

CUET 2024 Biology SET C Question Paper with Solution

Question 1. Given below is the DNA coding sequence. Its complementary strand would read as:

5' – GTATTACG – 3'

Options:

1. 5' – CUTUUTGC – 3'
2. 3' – CATAATGC – 5'
3. 3' – CUTUUTGC – 5'
4. 5' – CTUTTUGC – 3'

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

Solution: DNA bases pair specifically: Adenine (A) with Thymine (T), and Guanine (G) with Cytosine (C). Hence, the complementary sequence to 5' – GTATTACG – 3' is 3' – CATAATGC – 5'.

Quick Tip

Remember: In DNA, A pairs with T, and G pairs with C. Always write complementary strands in reverse order to align properly.

Question 2. Amino acid is attached to which site of tRNA?

Options:

1. Anticodon loop
2. 3' end
3. 5' end
4. D-loop

Correct Answer: (2) 3' end

Solution: The attachment of an amino acid occurs at the 3' end of the tRNA, specifically at the CCA sequence. This ensures accurate amino acid delivery during protein synthesis.

Quick Tip

The amino acid binding site is always at the 3' end, while the anticodon region helps in codon recognition.

Question 3. Which one of the following lymphoid organs is large at birth but reduces with age?

Options:

1. Bone marrow
2. Thymus
3. Spleen
4. Peyer's patches

Correct Answer: (2) Thymus

Solution: The thymus plays a crucial role in early life for T-cell development. Post-puberty, it undergoes gradual involution, diminishing in size and activity.

Quick Tip

The thymus is most active in childhood, reflecting its importance in developing the immune system.

Question 4. Which of the following plays a significant role in our stomach in checking disease-causing microbes?

Options:

1. *Penicillium notatum*
2. *Monascus purpureus*
3. *Trichoderma polysporum*
4. *Lactobacillus*

Correct Answer: (4) *Lactobacillus*

Solution: *Lactobacillus* helps in gut health by producing lactic acid, which creates an acidic environment unfavorable for many harmful microbes, thereby protecting the stomach from disease-causing pathogens.

Quick Tip

Lactobacillus produces lactic acid to maintain a hostile environment for pathogens, crucial for digestive health.

Question 5. 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.

Options:

1. Both Statement I and Statement II are true
2. Both Statement I and Statement II are false
3. Statement I is true, but Statement II is false
4. Statement I is false, but Statement II is true

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

Solution: Whisky, brandy, and rum are distilled after fermentation to increase alcohol concentration, making Statement I false. Statement II is true as *Saccharomyces cerevisiae* is widely used in fermentation and referred to as "doctor's yeast."

Quick Tip

Distilled beverages like whisky and rum require fermentation followed by distillation. Remember that *S. cerevisiae* is crucial for alcohol fermentation.

Question 6. Which of the following statements is not correct for restriction enzymes?

Options:

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. Exonucleases and endonucleases play different roles in DNA processing, and ligases join DNA fragments during molecular cloning.

Quick Tip

EcoRI was the first restriction enzyme discovered; it is crucial in DNA manipulation for biotechnology applications.

Question 7. Match List-I with List-II:

List-I (Recent Extinction):

- (A) Dodo
- (B) Quagga
- (C) Thylacine
- (D) Steller's Sea Cow

List-II (Place):

- (I) Africa
- (II) Russia
- (III) Mauritius
- (IV) Australia

Options:

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

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

Solution: The Dodo went extinct in Mauritius, the Quagga in Africa, the Thylacine in Australia, and Steller's Sea Cow in Russia. These extinctions often resulted from human impact on biodiversity.

Quick Tip

Link species and locations using mnemonics like "Dodo in Mauritius" to remember these extinctions.

Question 8. Which one of the following is not associated with megasporangium?

Options:

1. Funicle
2. Integument
3. Generative cell
4. Micropyle

Correct Answer: (3) Generative cell

Solution: The megasporangium, or ovule, comprises the funicle, integument, and micropyle. The generative cell, however, is a part of the pollen grain and is not associated with the megasporangium.

Quick Tip

Remember: The generative cell is part of the pollen grain, not the ovule structure.

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

Question 9. Which of the following does not constitute an accessory duct of the female reproductive system?

Options:

1. Fallopian tubes
2. Uterus
3. Cervix
4. Vagina

Correct Answer: (2) Uterus

Solution: The accessory ducts of the female reproductive system include the Fallopian tubes, cervix, and vagina, which are involved in gamete transport and fertilization. The uterus, however, serves as the site for embryo implantation and development rather than as an accessory duct.

