) *Lactobacillus*

Correct Answer: (4) *Lactobacillus*

Solution: *Lactobacillus* is a beneficial bacterium that contributes to gut health by inhibiting the growth of pathogenic microbes. It does this by producing lactic acid, which helps maintain an acidic environment that is hostile to many pathogens.

 Quick Tip

Lactobacillus is essential for gut health, primarily through lactic acid production that suppresses harmful microbes.

27. Given below are two statements:

Statement I: Whisky, brandy, and rum are produced without distillation of the fermented broth.

Statement II: *Saccharomyces cerevisiae* is called doctor's yeast.

Correct Answer: (4) Statement I is false, but Statement II is true

Solution: The statement about whisky, brandy, and rum is false; these alcoholic beverages are produced through fermentation followed by distillation. Statement II is true;

Saccharomyces cerevisiae, often referred to as baker's or doctor's yeast, is widely used in fermentation processes.

💡 Quick Tip

Remember that distilled alcoholic drinks undergo fermentation first, and *S. cerevisiae* is key in alcohol production.

28. Given below is the DNA coding sequence. Its complementary strand would read as:

5' – GTATTACG – 3'

(1) 5' – CUTUUTGC – 3'

(2) 3' – CATAATGC – 5'

(3) 3' – CUTUUTGC – 5'

(4) 5' – CTUTTUGC – 3'

Correct Answer: (2) 3' – CATAATGC – 5'

Solution: The complementary strand of DNA pairs according to base pairing rules: Adenine (A) pairs with Thymine (T) and Guanine (G) pairs with Cytosine (C). Therefore, the sequence 5' – GTATTACG – 3' pairs with 3' – CATAATGC – 5'.

💡 Quick Tip

In DNA, A pairs with T, and G pairs with C; remember these pairing rules when determining complementary strands.

29. Which of the following statements is not correct for Restriction enzymes?

(1) Exonucleases remove nucleotides from ends of the DNA.

(2) Endonucleases make cuts at specific positions within the DNA.

(3) Ligases join sticky ends of DNA together.

(4) The first restriction endonuclease was Hind II.

Correct Answer: (4) The first restriction endonuclease was Hind II.

Solution: The first restriction enzyme discovered was EcoRI, not Hind II. The roles of exonucleases and endonucleases differ in DNA processing, while ligases function to join DNA fragments, especially during cloning processes.

💡 Quick Tip

Remember: EcoRI was the first restriction enzyme discovered, while Hind II was identified later.

30. Match List-I with List-II:

List-I (Recent Extinction) List-II (Place)

- (A) Dodo (I) Africa
(B) Quagga (II) Russia
(C) Thylacine (III) Mauritius
(D) Steller's Sea Cow (IV) Australia

Correct Answer: (1) (A) - (III), (B) - (I), (C) - (II), (D) - (IV)

Solution: The Dodo is known to have gone extinct in Mauritius, the Quagga in Africa, the Thylacine in Australia, and the Steller's Sea Cow in Russia. Understanding these extinctions highlights the impact of human activities on biodiversity.

💡 Quick Tip

Use mnemonics to remember the locations of these extinctions, such as "Dodo in Mauritius."

31. Which one of the following is not associated with megasporangium?

- (1) Funicle
(2) Integument
(3) Generative cell
(4) Micropyle

Correct Answer: (3) Generative cell

Solution: The megasporangium (ovule) comprises integuments, a funicle connecting it to the ovary wall, and a micropyle, which allows pollen entry. The generative cell is associated with pollen grain development rather than the megasporangium itself.

💡 Quick Tip

The generative cell is part of the pollen grain structure, not associated with the megasporangium.

Read the following passage and answer the next five questions:

The reproductive cycle of female primates is called the menstrual cycle. Menstrual cycle starts only after attaining sexual maturation (puberty). Generally, during ovulation only one ovum is released per menstrual cycle. The cyclical changes in the ovary and the uterus during menstrual cycle are induced by changes in the levels of pituitary and ovarian hormones. After coitus, sperms are transported to the junction of the isthmus and ampulla, where the sperm fertilises the ovum leading to formation of a diploid zygote. **32. Which of the following does not constitute accessory duct of female**

reproductive system?

