CUET UG Biology Sample Paper - 4

Duration: 1 Hour **Maximum Marks: 250**

Instructions

- This paper contains a total of 50 Multiple Choice Questions.
- Each correct answer carries **+5 marks**.
- Each incorrect answer carries **-1 mark**.
- No negative marking for unattempted questions.

Q1. Given below are two statements:
Statement I: The filiform apparatus guides the entry of the pollen tube into the synergid.
Statement II: It is located at the chalazal end of the embryo sac.
In light of the above statements, choose the most appropriate answer:

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

Q2. If the endosperm of an angiosperm has 36 chromosomes, the number of chromosomes in the female gamete and the nucellus will be respectively:

(A) 12, 12
(B) 12, 24
(C) 24, 12
(D) 18, 36

Q3. Arrange the following events of human reproduction in the correct sequence:
A. Insemination

B. Gestation
C. Parturition
D. Gametogenesis
E. Implantation
Choose the correct answer from the options given below:

(A) D, A, E, B, C
(B) D, A, B, E, C
(C) A, D, E, B, C
(D) D, E, A, B, C

Q4. Which hormone acts on the Sertoli cells and stimulates the secretion of some factors which help in the process of spermiogenesis?

(A) GnRH
(B) LH
(C) FSH
(D) Testosterone

Q5. Match List I with List II regarding Contraceptive Methods:

List I	**List II**
A. Lippes Loop	I. Hormone releasing IUD
B. Multiload 375	II. Non-medicated IUD
C. LNG-20	III. Once-a-week pill
D. Saheli	IV. Copper releasing IUD

Choose the correct answer from the options given below:

(A) A-II, B-IV, C-I, D-III
(B) A-I, B-II, C-III, D-IV
(C) A-II, B-I, C-IV, D-III
(D) A-IV, B-III, C-II, D-I

Q6. In a dihybrid cross between a true-breeding round-yellow seeded plant and a wrinkled-green seeded plant, the percentage of recombinant phenotypes in F2 generation is:

(A) 37.5

(B) 50

(C) 12.5

(D) 25

Q7. Which of the following Mendelian disorders is caused due to the substitution of Glutamic acid by Valine at the sixth position of the beta globin chain?

(A) Phenylketonuria

(B) Thalassemia

(C) Sickle cell anemia

(D) Haemophilia

Q8. In E.coli, the lac operon gets switched on when:

(A) Lactose is present and it binds to RNA polymerase.

(B) Lactose is present and it binds to the repressor.

(C) Repressor binds to the operator.

(D) RNA polymerase binds to the operator.

Q9. Meselson and Stahl's experiment proved the semi-conservative nature of DNA replication using:

(A) ^{15}N and ^{14}N

(B) ^{35}S and ^{32}P

(C) ^{14}C and ^{15}N

(D) Thymidine and Uracil

Q10. If the sequence of the coding strand of DNA is 5'-ATGCATGC-3', the sequence of the transcribed mRNA will be:

(A) 5'-UACGUACG-3'

(B) 5'-AUGCUAGC-3'

(C) 5'-AUGCAUGC-3'

(D) 3'-UACGUACG-5'

Q11. The process of splicing in eukaryotic transcription involves:

(A) Removal of exons and joining of introns.

(B) Removal of introns and joining of exons.

(C) Addition of Methyl Guanosine triphosphate at 5' end.

(D) Addition of Poly-A tail at 3' end.

Q12. According to the Hardy-Weinberg principle, if the frequency of the dominant allele 'A' is 0.6, what is the frequency of the homozygous recessive individuals (aa)?

(A) 0.4

(B) 0.16

(C) 0.36

(D) 0.48

Q13. Identify the correct sequence of Hominid evolution:

(A) Australopithecus → Homo habilis → Homo erectus → Homo sapiens

(B) Homo habilis → Australopithecus → Homo erectus → Homo sapiens

(C) Australopithecus → Homo erectus → Homo habilis → Homo sapiens

(D) Homo erectus → Homo habilis → Australopithecus → Homo sapiens

Q14. The "Evil Quartet" is a term associated with:

(A) Four stages of Malaria life cycle.

(B) Four major causes of biodiversity loss.

(C) Four steps of PCR.

(D) Four types of contraceptive pills.

Q15. In the life cycle of Plasmodium, the infectious stage for humans is:

(A) Trophozoites

(B) Gametocytes

(C) Sporozoites

(D) Merozoites

Q16. Which of the following is an example of an "Auto-immune" disease?

(A) AIDS

(B) Rheumatoid arthritis

(C) Cancer

(D) Allergy

Q17. Secondary sewage treatment is mainly a:

(A) Physical process

(B) Mechanical process

(C) Biological process

(D) Chemical process

Q18. The "Bt" in Bt-Cotton stands for:

(A) Bio-technology

(B) Bacillus thuringiensis

(C) Bacterium terminalis

(D) B-lymphocyte toxin

Q19. In RNA interference (RNAi), the silencing of a specific mRNA is due to:

(A) Single-stranded RNA

(B) Double-stranded RNA

(C) Single-stranded DNA

(D) Double-stranded DNA

Q20. What is the role of the enzyme 'Taq Polymerase' in PCR?

(A) Denaturation of DNA

(B) Annealing of primers

(C) Extension of DNA strands at high temperature

(D) Ligation of DNA fragments

Q21. The first step of PCR is:

(A) Annealing

(B) Extension

(C) Denaturation

(D) Ligation

Q22. Humulin is produced by inserting the gene for human insulin into:

(A) Bacillus subtilis

(B) Escherichia coli

(C) Saccharomyces cerevisiae

(D) Agrobacterium tumefaciens

Q23. An interaction where one species is benefited and the other is neither benefited nor harmed is:

(A) Mutualism

(B) Amensalism

(C) Commensalism

(D) Parasitism

Q24. The pyramid of energy is always upright because:

(A) Energy is lost as heat at each trophic level.

(B) Herbivores have more energy than producers.

(C) Decomposition is very fast.

(D) Carnivores are more efficient.

Q25. Which of the following is an "ex-situ" conservation method?

(A) National Park

(B) Wildlife Sanctuary

(C) Biosphere Reserve

(D) Zoological Park

Q26. The primary endosperm nucleus (PEN) is formed by the fusion of:

(A) One male gamete + Egg cell

(B) One male gamete + Two polar nuclei

(C) Two male gametes + One polar nucleus

(D) One male gamete + Synergid

Q27. Identify the mismatched pair:

(A) Thalassemia - Autosome linked recessive

(B) Down's Syndrome - Trisomy of 21

(C) Klinefelter's Syndrome - 44+XO

(D) Turner's Syndrome - 44+XO

Q28. The unequivocal proof that DNA is the genetic material came from the experiment of:

(A) Griffith

(B) Avery, MacLeod, and McCarty

(C) Hershey and Chase

(D) Watson and Crick

Q29. During DNA replication, the enzyme that joins the Okazaki fragments is:

(A) DNA Polymerase I

(B) DNA Ligase

(C) Helicase

(D) Primase

Q30. In the 7-celled/8-nucleate embryo sac, the central cell contains:

(A) One haploid nucleus

(B) Two haploid polar nuclei

(C) One diploid secondary nucleus

(D) Three antipodal nuclei

Q31. A population growing in a habitat with limited resources shows:

(A) Exponential growth

(B) Logistic growth

(C) Geometric growth

(D) J-shaped curve

Q32. The enzyme used to cut DNA at specific palindromic sequences is:

(A) DNA Ligase

(B) Restriction Endonuclease

(C) Exonuclease

(D) RNA Polymerase

Q33. Which part of the poppy plant is used to obtain the drug "Smack"?

