CUET 2024 Biology SET B Question Paper with Solution

Question 1. Arrange the following steps of DNA fingerprinting in the 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 onto 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: The correct sequence of DNA fingerprinting steps is:

- (E) Isolation of DNA
- (C) Digestion using restriction enzymes
- (B) Separation of fragments by electrophoresis
- (D) Blotting fragments onto a nylon membrane
- (A) Hybridization with labeled probes

Quick Tip

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

Question 2. 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 fundamental units of chromatin structure. Negatively charged DNA coils around the positively charged histone octamer, enabling efficient DNA packaging and gene regulation.

Quick Tip

Nucleosomes condense DNA to fit within the nucleus and play a role in regulating gene expression.

Question 3. "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: Griffith's experiment with Streptococcus pneumoniae demonstrated the "Transforming Principle," where non-virulent bacteria acquired traits from heat-killed virulent bacteria. This study led to the discovery of DNA as the genetic material.

Quick Tip

Griffith's work established the foundation for identifying DNA as the genetic material.

Question 4. 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 results from a point mutation where Glutamic acid (Glu) is replaced by Valine (Val) in the beta globin chain. This leads to distorted red blood cell shapes, impairing oxygen transport and causing health complications.

Quick Tip

Sickle-cell anemia is an autosomal recessive disorder caused by a mutation in the HBB gene.

Question 5. 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) *Hemophilus influenzae*
(D) Pneumonia	(IV) *Epidermophyton*

Table 1: Matching diseases with their pathogens/genera

Options:

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

Correct Answer: (1) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
Solution: The correct matches are:

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

Quick Tip

Match diseases with their causative pathogens for better recall in exams.

Question 6. Streptokinase enzyme is used for:

Options:

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 is a bacterial enzyme used as a thrombolytic agent to dissolve blood clots. It is primarily employed in medical treatments for conditions like myocardial infarction and stroke to restore normal blood flow.

Quick Tip

Streptokinase helps in emergency treatment by breaking down blood clots, ensuring blood flow is not obstructed.

Question 7. 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 in the human genome, while chromosome Y has the fewest. The second statement is incorrect because chromosome 21 does not have the most genes.

Quick Tip

Remember: Chromosome 1 is the most gene-rich, and chromosome Y is the most gene-poor.

Question 8. 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 involves three main steps: denaturation (separating DNA strands), annealing (binding primers), and extension (synthesizing new strands). Downstream processing refers to the purification and formulation of products, which is not part of PCR.

Quick Tip

Focus on the core steps of PCR: denaturation, annealing, and extension. Downstream processing is a separate biotechnological process.

Question 9.. Which of the following equations 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. $\frac{dN}{dt} = (h-d)\frac{(N-K)}{N}$

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

Solution: The logistic growth equation models population growth under limited resources. Here, r is the intrinsic growth rate, N is the population size, and K is the carrying capacity. The equation reflects the decrease in growth as the population approaches K.

Quick Tip

Logistic growth predicts an S-shaped curve due to the limiting effects of carrying capacity (K).

Question 10. Match *List-I* with *List-II*:

List-I	Genes	List-II	Proteins – codes for lac operon
(A)	'i'	(I)	permease
(B)	'a'	(II)	β-galactosidase
(C)	'y'	(III)	transacetylase
(D)	'z'	(IV)	repressor

Table 2: Matching genes with their corresponding lac operon proteins.

Choose the correct answer from the options given below:

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

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

Solution: The lac operon genes and their corresponding proteins are:

- (A) 'i' - repressor (IV)
- (B) 'a' - transacetylase (III)
- (C) 'y' - permease (I)

- (D) 'z' - β-galactosidase (II)

The correct matching helps understand the functional roles of each gene in lactose metabolism.

Quick Tip

Lac operon proteins:

- z - β-galactosidase: hydrolyzes lactose.
- y - permease: facilitates lactose entry into the cell.
- a - transacetylase: detoxifies byproducts.
- i - repressor: regulates operon activity.

Question 11. 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 evolve 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

Analogous structures share function but not ancestry, while homologous structures share ancestry but may serve different functions.

