MHT-CET Biology Sample Paper-7

Duration: 90 Minutes **Maximum Marks: 100**

Instructions

- This paper contains a total of **100** Multiple Choice Questions.
- Each correct answer carries **+1 marks**.
- No negative marking for incorrect questions.
- Use of mobile phones, smartwatches, or any electronic gadgets is strictly prohibited.
- No marks will be deducted for questions that are left unattempted.

Q1. Which of the following taxonomic groups includes organisms that are multicellular, heterotrophic, and lack a cell wall?

(A) Monera

(B) Protista

(C) Fungi

(D) Animalia

Q2. In a typical dicot root, the vascular bundles are characterized as:

(A) Conjoint and open

(B) Radial with exarch xylem

(C) Conjoint and closed

(D) Radial with endarch xylem

Q3. The process of guttation in plants occurs primarily through:

(A) Stomata

(B) Lenticels

(C) Hydathodes

(D) Cuticle

Q4. Which hormone is primarily responsible for triggering the "Milk Ejection Reflex" during breastfeeding?

(A) Prolactin

(B) Oxytocin

(C) Estrogen

(D) Progesterone

Q5. In DNA technology, the enzyme used to cut DNA at specific palindromic sequences is:

(A) DNA Ligase

(B) Exonuclease

(C) Restriction Endonuclease

(D) DNA Polymerase

Q6. Identify the incorrect statement regarding the secondary growth in dicot stems:

(A) Phellogen is also known as cork cambium.

(B) Heartwood is peripherally located and light in color.

(C) Sapwood is involved in the conduction of water and minerals.

(D) Lenticels permit the exchange of gases.

Q7. In the human respiratory system, the majority of carbon dioxide is transported as:

(A) Dissolved gas in plasma

(B) Carbamino-hemoglobin

(C) Bicarbonate ions

(D) Carbonic acid

Q8. Which of the following is a "Stop Codon" during the process of translation?

(A) AUG

(B) GUG

(C) UAA

(D) UGG

Q9. The "Montreal Protocol" was specifically designed to:

(A) Reduce greenhouse gas emissions

(B) Protect the ozone layer

(C) Conserve endangered species

(D) Manage hazardous waste

Q10. Match the following parts of the human brain with their functions:

Column I	Column II
(i) Hypothalamus	(a) Coordination of movement
(ii) Cerebellum	(b) Thermoregulation
(iii) Medulla Oblongata	(c) Communication between hemispheres
(iv) Corpus Callosum	(d) Gastric secretions

(A) (i)-(b), (ii)-(a), (iii)-(d), (iv)-(c)

(B) (i)-(a), (ii)-(b), (iii)-(c), (iv)-(d)

(C) (i)-(c), (ii)-(d), (iii)-(a), (iv)-(b)

(D) (i)-(d), (ii)-(c), (iii)-(b), (iv)-(a)

Q11. The primary endosperm nucleus (PEN) in angiosperms is:

(A) Haploid

(B) Diploid

(C) Triploid

(D) Tetraploid

Q12. During the "S-phase" of the cell cycle, which of the following occurs?

(A) Chromosome number is doubled.

(B) DNA content per cell is doubled.

(C) Centriole duplication occurs in the nucleus.

(D) Histone protein synthesis stops.

Q13. In a population, "Natality" refers to:

(A) Number of deaths

(B) Number of births

(C) Number of individuals entering a habitat

(D) Number of individuals leaving a habitat

Q14. The "Lock and Key" model of enzyme action was proposed by:

(A) Koshland

(B) Emil Fischer

(C) Watson and Crick

(D) Robert Brown

Q15. Which of the following is an example of an "Analogous" organ pair?

(A) Wings of a butterfly and wings of a bird

(B) Forelimbs of a human and forelimbs of a horse

(C) Thorns of Bougainvillea and tendrils of Cucurbita

(D) Flippers of a penguin and flippers of a dolphin

Q16. The functional unit of a kidney is the:

(A) Neuron

(B) Nephron

(C) Nephridia

(D) Alveoli

Q17. In the context of "Animal Diversity," which phylum is characterized by the presence of a water vascular system?

(A) Porifera

(B) Coelenterata

(C) Echinodermata

(D) Arthropoda

Q18. The "P-wave" in a standard human ECG represents:

(A) Depolarization of ventricles

(B) Repolarization of atria

(C) Depolarization of atria

(D) Repolarization of ventricles

Q19. Which of the following is a product of "Dark Reaction" (Calvin Cycle) used in the light reaction?

(A) ATP

(B) NADPH

(C) NADP+

(D) Glucose

Q20. "Bt Cotton" is a transgenic plant resistant to:

(A) Fungal pathogens

(B) Viral diseases

(C) Bollworms

(D) Drought conditions

Q21. The term "Ecosystem" was coined by:

(A) Ernst Haeckel

(B) A.G. Tansley

(C) E.P. Odum

(D) Charles Darwin

Q22. Which cell organelle is known as the "Powerhouse of the Cell"?