(A) Flowers

(B) Latex

(C) Leaves

(D) Roots

Q34. The functional unit of inheritance is:

(A) Cistron

(B) Intron

(C) Codon

(D) Recon

Q35. The process of "Cleavage" in a human zygote results in the formation of:

(A) Gastrula

(B) Blastomers

(C) Trophoblast

(D) Inner cell mass

Q36. "Saheli" is a non-steroidal oral contraceptive developed by:

(A) AIIMS

(B) CDRI, Lucknow

(C) IARI

(D) NDRI

Q37. A cross between an F1 hybrid and its homozygous recessive parent is called:

(A) Back cross

(B) Test cross

(C) Monohybrid cross

(D) Reciprocal cross

Q38. The tailing process of hnRNA involves the addition of:

(A) Adenylate residues

(B) Guanylate residues

(C) Methyl group

(D) Ethyl group

Q39. Analogous structures are a result of:

(A) Divergent evolution

(B) Convergent evolution

(C) Genetic drift

(D) Saltation

Q40. Which antibody is present in Colostrum?

(A) IgG

(B) IgM

(C) IgA

(D) IgE

Q41. Cyclosporin-A, an immuno-suppressive agent, is produced by:

(A) Monascus purpureus

(B) Trichoderma polysporum

(C) Aspergillus niger

(D) Acetobacter aceti

Q42. In agarose gel electrophoresis, DNA fragments move towards:

(A) Anode (Positive electrode)

(B) Cathode (Negative electrode)

(C) Remains at the well

(D) Moves based on color

Q43. "Elution" refers to:

(A) Cutting of DNA by restriction enzymes.

(B) Separation of DNA fragments on gel.

(C) Extraction of DNA bands from the agarose gel.

(D) Ligation of DNA with a vector.

Q44. Which of the following is used as a biofertilizer in paddy fields?

(A) Nostoc

(B) Azolla

(C) Oscillatoria

(D) All of these

Q45. The Net Primary Productivity (NPP) is:

(A) GPP + Respiration

(B) GPP - Respiration

(C) Total biomass produced

(D) Rate of formation of new organic matter by consumers

Q46. "The Evil Quartet" includes all EXCEPT:

(A) Habitat loss and fragmentation

(B) Over-exploitation

(C) Co-extinctions

(D) In-situ conservation

Q47. The pioneer species in a xerarch succession are:

(A) Mosses

(B) Lichens

(C) Herbs

(D) Trees

Q48. During the follicular phase of the menstrual cycle, which hormone is primarily responsible for the regeneration of the endometrium?

(A) Progesterone

(B) Estrogen

(C) LH

(D) FSH

Q49. Which codon acts as the initiation codon and also codes for Methionine?

(A) UAA

(B) AUG

(C) UAG

(D) UGA

Q50. The technique used to amplify a specific gene of interest is:

(A) Blotting

(B) PCR

(C) Downstream processing

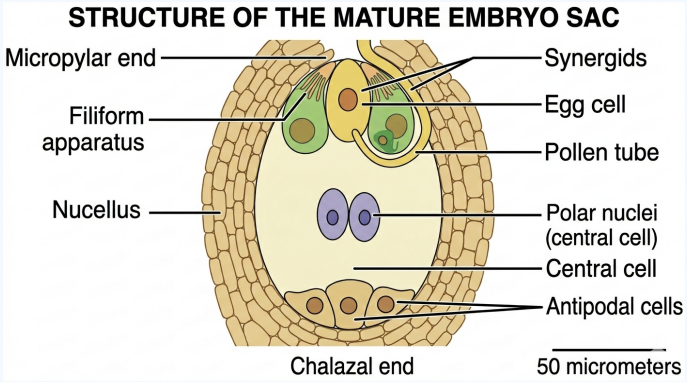
(D) DNA Fingerprinting

Detailed Solutions

Q1.

Solution

Concept: Successful fertilization in angiosperms is a coordinated process requiring the guidance of the pollen tube toward the female gamete through chemical signaling.



Solution: 1. **The Filiform Apparatus:** This structure consists of specialized finger-like cellular thickenings found in the synergids. Its primary physiological role is to secrete chemical attractants that guide the pollen tube to enter the synergid.

2. **Anatomical Polarity:** An angiosperm embryo sac has a distinct polar orientation. The egg apparatus, which includes the egg cell and two synergids, is strictly located at the **micropylar end**.

3. **Antipodal Positioning:** Conversely, the three antipodal cells are located at the opposite pole, known as the **chalazal end**.

4. **Statement Analysis:** Statement I correctly identifies the function of the filiform apparatus. However, Statement II is anatomically incorrect because it erroneously places the apparatus at the chalazal end.

Final Answer: Statement I is correct but Statement II is incorrect

Answer: (C)

Q2.

Solution

Concept: Calculating chromosome numbers in different parts of an ovule requires a clear understanding of the ploidy levels resulting from mitosis and triple fusion.

Solution: 1. **Determining the Haploid Number (n):** In angiosperms, the endosperm is triploid ($3n$) as it is formed by the fusion of two polar nuclei and one male gamete. Given $3n = 36$, we find that the haploid count is $n = 12$.

2. **Female Gamete (Egg Cell):** The female gamete is a product of megasporogenesis and is haploid (n). Therefore, its chromosome count is 12.

3. **Nucellus Tissue:** The nucellus is part of the diploid sporophytic tissue ($2n$) that surrounds the embryo sac. Therefore, its chromosome count is $2 \times 12 = 24$.

4. **Conclusion:** Based on the n and $2n$ values derived from the triploid endosperm, the counts for the gamete and nucellus are 12 and 24 respectively.

Final Answer: 12, 24

Answer: (B)

Q3.

Solution

Concept: Human reproduction is a sequential biological process where each event must occur in a specific chronological order to ensure successful development and birth.

Solution: 1. **Gametogenesis (D):** The initial step involving the formation of male and female gametes (sperm and ova).

2. **Insemination (A):** The subsequent transfer of sperm into the female reproductive tract.

3. **Implantation (E):** The stage where the resulting blastocyst attaches to the endometrium of the uterus.

4. **Gestation (B):** The duration of embryonic development (pregnancy) within the mother's womb.

5. **Parturition (C):** The final biological process involving the delivery of the fetus (childbirth).

Conclusion: The logical and physiological sequence is Gametogenesis $\rightarrow$ Insemination $\rightarrow$ Implantation $\rightarrow$ Gestation $\rightarrow$ Parturition.

Final Answer: D, A, E, B, C

Answer: (A)

Q4.

Solution

Concept: The endocrine regulation of the male reproductive system involves the pituitary gland, which secretes hormones targeting specific testicular cells.

Solution: 1. **Gonadotropin Secretion:** The anterior pituitary releases two primary hormones: Luteinizing Hormone (LH) and Follicle Stimulating Hormone (FSH).

2. **Cell-Specific Targeting:** While LH targets the Leydig cells to produce testosterone, FSH acts directly on the **Sertoli cells** (often called nurse cells).

3. **Role in Spermiogenesis:** Under the influence of FSH, Sertoli cells produce essential factors and nutrients required for the final maturation of spermatids into functional spermatozoa.

4. **Conclusion:** FSH is the specific hormonal signal that triggers the Sertoli cells to support the process of spermiogenesis.

Final Answer: FSH

Answer: (C)

Q5.