- (1) Fallopian tubes
- (2) Uterus
- (3) Cervix
- (4) Vagina

Correct Answer: (2) Uterus

Solution: Accessory ducts in the female reproductive system include the Fallopian tubes, cervix, and vagina, which help transport gametes and support fertilization. The uterus, however, serves as the site for embryo implantation and fetal development rather than acting as an accessory duct.

💡 Quick Tip

The uterus's role is critical for pregnancy, while accessory ducts facilitate gamete transport.

33. The female external genitalia include:

- (A) Mons pubis
- (B) Hymen
- (C) Mammary ducts
- (D) Clitoris
- (E) Cervix

Choose the correct answer from the options given below:

- (1) (A), (C) and (D) only
- (2) (B), (D) and (E) only
- (3) (A), (B) and (D) only
- (4) (C), (D) and (E) only

Correct Answer: (3) (A), (B) and (D) only

Solution: The female external genitalia, collectively known as the vulva, include the mons pubis, hymen, clitoris, and labia. Mammary ducts are part of the mammary glands

and are associated with lactation, not the external genitalia. The cervix is an internal structure connecting the uterus to the vagina.

💡 Quick Tip

Understanding these structures helps in comprehending human anatomy and reproductive health.

34. Select the organ of the female reproductive system where the sperm is not transported at the time of coitus:

- (1) Cervix
- (2) Ovary
- (3) Uterus
- (4) Fallopian tube

Correct Answer: (2) Ovary

Solution: During coitus, sperm is deposited in the vagina and travels through the cervix, uterus, and into the Fallopian tubes. The ovary is not directly involved in this pathway, as it is the site of egg release, not sperm transport.

💡 Quick Tip

The ovary's primary function is ovum release, while the other structures facilitate sperm movement.

35. Which of the following does not take place before ovulation in human females?

- (1) The secretion of LH and FSH increases during the follicular phase.
- (2) The corpus luteum secretes large amounts of progesterone.
- (3) LH and FSH attain peak levels in the middle of the cycle.
- (4) Maximum secretion of LH induces rupture of the Graafian follicle.

Correct Answer: (2) The corpus luteum secretes large amounts of progesterone.

Solution: Progesterone is primarily secreted by the corpus luteum after ovulation. During the follicular phase (before ovulation), estrogen is the predominant hormone, while LH and FSH levels peak just before ovulation to stimulate follicle rupture.

 Quick Tip

Understanding hormone regulation is crucial for grasping the menstrual cycle's phases.

36. Match List-I with List-II:

List-I (Phase of menstrual cycle) List-II (Days of menstrual cycle)

- (A) Proliferative phase (I) 14th day
(B) Menstrual phase (II) 15th–28th/29th days
(C) Secretory phase (III) 1st–5th days
(D) Ovulatory phase (IV) 5th–13th days

Choose the correct answer from the options given below:

- (1) (A) - (II), (B) - (IV), (C) - (III), (D) - (I)
(2) (A) - (III), (B) - (II), (C) - (I), (D) - (IV)
(3) (A) - (IV), (B) - (III), (C) - (II), (D) - (I)
(4) (A) - (II), (B) - (IV), (C) - (I), (D) - (III)

Correct Answer: (3) (A) - (IV), (B) - (III), (C) - (II), (D) - (I)

Solution: The correct matches are as follows: Proliferative phase (5th–13th days), Menstrual phase (1st–5th days), Secretory phase (15th–28th days), and Ovulatory phase (14th day). These phases correspond to different hormonal and structural changes in the menstrual cycle.

 Quick Tip

These phases are vital for understanding female reproductive health and the regulation of menstrual cycles.

37. Name the population interaction which takes place when one species is benefited and another species has no effect (no benefit, no harm).

- (1) Competition
(2) Predation
(3) Commensalism
(4) Amensalism

Correct Answer: (3) Commensalism

Solution: Commensalism is a type of interaction where one species benefits while the other species is neither helped nor harmed. This interaction is common in nature and can be observed in relationships such as barnacles attaching to whales, where the

barnacle benefits from movement to new food sources, but the whale remains unaffected.