(A) Golgi Apparatus

(B) Ribosome

(C) Mitochondria

(D) Lysosome

Q23. In human reproduction, "Capacitation" occurs in:

(A) Rete testis

(B) Epididymis

(C) Vas deferens

(D) Female reproductive tract

Q24. Assertion (A): Myelin sheath increases the speed of impulse conduction. Reason (R): In myelinated fibers, the impulse jumps from one Node of Ranvier to the next.

(A) Both A and R are true, and R is the correct explanation of A.

(B) Both A and R are true, but R is not the correct explanation of A.

(C) A is true, but R is false.

(D) A is false, but R is true.

Q25. Which of the following is a non-reducing sugar?

(A) Glucose

(B) Fructose

(C) Lactose

(D) Sucrose

Q26. In Mendel's experiments, the phenotypic ratio of a dihybrid cross in the F2 generation is:

(A) 3:1

(B) 1:2:1

(C) 9:3:3:1

(D) 1:1:1:1

Q27. The volume of air inspired or expired during a normal respiration is called:

(A) Residual Volume

(B) Vital Capacity

(C) Tidal Volume

(D) Inspiratory Capacity

Q28. "Golden Rice" is a variety of rice rich in:

(A) Vitamin C

(B) Vitamin A

(C) Iron

(D) Vitamin D

Q29. The first stable product of CO2 fixation in C4 plants is:

(A) PGA

(B) RuBP

(C) Oxaloacetic acid (OAA)

(D) PEP

Q30. Which of the following is NOT a part of the "Evil Quartet" regarding biodiversity loss?

(A) Habitat loss and fragmentation

(B) Co-extinctions

(C) Alien species invasion

(D) Endemic species conservation

Q31. The primary lymphoid organ in humans where T-lymphocytes mature is:

(A) Spleen

(B) Lymph nodes

(C) Thymus

(D) Peyer's patches

Q32. In "Animal Diversity," the presence of a "Notochord" is the defining feature of:

(A) Non-chordates

(B) Chordates

(C) Hemichordates

(D) Urochordates

Q33. Which of the following enzymes is used in the "PCR" technique for DNA amplification?

(A) RNA Polymerase

(B) Taq Polymerase

(C) DNA Ligase

(D) Reverse Transcriptase

Q34. The process of conversion of atmospheric nitrogen into ammonia by living organisms is:

(A) Nitrification

(B) Denitrification

(C) Biological Nitrogen Fixation

(D) Ammonification

Q35. "K Klinefelter's Syndrome" is characterized by the chromosomal constitution:

(A) 44 + XO

(B) 44 + XXY

(C) 44 + XYY

(D) 45 + XX

Q36. In "Plant Anatomy," the specialized cells that lack a nucleus at maturity are:

(A) Parenchyma cells

(B) Sieve tube elements

(C) Companion cells

(D) Mesophyll cells

Q37. The hormone "Erythropoietin," which stimulates RBC production, is secreted by:

(A) Liver

(B) Bone marrow

(C) Juxtaglomerular cells of kidney

(D) Spleen

Q38. "Syngamy" refers to:

(A) Fusion of similar gametes

(B) Fusion of dissimilar gametes

(C) Fusion of male and female gametes

(D) Fusion of cytoplasm only

Q39. Which of the following is an "In-situ" conservation method?

(A) Botanical Garden

(B) Wildlife Safari Park

(C) Biosphere Reserve

(D) Cryopreservation

Q40. The structural and functional unit of the liver is the:

(A) Hepatocyte

(B) Hepatic lobule

(C) Kupffer cell

(D) Glisson's capsule

Q41. In the "Double Helix" model of DNA, the two strands are held together by:

(A) Ionic bonds

(B) Hydrogen bonds

(C) Covalent bonds

(D) Phosphodiester bonds

Q42. Which of the following is a viral disease?

(A) Typhoid

(B) Pneumonia

(C) Common Cold

(D) Malaria

Q43. The first life forms on Earth were likely:

(A) Chemoheterotrophs

(B) Photoautotrophs

(C) Chemoautotrophs

(D) Eukaryotic cells

Q44. "Pleiotropy" refers to a condition where:

(A) Many genes control one trait.

(B) One gene controls many traits.

(C) One allele is dominant over the other.

(D) Two alleles show equal expression.

Q45. The "Node of Ranvier" is found in:

(A) Muscles

(B) Nephrons

(C) Myelinated axons

(D) Dendrites

Q46. "Floral formula" of the family Solanaceae includes:

(A) Zygomorphic flowers

(B) Epipetalous stamens

(C) Inferior ovary

(D) Monadelphous stamens

Q47. The enzyme "Pepsin" converts:

(A) Fats into fatty acids

(B) Proteins into proteoses and peptones

(C) Starch into maltose

(D) Nucleotides into nucleosides

Q48. In a normal human sperm, how many autosomes are present?