Solution

Concept: Contraceptive devices are categorized based on their mechanism of action, which can be non-medicated, copper-releasing, or hormone-releasing.

Solution: 1. **Lippes Loop (A):** This is a **Non-medicated IUD** that works by increasing the phagocytosis of sperm within the uterus.

2. **Multiload 375 (B):** This is a **Copper-releasing IUD**; the released copper ions suppress the motility and fertilizing capacity of the sperm.

3. **LNG-20 (C):** This is a **Hormone-releasing IUD** (Levonorgestrel) that makes the cervix hostile to sperm and alters the endometrium.

4. **Saheli (D):** This is a unique non-steroidal oral contraceptive pill that is taken **once a week**.

Conclusion: Matching the items from List I to List II gives the sequence: A-II, B-IV, C-I, D-III.

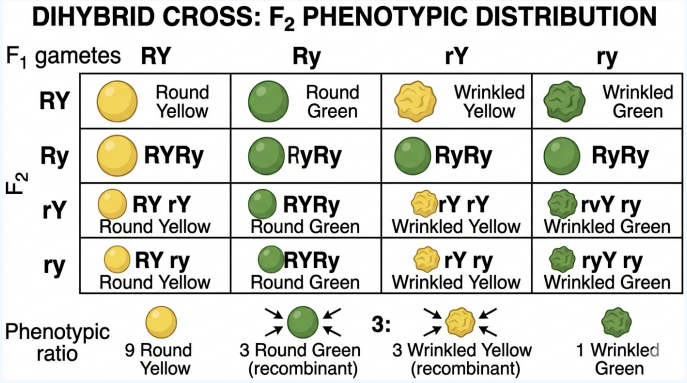
Final Answer: A-II, B-IV, C-I, D-III

Answer: (A)

Q6.

Solution

Concept: A dihybrid cross involves the simultaneous study of the inheritance patterns of two distinct genes, providing the experimental evidence for the Law of Independent Assortment.



Solution: 1. **Parental Genotypes:** The cross begins with a homozygous Round-Yellow ($RRYY$) plant and a homozygous Wrinkled-Green ($rryy$) plant. The F_1 generation is entirely $RrYy$ (Round-Yellow).

2. **F_2 Phenotypic Distribution:** When F_1 plants are self-pollinated, the offspring appear in a $9:3:3:1$ ratio:

- 9 Round-Yellow (Parental type)
- 3 Round-Green (**Recombinant type**)
- 3 Wrinkled-Yellow (**Recombinant type**)
- 1 Wrinkled-Green (Parental type)

3. **Identifying Recombinants:** Recombinants are phenotypes that exhibit new combinations of traits not seen in the original parental generation. Here, Round-Green and Wrinkled-Yellow are the recombinants.

4. **Percentage Calculation:** The number of recombinants is $3 + 3 = 6$ out of a total of 16 combinations.

Calculation: $(\frac{6}{16}) \times 100 = 37.5\%$.

Final Answer: 37.5%

Answer: (A)

Q7.

Solution

Concept: Point mutations are genetic alterations where a single nucleotide base is changed, potentially leading to the substitution of a specific amino acid in a protein chain.

Solution: 1. **The Molecular Cause:** Sickle cell anemia is an autosomal recessive disorder caused by a mutation in the *HBB* gene, which codes for the β-globin chain of hemoglobin.

2. **The Specific Substitution:** A point mutation occurs at the sixth codon of the β-globin gene, where the base sequence GAG is replaced by GUG.

3. **Biochemical Impact:** This genetic change results in the replacement of the amino acid **Glutamic acid** (Glu) by **Valine** (Val) at the sixth position of the polypeptide chain.

4. **Physiological Effect:** The presence of Valine causes the hemoglobin to polymerize under low oxygen tension, forcing the red blood cell to collapse into a rigid, sickle-like shape.

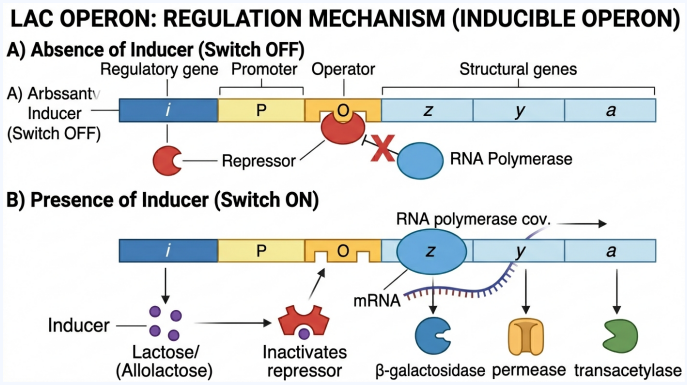
Final Answer: Sickle cell anemia

Answer: (C)

Q8.

Solution

Concept: The lac operon is a classic model for transcriptional regulation in prokaryotes, demonstrating how cells conserve energy by producing enzymes only when their substrate is available.



Solution: 1. **The Repressor Mechanism:** In the absence of an inducer, the *i* gene produces a repressor protein that binds to the operator region, blocking RNA polymerase from transcribing the structural genes.

2. **Role of the Inducer:** Lactose (or its isomer allolactose) acts as an inducer. When lactose enters the cell, it **binds to the repressor** molecule.

3. **Inactivation:** This binding causes a conformational change in the repressor, rendering it unable to bind to the operator.

4. **Operon Activation:** With the operator cleared, RNA polymerase can proceed to transcribe the *z*, *y*, and *a* genes, allowing the cell to metabolize lactose.

Final Answer: Lactose is present and it binds to the repressor.

Answer: (B)

Q9.

Solution

Concept: The semi-conservative model of DNA replication suggests that during the synthesis of new DNA, the two parental strands separate and each serves as a template for a new complementary strand.

Solution: 1. **Experimental Method:** Meselson and Stahl grew *E. coli* in a medium containing the heavy nitrogen isotope ^{15}N until the DNA was fully labeled.

2. **The Transfer:** The bacteria were kemudian transferred to a medium containing the normal, light nitrogen isotope ^{14}N.

3. **Density Gradient Analysis:** Using Cesium Chloride ($CsCl$) density gradient centrifugation, they observed the density of the DNA at different time intervals (generations).

4. **Observations:** After the first generation, the DNA was entirely "hybrid" ($^{15}N -^{14} N$). This provided definitive proof that each daughter DNA molecule contains one original (^{15}N) and one new (^{14}N) strand.

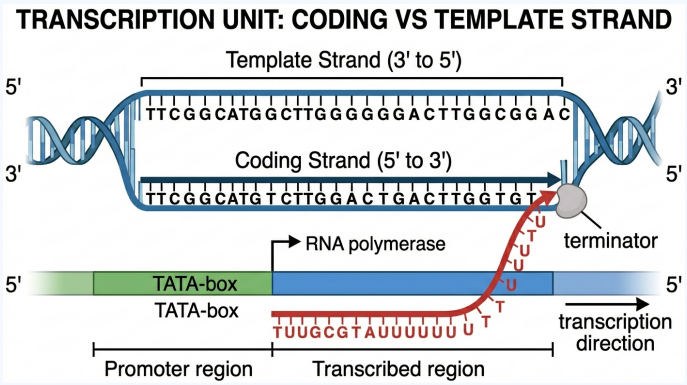
Final Answer: ^{15}N and ^{14}N

Answer: (A)

Q10.

Solution

Concept: During the process of transcription, the mRNA sequence is synthesized complementary to the template strand, making its sequence identical to the coding strand (with one base exception).