Quick Tip

The uterus is essential for pregnancy but does not function as a gamete transport duct.

Question 10. The female external genitalia include:

List of Structures:

- (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, known collectively as the vulva, include structures such as the mons pubis, hymen, clitoris, and labia. Mammary ducts belong to the mammary glands and are involved in lactation rather than being part of the external genitalia. Similarly, the cervix is an internal organ that connects the uterus to the vagina.

Quick Tip

External genitalia are part of the vulva, while mammary ducts and the cervix serve other specific roles in the reproductive system.

Question 11. Select the organ of the female reproductive system where the sperm is not transported at the time of coitus:

Options:

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 Fallopian tubes. The ovary is not part of the sperm transport pathway, as it is responsible for releasing the ovum.

Quick Tip

Ovaries release eggs but are not involved in sperm transport.

Question 12. Which of the following does not take place before ovulation in human females?

Options:

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. Before ovulation, estrogen is the dominant hormone, and LH and FSH levels peak to trigger follicle rupture.

Quick Tip

Differentiate between pre-ovulation (estrogen-dominated) and post-ovulation (progesterone-dominated) phases.

Question 13. Match List-I with List-II:

List-I (Phase of menstrual cycle):

- (A) Proliferative phase
- (B) Menstrual phase
- (C) Secretory phase
- (D) Ovulatory phase

List-II (Days of menstrual cycle):

- (I) 14th day
- (II) 15th–28th/29th days
- (III) 1st–5th days
- (IV) 5th–13th days

Options:

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 phases of the menstrual cycle are matched as follows:

- Proliferative phase: 5th–13th days
- Menstrual phase: 1st–5th days
- Secretory phase: 15th–28th days
- Ovulatory phase: 14th day

These phases align with the hormonal changes and uterine cycle.

Quick Tip

Use chronological order to remember menstrual cycle phases: Menstrual, Proliferative, Ovulatory, and Secretory.

Question 14. Name the population interaction which takes place when one species is benefited and another species has no effect (no benefit, no harm):

Options:

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 remains unaffected. An example is barnacles attaching to whales; barnacles benefit from transportation, while the whale is neither harmed nor helped.

Quick Tip

Remember: Commensalism is a $+/0$ interaction, distinct from mutualism $(+/+)$ and amensalism $(-/0)$.

Question 15. Identify the incorrect matching from the following population interactions:

Species A	Species B	Name of Interaction
+	+	Mutualism
+	-	Parasitism
-	-	Predation
-	0	Amensalism

Table 1: Species Interactions

Options:

1. Mutualism
2. Parasitism
3. Predation
4. Amensalism

Correct Answer: (3) Predation

Solution: Predation is characterized by a $+/-$ interaction, where one species benefits (predator) and the other is harmed (prey). A $-/-$ interaction, as listed, is incorrect for predation.

Quick Tip

Predation benefits one species at the expense of another. Avoid confusion with competition, which is often $-/-$.

Question 16. 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.

Options:

1. Both Statement I and Statement II are true
2. Both Statement I and Statement II are false
3. Statement I is true, but Statement II is false
4. Statement I is false, but Statement II is true

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

Solution: Orchids grow on mango trees without affecting the tree, deriving benefits like sunlight and air, which makes this a clear example of commensalism.

Quick Tip

Commensalism is a type of ecological interaction where one species benefits and the other is unaffected.

Question 17. 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

Table 2: Matching Examples with Types of Interactions

Options:

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 matches are:

- Extinction of Abingdon tortoise: Competition
- Infestation of marine fish: Parasitism
- Cattle egret: Commensalism
- Fig tree and wasp: Mutualism

Quick Tip

Use clear ecological definitions to identify interactions: Competition (-/-), Parasitism (+/-), Commensalism (+/0), and Mutualism (+/+).

Question 18. Select the incorrect pair in response to abiotic factors:

Options:

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 are regulators, maintaining a constant internal body temperature despite external changes, while conformers adapt their internal temperature to the environment. This makes the pairing incorrect.

Quick Tip

Remember: Regulators maintain constant internal conditions, while conformers adapt to external changes.

Question 19. Which one is the correct example of hermaphrodites?

Options:

1. Tapeworm and leech
2. Cockroach and frog
3. Cockroach and earthworm
4. Carp fish and pigeon

Correct Answer: (1) Tapeworm and leech

Solution: Hermaphrodites possess both male and female reproductive organs. Tapeworms and leeches are classic examples, while cockroaches and carp fish have distinct sexes.