(A) 21

(B) 22

(C) 23

(D) 44

Q49. "Adaptive Radiation" is best exemplified by:

(A) Darwin’s Finches

(B) Peppered Moth

(C) Human Evolution

(D) Marsupials of Australia

Q50. The "Sacculus" and "Utriculus" are parts of the:

(A) Middle ear

(B) Cochlea

(C) Vestibular apparatus

(D) External ear

Q51. Which of the following is a gaseous plant hormone?

(A) Auxin

(B) Ethylene

(C) Abscisic Acid

(D) Cytokinin

Q52. "Down's Syndrome" is caused by the trisomy of chromosome:

(A) 13

(B) 18

(C) 21

(D) 23

Q53. The "Filiform Apparatus" is a characteristic feature of:

(A) Egg cell

(B) Synergids

(C) Antipodal cells

(D) Zygote

Q54. Which of the following is a "Secondary Pollutant"?

(A) CO

(B) SO2

(C) O3 (Ozone)

(D) CO2

Q55. In "Cell Structure," the "Fluid Mosaic Model" was proposed by:

(A) Singer and Nicolson

(B) Schleiden and Schwann

(C) Camillo Golgi

(D) Antonie van Leeuwenhoek

Q56. The "Loop of Henle" is primarily associated with:

(A) Filtration

(B) Secretion

(C) Concentration of urine

(D) Storage of urine

Q57. Which of the following is a "Restriction Site" for EcoRI?

(A) AGCT

(B) GAATTC

(C) GGCC

(D) CCCGGG

Q58. "Humoral Immunity" is mediated by:

(A) T-lymphocytes

(B) B-lymphocytes

(C) Macrophages

(D) Neutrophils

Q59. The hormone secreted by the "Corpus Luteum" to maintain pregnancy is:

(A) Estrogen

(B) LH

(C) Progesterone

(D) FSH

Q60. Which part of the "Small Intestine" is highly coiled?

(A) Duodenum

(B) Jejunum

(C) Ileum

(D) Caecum

Q61. "Incomplete Dominance" is seen in:

(A) Pea plant

(B) Snap Dragon (Antirrhinum sp.)

(C) Human blood groups

(D) Fruit fly

Q62. The process of "Transpiration" helps in:

(A) Ascent of sap

(B) Cooling of leaves

(C) Mineral absorption

(D) All of the above

Q63. Which "Immunoglobulin" is found in colostrum?

(A) IgG

(B) IgM

(C) IgA

(D) IgE

Q64. In "Animal Tissue," the type of epithelium found in the lining of blood vessels is:

(A) Columnar

(B) Cuboidal

(C) Squamous

(D) Ciliated

Q65. The "Pyramid of Energy" in any ecosystem is:

(A) Always upright

(B) Always inverted

(C) Spindle-shaped

(D) Urn-shaped

Q66. The "Sino-Atrial Node" (SAN) is located in the:

(A) Left atrium

(B) Right atrium

(C) Left ventricle

(D) Right ventricle

Q67. "DNA Fingerprinting" relies on:

(A) Single nucleotide polymorphisms (SNPs)

(B) Satellite DNA (VNTRs)

(C) Coding sequences

(D) Intron removal

Q68. Which of the following is a "Polyploid" crop?

(A) Wheat

(B) Rice

(C) Pea

(D) Maize

Q69. The "U-shaped" bone present at the base of the buccal cavity is:

(A) Mandible

(B) Hyoid

(C) Maxilla

(D) Ethmoid

Q70. Match Column I (Chemical Name) with Column II (Vitamin Name):

Column I	Column II
(i) Thiamine	(a) Vitamin C
(ii) Ascorbic acid	(b) Vitamin B1
(iii) Retinol	(c) Vitamin D
(iv) Calciferol	(d) Vitamin A

(A) (i)-(b), (ii)-(a), (iii)-(d), (iv)-(c)

(B) (i)-(a), (ii)-(b), (iii)-(c), (iv)-(d)

(C) (i)-(c), (ii)-(d), (iii)-(a), (iv)-(b)

(D) (i)-(d), (ii)-(c), (iii)-(b), (iv)-(a)

Q71. "Amniocentesis" is used to determine:

(A) Heart rate of the fetus

(B) Chromosomal abnormalities

(C) Blood group of the mother

(D) Capacity of the lungs

Q72. The "Functional Megaspore" in an angiosperm develops into:

(A) Pollen grain

(B) Embryo sac

(C) Nucellus

(D) Ovule

Q73. Which of the following is a "C4 Plant"?