Solution: 1. **Strand Orientation:** The coding strand of DNA is the strand that runs in the $5' \rightarrow 3'$ direction.

2. **Sequence Correspondence:** The mRNA is also synthesized in the $5' \rightarrow 3'$ direction. Because it is complementary to the same template that the coding strand is complementary to, the mRNA sequence matches the **coding strand** exactly.

3. **The Base Difference:** The only difference between the coding DNA strand and the mRNA is that DNA contains Thymine (T), whereas mRNA contains Uracil (U).

4. **Application:** Coding strand: $5'$-ATGCATGC-$3'$. Replacing each T with U results in the mRNA: $5'$-AUGCAUGC-$3'$.

Final Answer: $5'$-AUGCAUGC-$3'$

Answer: (C)

Q11.

Solution

Concept: In eukaryotic organisms, the primary RNA transcript (hnRNA) is non-functional and must undergo post-transcriptional modifications to become mature, translatable mRNA.

Solution: 1. **The Nature of Split Genes:** Eukaryotic genes are composed of coding regions called exons and non-coding regions called introns. The initial transcript contains both, which prevents immediate translation.

2. **The Splicing Process:** Splicing is the specific biochemical mechanism where the **introns are removed** and the **exons are joined** together in a precise linear sequence.

3. **Other Modifications:** This process occurs in the nucleus alongside capping (at the 5' end) and tailing (at the 3' end) to provide stability to the mRNA.

4. **Conclusion:** Without the removal of introns via splicing, the protein synthesis machinery would produce non-functional or truncated polypeptides.

Final Answer: Removal of introns and joining of exons.

Answer: (B)

Q12.

Solution

Concept: The Hardy-Weinberg principle provides a mathematical model ($p^2 + 2pq + q^2 = 1$) to determine the frequency of alleles and genotypes in a population.

Solution: 1. **Assigning Allele Frequencies:** Let p represent the frequency of the dominant allele (A) and q represent the frequency of the recessive allele (a).

2. **Calculating q:** We are given $p = 0.6$. Since the sum of allele frequencies in a population must be 1 ($p + q = 1$), we find $q = 1 - 0.6 = 0.4$.

3. **Genotype Identification:** The frequency of homozygous recessive individuals (aa) in the population is mathematically defined as q^2.

4. **Final Calculation:** By squaring the frequency of the recessive allele, we get $q^2 = (0.4)^2 = 0.16$.

Final Answer: 0.16

Answer: (B)

Q13.

Solution

Concept: The evolutionary history of the human species is characterized by a gradual transition through various ancestral forms, marked by increasing brain capacity and upright posture.

Solution: 1. **Australopithecus:** These were early hominids that lived in East African grasslands; they were the first to walk upright but retained a small cranial capacity.

2. **Homo habilis:** Recognized as the first "human-like" hominid (handy man). They had a cranial capacity of approximately 650–800 cc and were the first tool makers.

3. **Homo erectus:** Evolved from *H. habilis*; they possessed a significantly larger brain (around 900 cc) and were the first to migrate out of Africa.

4. **Homo sapiens:** Modern humans who evolved in Africa and eventually replaced or interbred with other hominid species globally.

Conclusion: The chronological progression of human evolution follows the order: Australopithecus → Homo habilis → Homo erectus → Homo sapiens.

Final Answer: Australopithecus → Homo habilis → Homo erectus → Homo sapiens

Answer: (A)

Q14.

Solution

Concept: The "Evil Quartet" is a descriptive term used in conservation biology to highlight the four primary drivers responsible for the current global biodiversity crisis.

Solution: 1. **Habitat Loss and Fragmentation:** The most critical factor, particularly affecting tropical rainforests due to human encroachment and deforestation.

2. **Over-exploitation:** The unsustainable harvesting of natural resources or species (e.g., overfishing or poaching).

3. **Alien Species Invasions:** The introduction of non-native species that disrupt local ecosystems and cause the decline of indigenous species.

4. **Co-extinctions:** A domino effect where the extinction of one species leads to the mandatory extinction of another species that was ecologically dependent on it.

Conclusion: These four factors collectively represent the major causes behind the accelerated rate of species extinction.

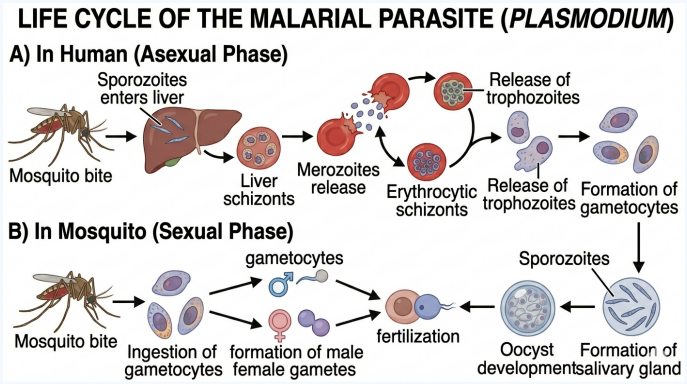
Final Answer: Four major causes of biodiversity loss.

Answer: (B)

Q15.

Solution

Concept: The life cycle of the malarial parasite *Plasmodium* involves complex transitions between different morphological stages within both the mosquito and human hosts.



Solution: 1. **The Vector:** The disease is transmitted when an infected female *Anopheles* mosquito bites a healthy human.

2. **The Infective Stage:** During the bite, the mosquito injects the parasite in the form of **sporozoites** into the human bloodstream.

3. **Developmental Path:** These sporozoites are motile and travel immediately to the liver to initiate the first phase of asexual reproduction before invading red blood cells.

4. **Conclusion:** While other stages like gametocytes are essential for the mosquito phase, only the sporozoite is the stage that initiates the human infection.

Final Answer: Sporozoites

Answer: (C)

Q16.

Solution

Concept: The immune system possesses an inherent ability to distinguish between foreign antigens and the body's own cells; a breakdown in this recognition leads to debilitating conditions.
Solution: 1. **Biological Mechanism:** In a healthy state, the immune system protects the body from external pathogens. In certain individuals, the immune system fails to recognize "self" cells and starts attacking them.
2. **Disease Classification:** This phenomenon is known as an autoimmune response.
3. **Rheumatoid Arthritis:** This is a classic example of an autoimmune disease where the body's own immune system attacks the tissues surrounding the joints, leading to chronic inflammation and damage.
4. **Distinction from Other Conditions:**

- AIDS is caused by a viral infection (HIV).
- Allergies are hypersensitive reactions to external environmental antigens.

Final Answer: Rheumatoid arthritis

Answer: (B)

Q17.

Solution

Concept: Sewage treatment is a multi-stage process designed to clean wastewater; the secondary stage focuses on removing organic matter using living organisms.
Solution: 1. **Primary Treatment:** Involves physical processes like filtration and sedimentation to remove large and small particles.
2. **Secondary Treatment:** This is also known as **biological treatment**. It involves passing the primary effluent into large aeration tanks.
3. **Role of Microbes:** Aerobic microbes (forming flocs) grow rapidly and consume the organic matter in the effluent, thereby reducing the Biochemical Oxygen Demand (BOD).
4. **Conclusion:** Because this stage relies entirely on the metabolic activity of living microbes to degrade waste, it is classified strictly as a biological process.
Final Answer: Biological process

Answer: (C)

Q18.

Solution

Concept: Biotechnology enables the creation of pest-resistant crops by incorporating specific insecticidal genes from bacteria into the plant's genome.