Quick Tip

Hermaphrodites are advantageous in certain environments as they can self-reproduce or mate flexibly.

Question 20. In diploid organisms, which of the following undergoes meiosis?

Options:

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 haploid spores. Vegetative cells and synergids are not involved in meiosis, while pollen grains arise after meiosis.

Quick Tip

Focus on the role of sporogenous tissue in plants; it is the starting point for gamete formation via meiosis.

Question 21. Who proposed that the first form of life could have come from pre-existing non-living organic molecules?

Options:

1. Darwin
2. Oparin and Haldane
3. Lamarck
4. Thomas Malthus

Correct Answer: (2) Oparin and Haldane

Solution: Oparin and Haldane proposed the concept of "chemical evolution," suggesting that life originated from a "primordial soup" of organic molecules under prebiotic conditions.

Quick Tip

The "primordial soup" hypothesis forms the basis of modern theories about the origin of life.

Question 22. 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.

Options:

1. Both Statement I and Statement II are true

2. Both Statement I and Statement II are false
3. Statement I is true, but Statement II is false
4. Statement I is false, but Statement II is true

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

Solution: While bioreactors are used for growing cultures that produce bio-products, downstream processing always includes quality testing before the products reach the market. Statement II is therefore incorrect.

Quick Tip

Downstream processing ensures product safety and quality, making it a critical step in biotechnology.

Question 23. The method where an ovum is transferred from a donor into the fallopian tube of another female is:

Options:

1. IUI
2. ICSI
3. GIFT
4. ZIFT

Correct Answer: (3) GIFT

Solution: Gamete Intra-Fallopian Transfer (GIFT) involves transferring an ovum directly to the recipient's fallopian tube, facilitating natural fertilization. This technique is often used when both gametes are healthy.

Quick Tip

GIFT allows fertilization to occur naturally in the fallopian tube, making it different from ZIFT, which involves zygote transfer.

Question 24. When one of the parents has 'A' blood group and the other parent has 'O' blood group, then their child can have blood group:

Options:

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 has blood group 'O' (genotype OO), the possible offspring genotypes are AO and OO. This results in either 'A' or 'O' blood group.

Quick Tip

Understand inheritance patterns: Blood group 'A' can result from genotypes AA or AO, and 'O' from OO.

Question 25. The size of VNTR varies from:

Options:

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 between 0.1 to 20 kilobases in length. They are widely used in DNA profiling due to their variability between individuals.

Quick Tip

VNTRs are crucial in genetic diversity studies and forensic DNA fingerprinting.

Question 26. The common approach(es) for the treatment of cancer is/are:

List of Options:

- (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 provide supportive care.

Quick Tip

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

Question 27. Which of the following controls the growth of bollworms?

Options:

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 in Bt cotton produce proteins toxic to bollworms. These genes reduce the need for chemical pesticides by offering effective pest resistance.

Quick Tip

Bt cotton with Cry genes exemplifies sustainable pest management in agriculture.

Question 28. ELISA is based on the principle of:

Options:

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) utilizes specific antigen-antibody interactions to detect and quantify biomolecules. A measurable color change confirms the presence of the target molecule.

Quick Tip

Remember: ELISA is a diagnostic tool relying on the specificity of antigen-antibody binding.

Question 29. Which of the following represents a test cross in which half the offspring is heterozygous and half would be homozygous recessive?

Options:

1. $TT \times tt$
2. $Tt \times tt$
3. $Tt \times Tt$
4. $tt \times tt$

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

Solution: A test cross between a heterozygous individual (Tt) and a homozygous recessive individual (tt) yields a 1:1 ratio of heterozygous to homozygous recessive offspring. This helps identify the genotype of the dominant phenotype.

Quick Tip

In test crosses, use homozygous recessive individuals to uncover the genotype of the dominant parent.

Question 30. In which phase of the cell cycle does replication of DNA take place?

Options:

1. G1 phase
2. M phase
3. S phase
4. G2 phase

Correct Answer: (3) S phase

Solution: DNA replication occurs in the S (Synthesis) phase of the cell cycle, ensuring that each daughter cell receives a complete copy of the genome during cell division.

Quick Tip

The S phase is exclusively dedicated to DNA replication, crucial for proper cell division.

Question 31. In Hershey and Chase experiment, some viruses grew on a medium that contained:

Options:

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: Hershey and Chase used ^{35}S to label protein coats and ^{32}P to label DNA in their experiment. Their work demonstrated that DNA, not protein, is the genetic material as only ^{32}P -labeled DNA was found inside infected bacteria.