(A) Wheat

(B) Rice

(C) Maize

(D) Potato

Q74. The "Central Dogma" of molecular biology is:

(A) DNA → Protein → RNA

(B) DNA → RNA → Protein

(C) RNA → DNA → Protein

(D) Protein → RNA → DNA

Q75. "Mycorrhiza" is a symbiotic association between:

(A) Algae and Fungi

(B) Fungi and Roots of higher plants

(C) Bacteria and Roots of legumes

(D) Algae and Roots of higher plants

Q76. The valve present between the right atrium and right ventricle is the:

(A) Mitral valve

(B) Bicuspid valve

(C) Tricuspid valve

(D) Semilunar valve

Q77. "RNA Interference" (RNAi) is used to make plants resistant to:

(A) Bacteria

(B) Fungi

(C) Nematodes

(D) Viruses

Q78. The "Corpus Callosum" connects the:

(A) Two lobes of the cerebellum

(B) Two cerebral hemispheres

(C) Cerebrum and Cerebellum

(D) Pons and Medulla

Q79. Which "Cell Junction" helps in stopping substance leakage across a tissue?

(A) Adhering junction

(B) Gap junction

(C) Tight junction

(D) Plasmodesmata

Q80. In human reproduction, the "Zygote" undergoes cleavage to form a solid ball of cells called:

(A) Blastocyst

(B) Gastrula

(C) Morula

(D) Trophoblast

Q81. The "Genetic Map" was first constructed by:

(A) T.H. Morgan

(B) Alfred Sturtevant

(C) Gregor Mendel

(D) Hugo de Vries

Q82. Which of the following is a "Bilateral" symmetrical organism?

(A) Sponge

(B) Jellyfish

(C) Earthworm

(D) Adult Starfish

Q83. The process of "Photolysis" of water occurs in:

(A) Stroma

(B) Grana (Thylakoid lumen)

(C) Inner mitochondrial membrane

(D) Cytoplasm

Q84. "Ozone Hole" is most prominent over:

(A) Arctic region

(B) Antarctic region

(C) Equator

(D) Tropical region

Q85. Which hormone is known as the "Emergency Hormone"?

(A) Thyroxine

(B) Adrenaline

(C) Insulin

(D) Glucagon

Q86. "Basal Metabolic Rate" (BMR) is primarily regulated by:

(A) Insulin

(B) Thyroxine

(C) Cortisol

(D) Growth Hormone

Q87. The "Acrosome" of the sperm is derived from:

(A) Nucleus

(B) Mitochondria

(C) Golgi body

(D) Ribosomes

Q88. Which of the following is a "Monoploid" (n) structure in a flowering plant?

(A) Zygote

(B) Endosperm

(C) Pollen grain

(D) Nucellus

Q89. "Ecological Succession" on a bare rock is called:

(A) Hydrarch

(B) Xerarch

(C) Mesarch

(D) Halosere

Q90. The enzyme "Enterokinase" activates:

(A) Pepsinogen

(B) Trypsinogen

(C) Chymotrypsinogen

(D) Procarboxypeptidase

Q91. Which of the following are examples of passive immunity?

(A) Colostrum and Injection of antitoxin

(B) Vaccination and Natural infection

(C) Vaccination and Colostrum

(D) Natural infection and Injection of antitoxin

Q92. "Karyotype" refers to:

(A) Study of nucleus

(B) Arrangement of chromosomes in a cell

(C) Study of cell division

(D) Study of mutations

Q93. The "Vital Capacity" of the human lung is:

(A) TV + IRV

(B) TV + ERV

(C) TV + IRV + ERV

(D) IRV + ERV

Q94. "Turner's Syndrome" individuals are:

(A) Sterile males

(B) Sterile females

(C) Fertile males

(D) Fertile females

Q95. The "Primary Consumer" in a grazing food chain is usually a:

(A) Herbivore

(B) Carnivore

(C) Omnivore

(D) Decomposer

Q96. Which of the following is NOT a "Living Fossil"?

(A) Limulus

(B) Sphenodon

(C) Archaeopteryx

(D) Latimeria

Q97. The "Pneumotaxic Center" in the human brain is located in:

(A) Cerebrum

(B) Cerebellum

(C) Pons Varolii

(D) Medulla Oblongata

Q98. In "Plant Anatomy," the "Bulliform Cells" are found in:

(A) Dicot leaves

(B) Monocot leaves

(C) Dicot stems

(D) Monocot stems

Q99. "GIFT" in assisted reproductive technology stands for:

(A) Gamete Intra-Fallopian Transfer

(B) Gamete In-Vitro Fertilization Technique

(C) Germcell Internal Fusion Transfer

(D) Genetic Intake Fallopian Technique

Q100. Which "Nitrogenous Base" is found in RNA but not in DNA?

(A) Adenine

(B) Guanine

(C) Cytosine

(D) Uracil

Detailed Solutions

Q1.