Question 12. 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 amino acid is attached to the 3' end of the tRNA molecule, specifically at the CCA sequence. This end facilitates the accurate delivery of the amino acid to the ribosome during protein synthesis.

Quick Tip

The 3' end of tRNA is the attachment site for amino acids, while the anticodon loop recognizes the mRNA codon.

Question 13. 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 is prominent at birth and plays a critical role in developing the immune system by producing T-cells. However, it gradually shrinks with age, a process called involution.

Quick Tip

The thymus is vital in early life for immune development but diminishes in size and activity with age.

Question 14. 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* is a beneficial bacterium present in the human gut. It produces lactic acid, which helps maintain a low pH in the stomach, inhibiting the growth of pathogenic microbes.

Quick Tip

Probiotics like *Lactobacillus* improve gut health by creating an unfavorable environment for harmful microbes.

Question 15. 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* is a probiotic bacterium that produces lactic acid, maintaining an acidic environment in the stomach. This acidity inhibits the growth of pathogenic microbes and promotes gut health.

Quick Tip

Include probiotics like *Lactobacillus* in your diet to enhance gut health and prevent infections.

Question 16. 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.

In the light of the above statements, choose the correct answer from the options given below:

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: Statement I is false because whisky, brandy, and rum are produced by distillation of fermented broth, not without it. Statement II is true as *Saccharomyces cerevisiae*, commonly known as baker's yeast, is also referred to as doctor's yeast due to its extensive use in fermentation and therapeutic applications.

Quick Tip

Remember: Distillation is an essential step in the production of alcoholic beverages like whisky, brandy, and rum.

Question 17. 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: In DNA, base pairing rules are strict: Adenine (A) pairs with Thymine (T), and Guanine (G) pairs with Cytosine (C). Thus, the complementary sequence for 5' – GTATTACG – 3' is 3' – CATAATGC – 5'.

Quick Tip

For DNA, remember: A pairs with T, and G pairs with C. Always reverse the strand direction when determining the complement.

Question 18. Which of the following statements is not correct for restriction enzymes?

Options:

1. Exonucleases remove nucleotides from the ends of 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. Restriction enzymes like exonucleases and endonucleases differ in their roles, while ligases help in joining DNA fragments during cloning.

Quick Tip

EcoRI was the first restriction enzyme identified, paving the way for genetic engineering.

Question 19. 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 the Steller's Sea Cow in Russia. These extinctions highlight human impact on biodiversity.

Quick Tip

Link species with their extinction locations for better recall, such as "Dodo in Mauritius."

Question 20. 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, contains integuments, a funicle, and a micropyle. The generative cell is part of the pollen grain, not the megasporangium.

Quick Tip

Remember: The generative cell contributes to pollen development, not ovule structure.

Read the following passage and answer the next five questions :

The reproductive cycle of female primates is called 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 **Question 41. 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: Accessory ducts of the female reproductive system include the Fallopian tubes, cervix, and vagina, which aid in gamete transport. The uterus, however, is primarily involved in implantation and fetal development, not as an accessory duct.

Quick Tip

Accessory ducts transport gametes, while the uterus supports embryo development.

Question 21. 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 external genitalia, or vulva, include the mons pubis, hymen, clitoris, and labia. Mammary ducts are related to lactation, while the cervix is an internal organ.

Quick Tip

Focus on distinguishing external structures (vulva) from internal reproductive organs like the cervix.

Question 22. 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 travels through the cervix, uterus, and Fallopian tubes to meet the ovum. The ovary releases the ovum but is not part of the sperm transport pathway.

Quick Tip

The ovary produces eggs but is not directly involved in sperm transport.

Question 23. 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 secretion by the corpus luteum occurs after ovulation. Before ovulation, the follicular phase is dominated by estrogen, while LH and FSH peaks trigger follicle rupture.

Quick Tip

Progesterone predominates post-ovulation; estrogen dominates the follicular phase.

Question 24. 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 menstrual cycle phases align with specific days: Proliferative phase (5th–13th days), Menstrual phase (1st–5th days), Secretory phase (15th–28th days), and Ovulatory phase (14th day).