 Quick Tip

Commensal relationships can be critical for ecosystem dynamics, influencing species distributions and interactions.

38. Identify the incorrect matching from the following population interactions:

Species A Species B Name of Interaction

+ + Mutualism

+ – Parasitism

– – Predation

– 0 Amensalism

Options:

(1) Mutualism

(2) Parasitism

(3) Predation

(4) Amensalism

Correct Answer: (3) Predation

Solution: Predation involves a +/– interaction, where one species (the predator) benefits by feeding on the other species (the prey), which is harmed. A –/– interaction is incorrect for predation, as it does not reflect the dynamics of predator-prey relationships.

 Quick Tip

Understanding the nature of these interactions is crucial for ecological studies and conservation efforts.

39. Given below are two statements:

Statement I: An orchid grows as an epiphyte on a mango branch where the mango tree does not derive any apparent benefit from it.

Statement II: An orchid growing on a mango tree is an example of commensalism.

Correct Answer: (1) Both Statement I and Statement II are true

Solution: Orchids benefit by growing on mango trees without harming them, which is an example of commensalism, where one species benefits while the other is unaffected.

💡 Quick Tip

This interaction exemplifies the complexities of ecological relationships and how they can influence biodiversity.

40. Match List-I with List-II:

List-I (Examples) List-II (Interactions)

- (A) Extinction of Abingdon tortoise after introduction of goats on Galapagos Islands
 (I) Parasitism
 (B) Infestations of marine fish by copepods (II) Commensalism
 (C) Cattle egret and grazing cattle (III) Mutualism
 (D) Fig tree and wasp (IV) Competition

Choose the correct answer from the options given below:

- (1) (A) - (IV), (B) - (II), (C) - (I), (D) - (III)
 (2) (A) - (II), (B) - (III), (C) - (I), (D) - (IV)
 (3) (A) - (III), (B) - (II), (C) - (IV), (D) - (I)
 (4) (A) - (IV), (B) - (I), (C) - (II), (D) - (III)

Correct Answer: (4) (A) - (IV), (B) - (I), (C) - (II), (D) - (III)

Solution: The correct matches reflect various ecological interactions: competition (extinction), parasitism (copepods), commensalism (egrets), and mutualism (fig tree and wasp). Understanding these interactions helps in grasping ecosystem dynamics.

💡 Quick Tip

This highlights the importance of studying species interactions for conservation and ecosystem management.

41. Select the incorrect pair in response to abiotic factors:

- (1) We maintain a constant body temperature of 37°C – Conformer
 (2) Every winter Keoladeo National Park hosts the birds coming from Siberia – Migration
 (3) Under unfavorable conditions many zooplankton species in ponds enter the stage of suspended development – Diapause
 (4) If a predator is too efficient it overexploits its prey – Extinction

Correct Answer: (1) We maintain a constant body temperature of 37°C – Conformer

Solution: Humans maintain a constant internal temperature, making us regulators rather than conformers. Conformers are organisms whose body temperature varies with the

environment.

 Quick Tip

Understanding the differences between regulators and conformers is essential for studying physiology and ecology.

42. Which one is the correct example of hermaphrodites?

- (1) Tapeworm and leech
- (2) Cockroach and frog
- (3) Cockroach and earthworm
- (4) Carp fish and pigeon

Correct Answer: (1) Tapeworm and leech

Solution: Hermaphroditic organisms, such as tapeworms and leeches, possess both male and female reproductive organs. Cockroaches and fish have separate sexes.

 Quick Tip

Hermaphroditism allows for more flexible reproductive strategies in certain environments.

43. In diploid organisms, which of the following undergoes meiosis?

- (1) Vegetative cell
- (2) Sporogenous tissue
- (3) Pollen grain
- (4) Synergids

Correct Answer: (2) Sporogenous tissue

Solution: In plants, meiosis occurs in sporogenous tissue to produce spores. Other cells like vegetative cells do not undergo meiosis.