Solution

Concept:

Taxonomy classifies organisms based on shared characteristics. The Five Kingdom classification by Whittaker defines Kingdom Animalia through specific cellular and nutritional traits.

Solution:

(a) Multicellularity distinguishes animals from unicellular Monera and many Protista.

(b) Heterotrophic nutrition means they rely on others for food, unlike plants.

(c) The absence of a cell wall is a definitive trait of Animalia; Fungi have chitinous walls.

(d) Animalia consists of eukaryotic, multicellular, heterotrophic organisms lacking cell walls.

Final Answer: The group is Animalia.

Answer: (D)

Go Back to Question 1

Q2.

Solution

Concept:

Root anatomy in dicots shows specific tissue arrangements. Vascular bundles are organized based on the relative position of protoxylem and the arrangement of xylem and phloem.

Solution:

(a) In roots, xylem and phloem are arranged on different radii, termed radial.

(b) Exarch xylem means protoxylem is toward the periphery and metaxylem is toward the center.

(c) This is characteristic of all roots (dicot and monocot).

(d) Stems, by contrast, usually have conjoint bundles with endarch xylem.

Final Answer: Radial with exarch xylem.

Answer: (B)

Go Back to Question 2

Q3.

Solution

Concept:

Guttation is the loss of water in liquid form from the margins of leaves, usually occurring at night or early morning under high humidity and root pressure.

Solution:

(a) Stomata are primarily involved in gaseous exchange and transpiration (water vapor).

(b) Lenticels are small pores in the bark of woody stems.

(c) Hydathodes are specialized secretory tissues found at leaf tips or margins.

(d) Liquid droplets are forced out through hydathodes due to hydrostatic pressure.

Final Answer: Hydathodes.

Answer: (C)

Q4.

Solution

Concept:

Lactation involves two main hormones. Prolactin stimulates milk production, while a different hormone facilitates the release of that milk.

Solution:

(a) Prolactin is responsible for the synthesis of milk in the mammary glands.

(b) Oxytocin is known as the birth hormone and the milk-ejection hormone.

(c) It causes contraction of myoepithelial cells surrounding the alveoli.

(d) This reflex is triggered by the suckling of the infant.

Final Answer: Oxytocin.

Answer: (B)

Go Back to Question 4

Q5.

Solution

Concept:

Biotechnology relies on molecular tools to manipulate DNA. Enzymes act as chemical scissors or glue to modify genetic sequences.

Solution:

(a) Restriction endonucleases recognize specific base sequences called palindromes.

(b) They cut the DNA backbone at precise locations within these sequences.

(c) DNA ligase is used to join DNA fragments, not cut them.

(d) Exonucleases remove nucleotides from the ends of DNA, not internal specific sites.

Final Answer: Restriction Endonuclease.

Answer: (C)

Go Back to Question 5

Q6.

Solution

Concept:

Secondary growth in dicots leads to wood formation. Heartwood and sapwood are the two regions of secondary xylem with distinct functions.

Solution:

(a) Heartwood is the central, older part of the secondary xylem.

(b) It is dark in color due to the deposition of organic compounds like tannins and resins.

(c) Sapwood is the lighter, peripheral part involved in water conduction.

(d) Heartwood provides mechanical support but does not conduct water.

Final Answer: Heartwood is peripherally located and light in color.

Answer: (B)

Go Back to Question 6

Q7.

Solution

Concept:

Respiratory gases are transported in the blood through various chemical forms. CO2 transport is more complex than oxygen transport.

Solution:

(a) About 7

(b) About 20-25

(c) The largest portion, roughly 70

(d) This conversion is catalyzed by the enzyme carbonic anhydrase in RBCs.

Final Answer: Bicarbonate ions.

Answer: (C)

Go Back to Question 7

Q8.

Solution

Concept:

The genetic code consists of 64 codons. While most code for amino acids, three codons signal the end of protein synthesis.

Solution:

(a) AUG is the start codon (methionine).

(b) UAA, UAG, and UGA are the three stop (nonsense) codons.

(c) These codons do not code for any amino acid and cause the ribosome to detach.

(d) UGG specifically codes for Tryptophan.

Final Answer: UAA.

Answer: (C)

Go Back to Question 8

Q9.

Solution

Concept:

International environmental agreements address specific ecological threats. The Montreal Protocol is one of the most successful global treaties.

Solution:

(a) The protocol was signed in 1987 to control the emission of ODS.

(b) ODS stands for Ozone Depleting Substances like CFCs.

(c) Its primary goal is the protection of the stratospheric ozone layer.

(d) Greenhouse gas reduction is primarily the focus of the Kyoto Protocol.

Final Answer: Protect the ozone layer.

Answer: (B)

Go Back to Question 9

Q10.

Solution

Concept:

The human brain is divided into regions with specialized physiological and cognitive roles, including homeostasis, motor control, and inter-hemispheric signaling.