Solution: 1. **The Source:** *Bacillus thuringiensis* (Bt) is a soil bacterium that naturally produces protein crystals containing an insecticidal toxin.

2. **Gene Extraction:** Scientists isolated the "cry" genes from this bacterium and introduced them into the cotton plant.

3. **Mode of Action:** The plant produces the toxin in an inactive form. When an insect (like a bollworm) ingests the plant tissue, the toxin is activated in its alkaline gut, leading to the death of the pest.

4. **Nomenclature:** The prefix "Bt" in Bt-Cotton refers directly to the genus and species of the bacterium, **B**acillus **t**huringiensis.

Final Answer: Bacillus thuringiensis

Answer: (B)

Q19.

Solution

Concept: RNA interference (RNAi) is a cellular defense mechanism used by eukaryotes to silence the expression of specific genes by targeting their messenger RNA.

Solution: 1. **The Trigger:** The process of RNA interference is initiated specifically by the presence of **double-stranded RNA (dsRNA)**.

2. **The Mechanism:** This dsRNA can come from viral infections or mobile genetic elements (transposons).

3. **Silencing:** The dsRNA is processed into small fragments that bind to and facilitate the cleavage of a specific target mRNA.

4. **Result:** Since the target mRNA is destroyed, translation cannot occur, and the corresponding protein is not produced, effectively "silencing" the gene.

Final Answer: Double-stranded RNA

Answer: (B)

Q20.

Solution

Concept: The Polymerase Chain Reaction (PCR) is a technique for DNA amplification that requires a specialized DNA polymerase capable of functioning at extremely high temperatures.

Solution: 1. **The Enzyme:** Taq polymerase is a thermostable enzyme isolated from the thermophilic bacterium *Thermus aquaticus*.

2. **Thermal Stability:** Unlike human DNA polymerase, Taq polymerase does not denature at the high temperatures (94°C–96°C) used to separate DNA strands.

3. **Extension Step:** During the **extension phase** of PCR, this enzyme adds nucleotides to the primers to synthesize a new DNA strand complementary to the template.

4. **Automation:** Its ability to remain active through multiple heating and cooling cycles allows the PCR process to be fully automated.

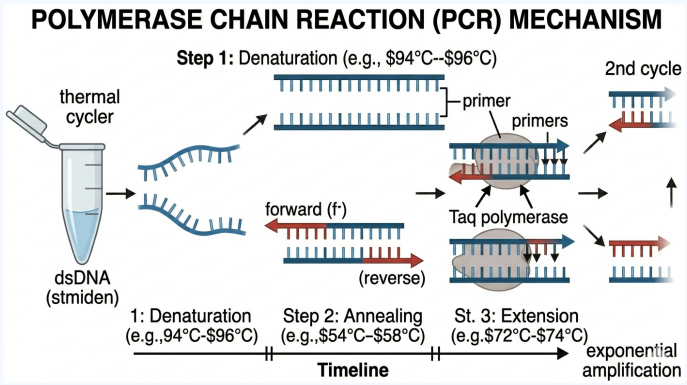
Final Answer: Extension of DNA strands at high temperature

Answer: (C)

Q21.

Solution

Concept: The Polymerase Chain Reaction (PCR) is a molecular technique used to amplify a specific DNA segment through repetitive cycles of heating and cooling.



Solution: 1. **The Three Steps:** PCR involves three main stages: Denaturation, Annealing, and Extension.

2. **Denaturation:** This is the initial step where the reaction mixture is heated to high temperatures (approx 94–96°C).

3. **Mechanism:** The intense heat breaks the hydrogen bonds between the nitrogenous bases of the double-stranded DNA, causing the strands to separate into two single-stranded templates.

4. **Outcome:** These single strands are now accessible for primers to bind in the subsequent annealing step. Without denaturation, replication cannot initiate.

Final Answer: Denaturation

Answer: (C)

Q22.

Solution

Concept: Recombinant DNA technology allows for the production of human therapeutic proteins, like insulin, using microbial hosts.

Solution: 1. **The Challenge:** Human insulin consists of two polypeptide chains (A and B). Producing it in bacteria required synthesizing these chains separately.

2. **The Innovation:** In 1983, the company Eli Lilly used genetic engineering to create DNA sequences corresponding to the human A and B chains.

3. **Host Organism:** These sequences were inserted into the plasmids of **Escherichia coli** (E. coli), which acted as the biological factory to produce the protein chains.

4. **Assembly:** The separately produced A and B chains were extracted and combined by creating disulfide bonds to form functional human insulin (Humulin).

Final Answer: Escherichia coli

Answer: (B)

Q23.

Solution

Concept: Population interactions are classified based on the beneficial, harmful, or neutral effects they have on the species involved.

Solution: 1. **Definition:** Commensalism is an interspecific interaction where one species (the commensal) derives benefit, while the other species (the host) remains unaffected.

2. **Ecological Notation:** This is represented as a (+, 0) interaction.

3. **Examples:**

- An orchid growing as an epiphyte on a mango branch.
- Barnacles attached to the back of a whale.
- Cattle egrets following grazing cattle to catch insects.

4. **Conclusion:** In all these cases, the host provides a substrate or opportunity without incurring any cost or receiving any gain.

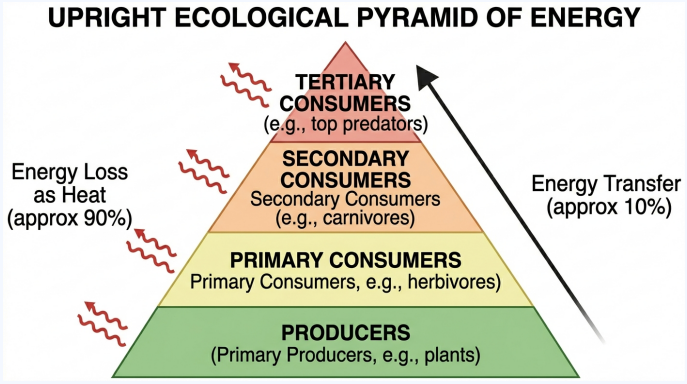
Final Answer: Commensalism

Answer: (C)

Q24.

Solution

Concept: An ecological pyramid of energy represents the total amount of energy available at each trophic level within an ecosystem.



Solution: 1. **The 10% Law:** According to the principles of thermodynamics, only about 10% of the energy at one trophic level is transferred to the next higher level.

2. **Energy Dissipation:** The majority of energy (approx 90%) is lost as heat during respiration and other metabolic processes.

3. **Upright Structure:** Because energy is lost at every step of the food chain, the amount of energy available to higher consumers is always less than the energy available to producers.

4. **Rule of Nature:** Unlike pyramids of biomass or numbers, the pyramid of energy is **always upright** and can never be inverted.

Final Answer: Energy is lost as heat at each trophic level.

Answer: (A)

Q25.

Solution

Concept: Biodiversity conservation strategies are categorized into in-situ (protecting species in their natural habitat) and ex-situ (protecting species outside their natural habitat).

Solution: 1. **In-situ Examples:** National Parks, Wildlife Sanctuaries, and Biosphere Reserves involve protecting the entire ecosystem to save a species.

2. **Ex-situ Conservation:** This involves removing threatened species from their natural environment and placing them in a controlled, human-managed setting for protection and breeding.

3. **Zoological Parks:** Zoos are a primary example of ex-situ conservation where animals are kept in enclosures that mimic their natural environment but are outside their original range.