Quick Tip

Learn the sequence and timing of menstrual cycle phases for better understanding of reproductive physiology.

Read the following passage and answer the next five questions :

In nature, populations of different species in a habitat do not live in isolation but interact in many ways. Depending on the outcome, these interactions between two species are classified as competition, predation and parasitism, commensalism, amensalism and mutualism. Through these interactions trophic

energy transfer is facilitated. Some predators help in controlling their prey populations, whereas plants have evolved diverse morphological and chemical defences against herbivores.

Question 25. 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: In commensalism, one species benefits while the other remains unaffected. An example is barnacles attaching to whales, where barnacles gain mobility without affecting the whale.

Quick Tip

Commensalism involves a +/0 relationship, unlike mutualism (+/+) or parasitism (+/–).

Question 26. Identify the incorrect matching from the following population interactions:

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

Table 3: Types of interactions between Species A and Species B

Correct Answer: (3) Predation

Solution: Predation involves a +/– interaction, where the predator benefits and the prey is harmed. The –/– notation is incorrect for predation.

Quick Tip

Predation dynamics are distinct from other interactions like competition or mutualism.

Question 27. 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 benefit from growing on mango trees, gaining access to sunlight and air, while the mango tree remains unaffected. This exemplifies commensalism.

Quick Tip

Commensalism describes a neutral relationship for one species and a benefit for the other.

Question 28. 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 4: 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: Extinction of Abingdon tortoise relates to competition, copepod infestations represent parasitism, cattle egrets exemplify commensalism, and fig trees with wasps illustrate mutualism.

Quick Tip

Interactions between species highlight the ecological dynamics of survival and coexistence.

Question 29. 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 maintain a constant internal temperature and are regulators, not conformers. Conformers adjust their internal environment to external changes.

Quick Tip

Distinguish between regulators (constant internal conditions) and conformers (variable internal conditions).

Question 30. 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: Hermaphroditic organisms, such as tapeworms and leeches, possess both male and female reproductive organs, allowing them to reproduce flexibly. In contrast, cockroaches and fish exhibit separate sexes for reproduction.

Quick Tip

Hermaphroditism provides reproductive advantages, especially in environments where mates are scarce.

Question 31. 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: Meiosis occurs in sporogenous tissue within plants to produce haploid spores. This contrasts with vegetative cells and synergids, which do not participate in meiosis.

Quick Tip

Sporogenous tissue is integral to reproduction, generating haploid gametes through meiosis.

Question 32. 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 theorized that life originated from non-living organic molecules through chemical evolution, forming a "primordial soup." This process laid the foundation for abiogenesis studies.

Quick Tip

Chemical evolution theory provides insights into how life might have originated under prebiotic conditions.

Question 33. Given below are two statements:

Statement I: In a bioreactor, small volumes of cultures are developed in which useful bio-products are produced.
Statement II: In downstream processing, the products formulated with suitable preservatives are ready for marketing without testing of their quality.

In the light of the above statements, choose the correct answer from the options given below:

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: Statement I is correct as bioreactors are specifically designed for producing bio-products on a small or large scale. Statement II is incorrect because downstream processing always involves rigorous quality testing before products are marketed. Preservatives alone do not guarantee the quality and safety of bio-products.

Quick Tip

Downstream processing includes steps like purification and quality testing, ensuring the final product meets safety standards.

Question 34. 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) is a reproductive technique where the ovum is placed directly into the fallopian tube of the recipient, enabling natural fertilization. This contrasts with ZIFT, which involves transferring a zygote.

Quick Tip

GIFT involves direct placement of gametes, while ZIFT requires transferring the already fertilized zygote.

Question 35. 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), their offspring can inherit either 'A' (AO) or 'O' (OO), depending on the allele transmitted.

Quick Tip

Understand inheritance patterns: Blood group 'A' can result from genotype AO or AA, while group 'O' comes from OO.

Question 36. 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 nucleotide sequences that range in size from 0.1 to 20 kilobases. Their variability makes them a crucial tool in genetic profiling and forensic investigations.