Quick Tip

^{32}P is associated with DNA, while ^{35}S is used to label proteins in such experiments.

Question 32. Who performed experiments on *Vicia faba* to prove that DNA replicates semiconservatively?

Options:

1. Taylor and colleagues
2. Matthew Meselson
3. Stahl
4. Hershey and Chase

Correct Answer: (1) Taylor and colleagues

Solution: Taylor and his team used *Vicia faba* (broad bean) root tips in their experiment to demonstrate that newly synthesized DNA strands incorporate one original strand, confirming the semiconservative replication of DNA.

Quick Tip

Plant cells like *Vicia faba* and bacterial cells were crucial models in demonstrating DNA replication mechanisms.

Question 33. A thermostable DNA polymerase is isolated from:

Options:

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

Correct Answer: (1) *Thermus aquaticus*

Solution: Taq polymerase, a thermostable enzyme used in Polymerase Chain Reaction (PCR), is isolated from the bacterium *Thermus aquaticus*. Its ability to withstand high temperatures makes it essential for DNA amplification.

Quick Tip

Taq polymerase is a cornerstone of molecular biology, enabling efficient DNA amplification during PCR.

Question 34. Which one of the following is not a process of DNA recombinant technology?

Options:

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 biological mechanism for gene silencing, not directly part of recombinant DNA technology. Recombinant techniques include DNA isolation, enzymatic cutting, and culturing host cells for product generation.

Quick Tip

Recombinant DNA technology focuses on DNA manipulation, while RNAi is a gene regulation process.

Question 35. Which of the following gas is found in the stratosphere?

Options:

1. Ozone
2. Carbon dioxide
3. Methane
4. Hydrogen

Correct Answer: (1) Ozone

Solution: The ozone layer is located in the stratosphere, where it absorbs harmful ultraviolet radiation from the sun, playing a vital role in protecting life on Earth.

Quick Tip

The ozone layer in the stratosphere is critical for blocking UV rays and maintaining ecological balance.

Question 36.In which of the following units is the thickness of the ozone layer measured?

Options:

1. Dobson
2. Joule
3. Newton
4. Decibel

Correct Answer: (1) Dobson

Solution: The thickness of the ozone layer is measured in Dobson units (DU), representing the concentration of ozone in a column of the atmosphere. This unit is named after G.M.B. Dobson, a pioneer in ozone studies.

Quick Tip

Dobson units quantify ozone thickness, highlighting its importance in atmospheric science.

Question 37.Ex-situ conservation includes:

Options:

1. Biosphere reserves
2. National parks
3. Wildlife sanctuaries
4. Seed banks

Correct Answer: (4) Seed banks

Solution: Ex-situ conservation involves preserving species outside their natural habitats. Seed banks are an example, where genetic materials are stored to safeguard biodiversity for future use. In contrast, biosphere reserves, national parks, and wildlife sanctuaries represent in-situ conservation methods.

Quick Tip

Ex-situ conservation occurs in controlled environments, whereas in-situ conservation happens in natural habitats.

Question 38.In a velvet grass seed, the cotyledon is called:

Options:

1. Scutellum
2. Coleorrhiza

3. Coleoptile
4. Testa

Correct Answer: (1) Scutellum

Solution: In monocot seeds, like velvet grass, the single cotyledon is known as the scutellum. It plays a crucial role in absorbing nutrients from the endosperm during germination.

Quick Tip

Remember that the scutellum in monocot seeds aids nutrient transfer during germination.

Question 39. Which of the following is a recessive trait for garden pea plant?

Options:

1. Round seed
2. Constricted pod
3. Tall plant
4. Violet flower

Correct Answer: (2) Constricted pod

Solution: According to Mendelian genetics, traits like round seed, tall plant, and violet flower are dominant, while a constricted pod is a recessive trait in garden pea plants.

Quick Tip

In Mendel's experiments, recessive traits are expressed only when both alleles are recessive.

Question 40. Nucleosome is:

Options:

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 are the basic structural unit of chromatin. Negatively charged DNA coils around a positively charged histone octamer, facilitating DNA packaging and regulating gene expression.

Quick Tip

Understand nucleosome composition: DNA (negative charge) and histone proteins (positive charge) ensure compact chromatin structure.

Question 41. "Transforming Principle" was given by:

Options:

1. Maclyn McCarty
2. Frederick Griffith
3. Alfred Hershey
4. Watson and Crick

Correct Answer: (2) Frederick Griffith

Solution: Frederick Griffith demonstrated the "Transforming Principle" in his experiments with *Streptococcus pneumoniae*, showing that genetic material from dead bacteria could transfer traits to living bacteria.