4. **Conclusion:** Other ex-situ methods include botanical gardens, wildlife safari parks, and seed banks.

Final Answer: Zoological Park

Answer: (D)

Q26.

Solution

Concept: Decomposition is a complex biological and chemical process where decomposers break down complex organic matter into inorganic substances like carbon dioxide, water, and nutrients.
Solution: 1. **Fragmentation:** The process begins with detritivores (like earthworms) breaking down detritus into smaller particles to increase the surface area for microbial action.
2. **Leaching:** Water-soluble inorganic nutrients settle into the soil horizon and get precipitated as unavailable salts through the movement of water.
3. **Catabolism:** Bacterial and fungal enzymes further degrade detritus into simpler inorganic substances.
4. **Humification and Mineralization:** Humification leads to the accumulation of a dark-colored amorphous substance called humus, which is highly resistant to microbial action. Mineralization is the final step where humus is further degraded by some microbes to release inorganic nutrients.
Final Answer: Fragmentation, Leaching, Catabolism, Humification, Mineralization

Answer: (B)

Q27.

Solution

Concept: A species-area relationship describes how the number of species found in a geographical area increases with the size of that area, typically represented on a logarithmic scale.
Solution: 1. **The Formula:** Alexander von Humboldt observed that within a region, species richness increases with increasing explored area, but only up to a limit. This is represented by the equation: $\log S = \log C + Z \log A$.
2. **Variables:** In this equation, S stands for Species richness, A is the Area, C is the Y-intercept, and Z is the slope of the line (regression coefficient).
3. **Slope Significance:** The value of Z typically ranges from 0.1 to 0.2 regardless of the taxonomic group or region, but for very large areas like entire continents, the slope becomes much steeper (0.6 to 1.2).
4. **Conclusion:** On a logarithmic scale, this relationship is a straight line, while on a normal scale, it appears as a rectangular hyperbola.
Final Answer: $\log S = \log C + Z \log A$

Answer: (A)

Q28.

Solution

Concept: Restriction enzymes, or molecular scissors, are used in recombinant DNA technology to cut DNA at specific nucleotide sequences known as recognition sites.

Solution: 1. **Nomenclature:** The first letter of the name comes from the genus and the next two letters from the species of the prokaryotic cell from which they were isolated.

2. **EcoRI example:** In EcoRI, 'E' comes from *Escherichia*, 'co' from *coli*, 'R' is derived from the name of the strain (RY 13), and 'I' (Roman numeral) indicates the order in which the enzyme was isolated.

3. **Specific Cutting:** These enzymes inspect the length of a DNA sequence and cut the two strands of the double helix at specific points in their sugar-phosphate backbones.

4. **Palindromic Sequences:** Most restriction endonucleases recognize a specific palindromic nucleotide sequence, where the sequence reads the same on both strands when the orientation of reading is kept the same.

Final Answer: Roman numerals following the name indicate the order in which the enzymes were isolated from the strain of bacteria.

Answer: (D)

Q29.

Solution

Concept: Primary productivity is the rate at which biomass or organic matter is produced per unit area by plants during photosynthesis, which varies across different ecosystems.

Solution: 1. **Gross Primary Productivity (GPP):** The total rate of production of organic matter during photosynthesis.

2. **Net Primary Productivity (NPP):** This is the available biomass for the consumption of heterotrophs (herbivores and decomposers). It is calculated as: NPP = GPP $-$ R, where R is respiration loss.

3. **Secondary Productivity:** Defined as the rate of formation of new organic matter by consumers.

4. **Factors:** Primary productivity depends on the plant species inhabiting a particular area, environmental factors, availability of nutrients, and photosynthetic capacity of plants.

Final Answer: Net Primary Productivity

Answer: (B)

Q30.

Solution

Concept: Biomagnification refers to the increase in concentration of a toxicant at successive trophic levels because a toxic substance cannot be metabolized or excreted.

Solution: 1. **The Mechanism:** When a persistent pollutant like DDT or Mercury enters the food chain, its concentration increases as it moves from producers to top consumers.

2. **The Aquatic Example:** If water has a DDT concentration of 0.003 ppb, it may reach 0.04 ppm in zooplankton, 0.5 ppm in small fish, 2 ppm in large fish, and eventually 25 ppm in fish-eating birds.

3. **Biological Impact:** High concentrations of DDT disturb calcium metabolism in birds, which causes thinning of eggshells and their premature breaking, eventually causing a decline in bird populations.

4. **Conclusion:** This phenomenon explains why top predators often suffer the most from environmental pollutants.

Final Answer: Increase in concentration of a toxicant at successive trophic levels.

Answer: (C)

Q31.

Solution

Concept: A test cross is a fundamental genetic tool used to determine the unknown genotype of a dominant-phenotype individual by crossing it with a homozygous recessive parent.

Solution: 1. **The Problem:** An organism expressing a dominant trait (like a violet flower) could be either homozygous dominant (PP) or heterozygous (Pp). Phenotypically, they look identical.

2. **The Method:** To distinguish between them, the organism is crossed with a plant exhibiting the recessive trait (white flower, pp).

3. **Interpreting Results:**

- If all offspring show the dominant trait, the unknown parent was homozygous (PP).
- If 50% show the dominant trait and 50% show the recessive trait, the unknown parent was heterozygous (Pp).

4. **Significance:** This cross bypasses the need for multi-generational selfing to identify the genetic makeup of a "test" subject.

Final Answer: To determine the genotype of a plant showing a dominant phenotype.

Answer: (B)

Q32.

Solution

Concept: Pedigree analysis is the study of an inherited trait in a group of related individuals to determine the pattern of inheritance and the probability of its appearance in future generations.
Solution: 1. **Symbolism:** In a standard pedigree chart, a square represents a male, a circle represents a female, and a diamond represents a person of unspecified sex.
2. **Identifying Affected Individuals:** Symbols that are filled or darkened indicate individuals who express the trait being studied (affected individuals).
3. **Connecting Lines:** A horizontal line between a square and a circle represents mating. A vertical line descending from a mating pair leads to the next generation (siblings).
4. **Consanguineous Mating:** A double horizontal line between a square and a circle indicates a marriage or mating between close relatives (cousins, etc.).
Final Answer: Mating between relatives

Answer: (C)

Q33.

Solution

Concept: Turner's syndrome is a chromosomal disorder caused by the absence of one of the X chromosomes in females, leading to a 45, XO karyotype.
Solution: 1. **Genetic Basis:** It is an example of aneuploidy, specifically monosomy, where a female has 44 autosomes but only one X chromosome ($44 + X0$).
2. **Physical Characteristics:** Affected individuals are phenotypically female but typically exhibit short stature and a webbed neck.
3. **Reproductive Status:** The ovaries are rudimentary (underdeveloped), which leads to a lack of secondary sexual characteristics and infertility (sterility).
4. **Comparison:** This differs from Klinefelter's syndrome, where a male has an extra X chromosome ($47, XXY$) and also faces sterility.
Final Answer: Rudimentary ovaries and sterility.

Answer: (A)

Q34.

Solution

Concept: In DNA, the two polynucleotide chains are held together by hydrogen bonds between complementary nitrogenous bases, ensuring the stability of the double helix.

Solution: 1. **Base Pairing Rules:** According to Chargaff's rules, a purine always pairs with a pyrimidine. Specifically, Adenine (A) pairs with Thymine (T), and Guanine (G) pairs with Cytosine (C).