Solution:

(a) Hypothalamus regulates body temperature (thermoregulation).

(b) Cerebellum maintains balance and coordinates voluntary movements.

(c) Medulla oblongata controls involuntary functions like gastric secretions.

(d) Corpus callosum is the tract of nerve fibers connecting the two hemispheres.

Final Answer: (i)-(b), (ii)-(a), (iii)-(d), (iv)-(c).

Answer: (A)

Go Back to Question 10

Q11.

Solution

Concept:
Double fertilization is a unique process in angiosperms where two sperm cells enter the embryo sac. One fuses with the egg, and the other fuses with the polar nuclei.
Solution:

(a) The fusion of one male gamete with two polar nuclei (or a secondary nucleus) is called triple fusion.

(b) This results in the formation of the Primary Endosperm Nucleus (PEN).

(c) Since it involves the fusion of three haploid nuclei ($n + n + n$), the PEN is triploid ($3n$).

(d) This triploid tissue eventually develops into the endosperm, which provides nourishment to the developing embryo.

Final Answer: The PEN is Triploid.

Answer: (C)
Go Back to Question 11

Q12.

Solution

Concept:
The cell cycle consists of Interphase and M-phase. Interphase is further divided into G1, S, and G2 phases, each characterized by specific molecular events.
Solution:

(a) The S-phase stands for the Synthesis phase of the cell cycle.

(b) During this interval, DNA replication occurs, meaning the amount of DNA per cell doubles (from $2C$ to $4C$).

(c) Importantly, the chromosome number remains the same; only the genetic material within them is copied.

(d) In animal cells, the centriole also duplicates in the cytoplasm during this specific phase.

Final Answer: DNA content per cell is doubled.

Answer: (B)
Go Back to Question 12

Q13.

Solution

Concept:
Population ecology uses specific terms to describe the dynamics of a group. Four main processes determine whether a population increases or decreases in size.
Solution:

(a) Natality refers to the birth rate, which adds new individuals to the population.

(b) Mortality refers to the death rate, which removes individuals.

(c) Immigration is the inward movement of individuals, while emigration is the outward movement.

(d) Therefore, natality is the fundamental parameter representing the number of births during a given period.

Final Answer: Number of births.

Answer: (B)
Go Back to Question 13

Q14.

Solution

Concept:
Enzymes are highly specific biological catalysts. Various models have been proposed to explain how an enzyme binds to its substrate to facilitate a reaction.
Solution:

(a) The Lock and Key model suggests the enzyme and substrate have rigid, complementary shapes.

(b) This theory was proposed by Emil Fischer in 1894.

(c) It posits that only a specific substrate (the key) can fit into the active site (the lock).

(d) This was later refined by the Induced Fit model proposed by Daniel Koshland.

Final Answer: Emil Fischer.

Answer: (B)
Go Back to Question 14

Q15.

Solution

Concept:
Evolutionary biology distinguishes between organs based on their origin and function. Analogous organs result from convergent evolution.
Solution:

(a) Analogous organs have different embryonic origins and internal structures but perform similar functions.

(b) Wings of a butterfly (composed of chitin) and wings of a bird (composed of bone and feathers) are structurally different.

(c) Both structures are used for the common purpose of flight.

(d) Homologous organs, conversely, share a common origin but may have different functions, like human and horse forelimbs.

Final Answer: Wings of a butterfly and wings of a bird.

Answer: (A)
Go Back to Question 15

Q16.

Solution

Concept:
Organs are composed of microscopic units that perform the actual physiological work. In the excretory system, this unit manages blood filtration.
Solution:

(a) The kidney contains about one million microscopic structures called nephrons.

(b) A nephron consists of a renal corpuscle and a renal tubule.

(c) It performs ultrafiltration, selective reabsorption, and tubular secretion.

(d) Neurons are the units of the nervous system, while alveoli are the units of the respiratory system.

Final Answer: Nephron.

Answer: (B)
Go Back to Question 16

Q17.

Solution

Concept:

Phylum-level classification in the animal kingdom is based on unique body plans. One particular marine phylum uses a hydraulic system for movement.

Solution:

(a) Echinodermata includes organisms like starfish and sea urchins.

(b) Their most distinctive feature is the water vascular system (amblacral system).

(c) This system consists of canals filled with seawater used for locomotion, food capture, and respiration.

(d) Sponges (Porifera) have a water transport or canal system, which is different in structure.

Final Answer: Echinodermata.

Answer: (C)

Go Back to Question 17

Q18.

Solution

Concept:

An Electrocardiogram (ECG) records the electrical activity of the heart over time. Each wave corresponds to the electrical state of a specific heart chamber.

Solution:

(a) The standard ECG consists of a P-wave, a QRS complex, and a T-wave.