Quick Tip

Griffith's work laid the foundation for understanding DNA as the carrier of genetic information.

Question 42. Which disorder is caused by the substitution of Glutamic acid (Glu) by Valine (Val) at the sixth position of the beta globin chain of hemoglobin?

Options:

1. Phenylketonuria
2. Sickle-cell Anemia
3. Hemophilia
4. Thalassemia

Correct Answer: (2) Sickle-cell Anemia

Solution: Sickle-cell anemia is caused by a point mutation where Glutamic acid is replaced by Valine in the beta globin chain. This change alters hemoglobin's structure, causing red blood cells to adopt a sickle shape, leading to reduced oxygen transport and other complications.

Quick Tip

Sickle-cell anemia is a classic example of a genetic disorder caused by a point mutation in the hemoglobin gene.

Question 43. Arrange the following steps of DNA fingerprinting in proper sequence:
Steps:

- (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

Options:

1. (E), (C), (B), (D), (A)
2. (C), (E), (A), (B), (D)
3. (B), (D), (E), (C), (A)
4. (D), (A), (C), (E), (B)

Correct Answer: (1) (E), (C), (B), (D), (A)

Solution: DNA fingerprinting involves the following steps:

- (E) Isolation of DNA
- (C) Digestion using restriction enzymes
- (B) Electrophoretic separation of fragments
- (D) Blotting fragments onto a nylon membrane
- (A) Hybridization with a labeled probe

Quick Tip

Memorize the DNA fingerprinting sequence: Isolation, Digestion, Separation, Blotting, and Hybridization.

Question 44. 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

Table 3: Matching Diseases with Pathogens/Genera

Options:

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

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

Solution: The correct matches are:

- Amoebiasis - Entamoeba histolytica
- Filariasis - Wuchereria
- Ringworm - Epidermophyton
- Pneumonia - Haemophilus influenzae

Quick Tip

Associate diseases with their causative organisms for quick recall.

Question 45. Streptokinase enzyme is used for:

Options:

1. Removing clots from blood vessels
2. Clarifying fruit juices
3. Synthesis of cholesterol
4. Removing oily stains

Correct Answer: (1) Removing clots from blood vessels

Solution: Streptokinase, a bacterial enzyme, is used as a thrombolytic agent to dissolve clots in blood vessels, particularly in conditions like myocardial infarction.

Quick Tip

Streptokinase is crucial in emergency treatments to prevent or dissolve blood clots.

Question 46. Select the incorrect statement:

Options:

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 contains the highest number of genes, whereas chromosome Y has the fewest. Chromosome 21 does not have the most genes, making this statement incorrect.

Quick Tip

Chromosome 1 is gene-rich, while the Y chromosome is gene-poor.

Question 47. Which of the following is not a step of Polymerase Chain Reaction?

Options:

1. Extension
2. Downstream processing
3. Annealing
4. Denaturation

Correct Answer: (2) Downstream processing

Solution: PCR consists of three main steps: denaturation, annealing, and extension. Downstream processing involves product purification, which is not part of the PCR process.

Quick Tip

PCR focuses on DNA amplification, while downstream processing occurs after synthesis.

Question 48. Which of the following equation is correct about Verhulst-Pearl Logistic Growth?

Options:

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 logistic growth equation describes population growth under limited resources, where N is the population size, r is the intrinsic growth rate, and K is the carrying capacity.

Quick Tip

Logistic growth models predict an S-shaped curve as the population approaches its carrying capacity.

Question 49. Match List-I with List-II:

List-I (Genes):

- (A) i
- (B) a
- (C) y
- (D) z

List-II (Proteins – Codes for lac operon):

- (I) Permease
- (II) β -galactosidase
- (III) Transacetylase
- (IV) Repressor

Options:

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

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

Solution: The lac operon genes are matched as follows:

- i - Repressor
- a - Transacetylase
- y - Permease
- z - β -galactosidase

Quick Tip

Focus on lac operon functionality: z codes for β -galactosidase, y for permease, a for transacetylase, and i for the repressor.

Question 50. Analogous structures are a result of:

Options:

1. Divergent evolution
2. Convergent evolution
3. Genetic drift
4. Point mutations

Correct Answer: (2) Convergent evolution

Solution: Analogous structures arise due to convergent evolution, where unrelated species develop similar traits to adapt to comparable environments. An example is the wings of birds and bats, which serve similar functions but have different evolutionary origins.

Quick Tip

Convergent evolution leads to analogous structures; divergent evolution results in homologous structures.