Quick Tip

VNTRs are widely used in DNA fingerprinting due to their polymorphic nature across individuals.

Question 37. 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: The most effective methods for cancer treatment are surgery, radiation therapy, and immunotherapy. While vaccination and physiotherapy play supportive roles, they are not the primary methods used to treat cancer.

Quick Tip

Cancer treatment methods focus on directly removing or destroying cancerous tissues, with surgery, radiation, and immunotherapy being the core approaches.

Question 38. Which of the following controls/control 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, derived from *Bacillus thuringiensis* (Bt), produce proteins toxic to bollworms. These genes are introduced into genetically modified crops like Bt cotton to control bollworm infestations effectively.

Quick Tip

Cry genes provide pest resistance by producing insecticidal proteins, reducing the need for chemical pesticides.

Question 39. 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) detects the presence of specific molecules using antigen-antibody binding, amplified by an enzymatic reaction for quantifiable results.

Quick Tip

ELISA is a powerful diagnostic tool that relies on the specificity of antigen-antibody interactions.

Question 40. 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 × Tt

4. tt × tt

Correct Answer: (2) Tt × tt

Solution: In a test cross involving a heterozygous individual (Tt) and a homozygous recessive individual (tt), the offspring are produced in a 1:1 ratio of heterozygous (Tt) and homozygous recessive (tt).

Quick Tip

Test crosses are used to determine the genotype of dominant individuals by crossing with homozygous recessive organisms.

Question 41. 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 during the S (Synthesis) phase of the cell cycle, ensuring that each daughter cell inherits an identical genome during cell division.

Quick Tip

The S phase is a dedicated period of DNA replication, preparing the cell for mitosis or meiosis.

Question 42. 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: In their experiment, Hershey and Chase used ^{35}S to label proteins and ^{32}P to label DNA in bacteriophages. Their findings confirmed that DNA, not protein, serves as the genetic material.

Quick Tip

^{32}P is specific to DNA labeling, while ^{35}S is used for protein labeling in experiments.

Question 43. 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 conducted experiments on Vicia faba (broad bean) root tips to demonstrate the semiconservative mode of DNA replication by incorporating radioactive tracers.

Quick Tip

Semiconservative replication ensures that each new DNA molecule consists of one parental and one newly synthesized strand.

Question 44. 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 derived from the bacterium Thermus aquaticus. Its heat resistance makes it ideal for high-temperature DNA amplification.

Quick Tip

Taq polymerase is indispensable in PCR due to its ability to withstand the denaturation step.

Question 45. 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 natural gene-silencing mechanism and is not directly involved in DNA recombinant technology. Recombinant DNA technology includes DNA isolation, enzymatic cleavage, and host cell culture.

Quick Tip

Recombinant DNA techniques focus on manipulating DNA, while RNAi regulates gene expression.

Question 46. 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: Ozone is primarily located in the stratosphere, where it absorbs ultraviolet radiation, protecting life on Earth from harmful solar rays.

Quick Tip

The ozone layer is vital for blocking UV radiation and preserving ecological balance.

Question 47. 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), which quantify the amount of ozone in a column of the Earth's atmosphere.

Quick Tip

Dobson Units (DU) help monitor ozone concentration, essential for studying climate and environmental changes.

Question 48. 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, as in seed banks. In contrast, biosphere reserves, national parks, and wildlife sanctuaries represent in-situ conservation.

Quick Tip

Ex-situ conservation safeguards genetic resources for future use, particularly in seed banks.

Question 49. 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, such as velvet grass, the single cotyledon is known as the scutellum. It absorbs nutrients from the endosperm during germination and supports seedling growth.

Quick Tip

The scutellum is exclusive to monocot seeds and is vital for nutrient transfer during germination.

Question 50. Which of the following is a recessive trait for a garden pea plant?

Options:

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

Correct Answer: (2) Constricted pod

Solution: In Mendel's experiments, constricted pod shape was observed as a recessive trait, while traits like round seed and tall plant were dominant. Recessive traits appear only when both alleles are recessive.

Quick Tip

Dominant traits mask recessive ones; recessive traits are expressed only in homozygous recessive individuals.