(b) The P-wave is a small upward deflection representing the electrical excitation of the atria.

(c) This excitation leads to atrial contraction (depolarization).

(d) The QRS complex represents ventricular depolarization, and the T-wave represents ventricular repolarization (recovery).

Final Answer: Depolarization of atria.

Answer: (C)

Go Back to Question 18

Q19.

Solution

Concept:

Photosynthesis involves two interconnected stages: the light-dependent reactions and the light-independent (dark) reactions or Calvin Cycle.

Solution:

(a) Light reactions produce ATP and NADPH for use in the dark reactions.

(b) Dark reactions use these molecules to fix CO2 into glucose.

(c) During the Calvin Cycle, NADPH is oxidized back to $NADP^+$ and ATP is hydrolyzed to ADP.

(d) These depleted molecules ($NADP^+$ and ADP) are then recycled back to the light reaction to be recharged.

Final Answer: $NADP^+$.

Answer: (C)

Go Back to Question 19

Q20.

Solution

Concept:

Genetically Modified (GM) crops are engineered to possess traits that help them survive environmental or biological threats without chemical assistance.

Solution:

(a) Bt cotton contains genes from the soil bacterium *Bacillus thuringiensis*.

(b) These genes code for protoxins that are lethal to certain insect pests.

(c) Specifically, the toxins target lepidopterans like bollworms.

(d) When the larvae ingest the plant tissue, the alkaline pH of their gut activates the toxin, leading to their death.

Final Answer: Bollworms.

Answer: (C)

Go Back to Question 20

Q21.

Solution

Concept:

The study of interactions between living organisms and their physical environment is fundamental to ecology. Different scientists have contributed to the terminology used to describe these systems.

Solution:

(a) Ernst Haeckel originally coined the term Ecology to describe the study of the relationship between organisms and their environment.

(b) A.G. Tansley, in 1935, introduced the specific term Ecosystem.

(c) He defined it as a functional unit of nature where living organisms interact among themselves and with the surrounding physical environment.

(d) E.P. Odum is often regarded as the father of modern ecology, but he did not coin the term itself.

Final Answer: A.G. Tansley.

Answer: (B)

Go Back to Question 21

Q22.

Solution

Concept:

Eukaryotic cells contain specialized organelles that perform distinct metabolic tasks. Energy production is localized within a double-membranous structure.

Solution:

(a) Mitochondria are the sites of aerobic respiration within the cell.

(b) They produce cellular energy in the form of Adenosine Triphosphate (ATP) through the electron transport chain.

(c) Because of this vital role in energy synthesis, they are nicknamed the powerhouses of the cell.

(d) Other organelles like Ribosomes are for protein synthesis, while Lysosomes handle waste digestion and are called suicidal bags.

Final Answer: Mitochondria.

Answer: (C)

Go Back to Question 22

Q23.

Solution

Concept:

The process of fertilization in humans requires the sperm to undergo final physiological changes to become capable of penetrating the egg's protective layers.

Solution:

(a) Capacitation refers to the functional maturation of the spermatozoon.

(b) While sperm are produced in the testes and stored in the epididymis, they are not immediately fertile upon ejaculation.

(c) This process occurs only after the sperm enters the female reproductive tract (uterus and fallopian tubes).

(d) It involves the removal of membrane proteins and cholesterol, allowing the acrosome reaction to occur later.

Final Answer: Female reproductive tract.

Answer: (D)

Go Back to Question 23

Q24.

Solution

Concept:

Nerve impulses are electrical signals that travel along axons. The presence of an insulating layer significantly alters the mode and speed of this conduction.

Solution:

(a) The myelin sheath, formed by Schwann cells, acts as an electrical insulator around the axon.

(b) It is interrupted at regular intervals by gaps known as the Nodes of Ranvier.

(c) In myelinated fibers, the action potential jumps from one node to another rather than flowing continuously.

(d) This process is called saltatory conduction, which is much faster than the continuous conduction seen in unmyelinated fibers.

Final Answer: Both A and R are true, and R is the correct explanation.

Answer: (A)

Go Back to Question 24

Q25.

Solution

Concept:

Carbohydrates are classified based on their ability to reduce copper or silver ions. This depends on the presence of a free aldehyde or ketone group.

Solution:

(a) Reducing sugars like glucose and fructose have free reactive groups.

(b) Disaccharides like lactose and maltose also have a free hemiacetal group and are reducing.

(c) Sucrose is formed by a bond between the reducing groups of glucose and fructose.

(d) Since both functional groups are involved in the glycosidic bond, sucrose lacks a free reducing group and is a non-reducing sugar.

Final Answer: Sucrose.

Answer: (D)

Go Back to Question 25

Q26.

Solution

Concept:

Mendelian genetics studies the inheritance of traits. A dihybrid cross involves the simultaneous inheritance of two pairs of contrasting characteristics.