 Quick Tip

Understanding the role of sporogenous tissue in reproduction is key to botany and plant biology.

44. Who proposed that the first form of life could have come from pre-existing

non-living organic molecules?

- (1) Darwin
- (2) Oparin and Haldane
- (3) Lamarck
- (4) Thomas Malthus

Correct Answer: (2) Oparin and Haldane

Solution: Oparin and Haldane hypothesized that life originated from organic molecules through chemical evolution in a "primordial soup." This theory suggests that simple organic compounds could form complex molecules leading to life.

💡 Quick Tip

This hypothesis has laid the foundation for many studies in abiogenesis and evolutionary biology.

45. Given below are two statements:

Statement I: In a bioreactor, small volumes of cultures are developed where useful bio-products are produced.

Statement II: In downstream processing, products formulated with preservatives are ready for marketing without quality testing.

Correct Answer: (3) Statement I is true, but Statement II is false

Solution: While bioreactors do produce useful bio-products in culture, downstream processing involves quality testing before products are marketed to ensure safety and efficacy.

💡 Quick Tip

Understanding both bioreactor function and downstream processing is critical for biotechnology applications.

46. The method where an ovum is transferred from a donor into the fallopian tube of another female is:

- (1) IUI
- (2) ICSI
- (3) GIFT
- (4) ZIFT

Correct Answer: (3) GIFT

Solution: In Gamete Intra-Fallopian Transfer (GIFT), an ovum is transferred to the fallopian tube, facilitating fertilization in the body of the recipient female. This method allows for natural fertilization conditions.

 Quick Tip

GIFT is often preferred in cases where both gametes are viable, allowing for the best chances of conception.

47. When one of the parents has 'A' blood group and the other parent has 'O' blood group, then their child can have blood group.

- (1) Only 'A'
- (2) Only 'O'
- (3) Both 'A' and 'O'
- (4) Either 'A' or 'O'

Correct Answer: (4) Either 'A' or 'O'

Solution: If one parent has blood group 'A' (genotype AO) and the other parent has blood group 'O' (genotype OO), their offspring could inherit either the 'A' allele from the 'A' parent or the 'O' allele from the 'O' parent, leading to possible blood groups of 'A' or 'O'.

 Quick Tip

This basic understanding of inheritance patterns is crucial for predicting offspring blood types in genetic counseling.

48. The size of VNTR varies from:

- (1) 0.1 to 20 kb
- (2) 0.1 to 10 kb
- (3) 0.2 to 15 kb
- (4) 0.2 to 10 kb

Correct Answer: (1) 0.1 to 20 kb

Solution: Variable Number Tandem Repeats (VNTRs) are short nucleotide sequences that vary greatly in length, typically from 0.1 to 20 kilobases, and are used in DNA profiling and forensic analysis.

💡 Quick Tip

VNTRs are significant for genetic diversity and individual identification in forensic science.

49. The common approach(es) for the treatment of cancer is/are:

- (A) Vaccination
- (B) Surgery
- (C) Physiotherapy
- (D) Radiation therapy
- (E) Immunotherapy

Choose the correct answer from the options given below:

- (1) (A) only
- (2) (B), (D) and (E) only
- (3) (A), (C) and (D) only
- (4) (A) and (C) only

Correct Answer: (2) (B), (D) and (E) only

Solution: Cancer treatment commonly involves surgery, radiation therapy, and immunotherapy. Vaccination and physiotherapy are not primary cancer treatments, although they may support care.

💡 Quick Tip

Understanding these treatment modalities is essential for comprehensive cancer care and management.

50. Which of the following controls/control the growth of bollworms?

- (1) CryIAc and CryIIAb genes
- (2) CryIAb gene
- (3) RNAi
- (4) dsRNA

Correct Answer: (1) CryIAc and CryIIAb genes

Solution: The CryIAc and CryIIAb genes produce proteins toxic to bollworms, which are utilized in genetically modified crops like Bt cotton for pest resistance. These genes have significantly reduced the need for chemical pesticides in agriculture.

 Quick Tip

These genetic modifications represent a significant advancement in sustainable agriculture practices.