2. **Hydrogen Bonds:** The number of hydrogen bonds is specific to the base pair:

- A and T are joined by **two** hydrogen bonds ($A = T$).
- G and C are joined by **three** hydrogen bonds ($G \equiv C$).

3. **Stability:** The triple bond between G and C makes $G - C$ rich regions of DNA more stable and harder to denature than $A - T$ rich regions.

Final Answer: Two

Answer: (B)

Q35.

Solution

Concept: The genetic code is a set of rules used by living cells to translate information encoded within genetic material into proteins; it possesses several universal characteristics.

Solution: 1. **Triplet Nature:** Each codon consists of three nitrogenous bases. There are 64 codons in total (61 for amino acids and 3 stop codons).

2. **Unambiguous and Specific:** One particular codon always codes for the same amino acid, and only that amino acid.

3. **Degeneracy:** While a codon is specific to one amino acid, a single amino acid can be coded by **multiple** different codons (except for Methionine and Tryptophan).

4. **Universality:** From bacteria to humans, the same codon codes for the same amino acid (e.g., UUU codes for Phenylalanine in all known organisms).

Final Answer: Some amino acids are coded by more than one codon.

Answer: (C)

Q36.

Solution

Concept: The transforming principle experiments led to the discovery that DNA is the genetic material responsible for inheritance and the transformation of organisms.

Solution: 1. **Griffith's Experiment:** In 1928, Frederick Griffith observed that heat-killed S-strain (virulent) *Streptococcus pneumoniae* could transform live R-strain (non-virulent) into virulent S-strain.

2. **The Biochemical Characterization:** In 1944, Avery, MacLeod, and McCarty sought to identify the "transforming principle." They purified proteins, DNA, and RNA from the heat-killed S-cells.

3. **Enzymatic Digestion:** They used specific enzymes to digest these molecules:

- Proteases (digesting protein) did not affect transformation.
- RNases (digesting RNA) did not affect transformation.
- **DNases** (digesting DNA) completely inhibited the transformation.

4. **Conclusion:** This proved that DNA was the substance causing the transformation, identifying it as the genetic material.

Final Answer: DNase

Answer: (A)

Q37.

Solution

Concept: Homologous organs are anatomical structures in different species that share a common evolutionary origin and basic structural plan, even if they perform different functions.

Solution: 1. **Divergent Evolution:** Homology indicates that different species evolved from a common ancestor but adapted their structures for different needs (divergent evolution).

2. **Structural Similarity:** The forelimbs of whales (flippers), bats (wings), cheetahs (legs), and humans (arms) all share a similar skeletal pattern consisting of humerus, radius, ulna, carpals, metacarpals, and phalanges.

3. **Functional Difference:** Despite the structural similarity, these limbs are used for swimming, flying, running, and grasping, respectively.

4. **Conclusion:** This shared underlying anatomy is strong evidence of a shared ancestry among mammals.

Final Answer: Homology

Answer: (B)

Q38.

Solution

Concept: Convergent evolution occurs when unrelated species independently evolve similar traits or structures as adaptations to similar environmental pressures or lifestyles.

Solution: 1. **Analogy:** Structures that perform similar functions but have different anatomical origins are called analogous organs.

2. **The Example:** The eye of an octopus (a mollusk) and the eye of a mammal (a vertebrate) are functionally very similar in how they perceive light and form images.

3. **Structural Difference:** However, their internal anatomy, retinal structure, and embryonic development are entirely different.

4. **Evolutionary Context:** This demonstrates that different lineages can arrive at the same biological "solution" (vision) through independent evolutionary paths.

Final Answer: Convergent evolution

Answer: (C)

Q39.

Solution

Concept: The Miller-Urey experiment provided the first experimental evidence for the "chemical evolution" theory, suggesting that life's building blocks could form under primitive Earth conditions.

Solution: 1. **The Apparatus:** Stanley Miller created a closed system to mimic the Earth's early atmosphere. He used a flask for boiling water and another with electrodes for electric discharge (mimicking lightning).

2. **Atmospheric Composition:** He used a mixture of gases: Methane (CH_4), Ammonia (NH_3), Hydrogen (H_2), and Water vapor (H_2O).

3. **Temperature:** The experiment was conducted at a high temperature of approximately 800°C.

4. **Results:** After several days, Miller observed the formation of various organic compounds, most notably **amino acids**, which are the precursors to proteins.

Final Answer: Amino acids

Answer: (D)

Q40.

Solution

Concept: Active immunity is the resistance developed by an individual's own immune system in response to exposure to an antigen, either through natural infection or vaccination.

Solution: 1. **Mechanism:** When a host is exposed to antigens (living or dead microbes or other proteins), antibodies are produced in the host body.

2. **Characteristics:** Active immunity is slow and takes time to give its full effective response, but it often provides long-lasting protection due to the formation of memory cells.

3. **Vaccination:** Injecting microbes deliberately during immunization or infectious organisms gaining access during natural infection induces active immunity.

4. **Passive Immunity:** This is different from active immunity, as passive immunity involves the direct transfer of pre-formed antibodies (e.g., Colostrum containing IgA or anti-tetanus serum).

Final Answer: Injecting microbes during immunization.

Answer: (A)

Q41.

Solution

Concept: Inbreeding is the mating of more closely related individuals within the same breed for 4–6 generations, which is used to increase homozygosity and evolve pure lines.

Solution: 1. **The Goal:** Inbreeding is necessary to preserve the specific traits of a breed and to expose harmful recessive genes so they can be eliminated by selection.

2. **The Problem:** Continued close inbreeding, especially in animals, usually reduces fertility and even productivity. This biological phenomenon is known as **inbreeding depression**.

3. **Restoration:** To overcome this, selected animals of the inbreeding population should be mated with unrelated superior animals of the same breed.

4. **Outcome:** A single outcross (mating with an unrelated animal) is often sufficient to remove the depression and restore fertility and yield.

Final Answer: Inbreeding depression

Answer: (C)

Q42.

Solution

Concept: Controlled breeding experiments like Multiple Ovulation Embryo Transfer (MOET) technology are used to improve herd size and quality in a short period.

Solution: 1. **Hormonal Induction:** A cow is administered hormones with FSH-like activity to induce follicular maturation and superovulation.

2. **Superovulation:** Instead of the usual one egg per cycle, the cow produces 6–8 eggs.

3. **Fertilization:** The cow is either mated with an elite bull or artificially inseminated.

4. **Embryo Recovery:** The fertilized eggs (embryos) are recovered non-surgically at the 8–32 cell stage and transferred to **surrogate mothers**. The genetic mother is then available for another round of superovulation.

Final Answer: Surrogate mother

Answer: (B)

Q43.

Solution

Concept: Micro-propagation is a method of producing thousands of plants through tissue culture, utilizing the property of totipotency of plant cells.

Solution: 1. **Explants:** Any part of a plant taken out and grown in a test tube under sterile conditions in special nutrient media is called an explant.

2. **Totipotency:** The capacity of the explant or cell to generate a whole new plant is called totipotency.

3. **Somaclones:** Because these plants are grown from the same parent plant through vegetative/asexual means, they are genetically identical to the original plant.

4. **Terminology:** These genetically identical plants produced through tissue culture are referred to as **somaclones**.

Final Answer: Somaclones

Answer: (A)

Q44.

Solution

Concept: Biofortification is the process of breeding crops with higher levels of vitamins, minerals, or higher protein and healthier fats to improve public health.

Solution: 1. **Objective:** The main goal is to reduce "hidden hunger" by improving the nutritional quality of staple food crops.

2. **The Maize Example:** In the year 2000, maize hybrids were developed that had twice the amount of the amino acids **Lysine and Tryptophan** compared to existing maize hybrids.

3. **Other Examples:** Wheat varieties with high protein content (Atlas 66) and iron-fortified rice have also been developed.

4. **Significance:** This approach is a sustainable way to address micronutrient deficiencies in large populations.

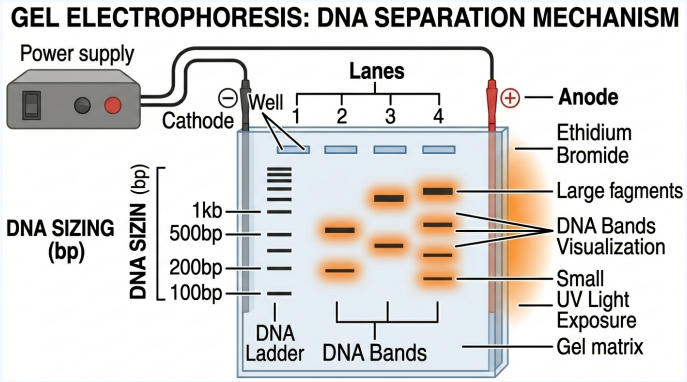
Final Answer: Lysine and Tryptophan

Answer: (B)

Q45.

Solution

Concept: Gel electrophoresis is a technique used to separate DNA fragments based on their size under the influence of an electric field.



Solution: 1. **Charge:** DNA fragments are negatively charged molecules; therefore, they move towards the positive electrode (anode).

2. **Matrix:** The most commonly used matrix is agarose, which acts as a sieve. Smaller fragments move faster and further, while larger fragments stay closer to the wells.

3. **Visualization:** DNA is invisible to the naked eye. It must be stained with a compound called **Ethidium bromide**.

4. **UV Exposure:** After staining, the DNA fragments can be seen as bright orange-colored bands only when exposed to ultraviolet (UV) light. They cannot be seen in normal visible light.

Final Answer: Ethidium bromide and UV light.

Answer: (C)

Q46.

Solution

Concept: A bioreactor is a large-volume vessel used to provide the optimal environment (temperature, pH, substrate, salts, vitamins, oxygen) for the biological conversion of raw materials into specific products by microbes, plant, or animal cells.

Solution: 1. **The Most Common Type:** The stirred-tank bioreactor is the most frequently used type in biotechnology industries. 2. **Design Features:** It is usually cylindrical or has a curved base to facilitate the mixing of the reactor contents. 3. **The Stirrer:** The stirrer facilitates even mixing and oxygen availability throughout the bioreactor. 4. **Sparged Type:** Alternatively, in a sparged stirred-tank bioreactor, sterile air is bubbled through the system. This significantly increases the surface area for oxygen transfer. 5. **Conclusion:** These features ensure that the microorganisms are always in contact with the nutrients and oxygen required for high-yield production.

Final Answer: Ensuring oxygen availability throughout the process.

Answer: (A)

Q47.

Solution

Concept: Adaptations are morphological, physiological, or behavioral attributes of an organism that enable it to survive and reproduce in its specific habitat.

Solution: 1. **Xerophytic Adaptation:** To minimize water loss through transpiration in arid environments, desert plants have evolved specialized structures. 2. **Cuticle:** They possess a thick cuticle on their leaf surfaces. 3. **Stomata:** Their stomata are arranged in deep pits (sunken stomata) to reduce the exposure to wind and heat. 4. **Photosynthetic Pathway:** Many desert plants use a special photosynthetic pathway (CAM) that allows their stomata to remain closed during the day. 5. **Opuntia Example:** In plants like *Opuntia*, leaves are reduced to **spines**, and the photosynthetic function is taken over by flattened, fleshy stems.

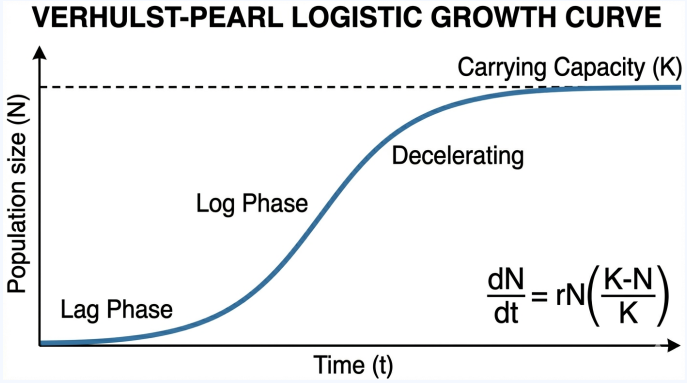
Final Answer: Thick cuticle and sunken stomata.

Answer: (B)

Q48.

Solution

Concept: Logistic growth represents a more realistic model of population expansion where resources are finite, leading to a maximum number of individuals that an environment can support.



Solution: 1. **Carrying Capacity (K):** In nature, a given habitat has enough resources to support a maximum possible number, beyond which no further growth is possible. 2. **Growth Phases:** A population shows an initial lag phase, followed by phases of acceleration and deceleration, and finally an asymptote when the population density reaches the carrying capacity. 3. **The Equation:** This Verhulst-Pearl Logistic Growth is described by the differential equation:

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

4. **Shape of Curve:** Unlike the J-shaped exponential curve, the logistic growth curve is Sigmoid (S-shaped).

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

Answer: (A)

Q49.

Solution

Concept: Primary succession occurs in areas where no living organisms ever existed, such as on bare rock, newly cooled lava, or a newly created pond.

Solution: 1. **Pioneer Species:** The species that invade a bare area are called pioneer species. For primary succession on rocks, these are usually **lichens**. 2. **Soil Formation:** Lichens secrete acids to dissolve rock, helping in weathering and soil formation. 3. **Succession Ladder:** As soil accumulates, small plants like bryophytes take hold, followed by bigger plants, eventually leading to a stable climax community (forest). 4. **Rate:** Primary succession is extremely slow because the formation of fertile soil from bare rock takes hundreds to thousands of years.

Final Answer: Lichens

Answer: (C)

Q50.

Solution

Concept: Eutrophication is the natural aging of a lake by biological enrichment of its water, which can be greatly accelerated by human activities.

Solution: 1. **Nutrient Enrichment:** Run-off from agricultural fields and sewage brings nutrients like nitrogen and phosphorus into the lake. 2. **Algal Bloom:** These nutrients act as fertilizers, causing explosive growth of algae (algal bloom), which consumes dissolved oxygen and blocks sunlight. 3. **Oxygen Depletion:** As algae and other organisms die and decompose, the oxygen levels in the water drop sharply. 4. **Fish Mortality:** The lack of dissolved oxygen leads to the death of fish and other aquatic animals, eventually "suffocating" the lake. 5. **Cultural Eutrophication:** When human pollutants accelerate this process, it is called "Accelerated" or "Cultural" Eutrophication.

Final Answer: Depletion of dissolved oxygen.

Answer: (B)

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	C	2	B	3	A	4	C	5	A
6	A	7	C	8	B	9	A	10	C
11	B	12	B	13	A	14	B	15	C
16	B	17	C	18	B	19	B	20	C
21	C	22	B	23	C	24	A	25	D
26	B	27	A	28	D	29	B	30	C
31	B	32	C	33	A	34	B	35	C
36	A	37	B	38	C	39	D	40	A
41	C	42	B	43	A	44	B	45	C
46	A	47	B	48	A	49	C	50	B