Solution:

(a) Mendel crossed pea plants differing in two traits, such as seed shape (Round/Wrinkled) and color (Yellow/Green).

(b) The F1 generation shows only the dominant traits.

(c) In the F2 generation, the traits assort independently to produce four different phenotypes.

(d) The resulting ratio is 9 (Both dominant) : 3 (One dominant, one recessive) : 3 (Other dominant, other recessive) : 1 (Both recessive).

Final Answer: 9:3:3:1.

Answer: (C)

Go Back to Question 26

Q27.

Solution

Concept:

Pulmonary volumes are specific measurements of air moving in and out of the lungs. These values help in assessing respiratory health.

Solution:

(a) The volume of air inspired or expired during a normal, quiet breath is very small.

(b) This is defined as the Tidal Volume (TV), which is approximately 500 mL in a healthy adult.

(c) Vital Capacity is the maximum air one can breathe out after a forced inspiration.

(d) Residual Volume is the air remaining in the lungs even after a forceful expiration.

Final Answer: Tidal Volume.

Answer: (C)

Go Back to Question 27

Q28.

Solution

Concept:

Biofortification is a method of improving the nutritional quality of food crops through genetic engineering or selective breeding.

Solution:

(a) Golden Rice was developed to address Vitamin A deficiency (VAD) in populations dependent on rice.

(b) It is engineered to biosynthesize beta-carotene, a precursor of Vitamin A, in the edible parts of the grain.

(c) The presence of beta-carotene gives the rice its characteristic golden-yellow color.

(d) This serves as a primary example of using biotechnology to solve public health issues related to malnutrition.

Final Answer: Vitamin A.

Answer: (B)

Go Back to Question 28

Q29.

Solution

Concept:
Plants have evolved different pathways for carbon fixation depending on their environment. C4 plants possess a specialized anatomy to minimize photorespiration.
Solution:

(a) In C3 plants, the first product is a 3-carbon compound (PGA).

(b) In C4 plants (like maize and sorghum), the initial CO2 acceptor is Phosphoenolpyruvate (PEP).

(c) The reaction is catalyzed by PEP carboxylase in the mesophyll cells.

(d) This results in the formation of Oxaloacetic acid (OAA), which is a 4-carbon organic acid.

Final Answer: Oxaloacetic acid (OAA).

Answer: (C)
Go Back to Question 29

Q30.

Solution

Concept:
Biodiversity loss is driven by several major factors often grouped together. Understanding these helps in prioritizing conservation efforts.
Solution:

(a) The Evil Quartet refers to the four major causes of species extinction.

(b) These include Habitat loss and fragmentation, Over-exploitation, Alien species invasion, and Co-extinctions.

(c) Endemic species conservation is a positive management strategy, not a cause of loss.

(d) Habitat loss is considered the single most important cause driving animals and plants to extinction.

Final Answer: Endemic species conservation.

Answer: (D)
Go Back to Question 30

Q31.

Solution

Concept:

The immune system consists of various organs where lymphocytes are produced and matured. These are classified into primary and secondary lymphoid organs based on their role.

Solution:

(a) Primary lymphoid organs are sites where immature lymphocytes differentiate into antigen-sensitive cells.

(b) These include the bone marrow and the thymus.

(c) While all lymphocytes are produced in the bone marrow, T-lymphocytes migrate to the thymus to undergo maturation and selection.

(d) Spleen and lymph nodes are secondary lymphoid organs where mature lymphocytes interact with antigens to trigger an immune response.

Final Answer: Thymus.

Answer: (C)

Go Back to Question 31

Q32.

Solution

Concept:

Animal classification is based on fundamental features like the presence of a supporting rod-like structure at some stage of the life cycle.

Solution:

(a) The phylum Chordata is defined by three fundamental characteristics: a dorsal hollow nerve cord, paired pharyngeal gill slits, and a notochord.

(b) The notochord is a flexible rod situated between the digestive tract and the nerve cord.

(c) In some chordates, it persists throughout life, while in vertebrates, it is replaced by the vertebral column.

(d) Non-chordates lack this structure entirely.

Final Answer: Chordates.

Answer: (B)

Go Back to Question 32

Q33.

Solution

Concept:
Polymerase Chain Reaction (PCR) is a technique used to amplify a specific DNA segment. It requires a heat-stable enzyme that can survive high temperatures.
Solution:

(a) The PCR process involves repeated cycles of denaturation, annealing, and extension.

(b) Denaturation occurs at very high temperatures (around 94 degrees Celsius) which would destroy normal DNA polymerases.

(c) Taq Polymerase is isolated from the bacterium *Thermus aquaticus*, which lives in hot springs.

(d) This enzyme remains functional at high temperatures, allowing it to extend primers and synthesize new DNA strands.

Final Answer: Taq Polymerase.

Answer: (B)
Go Back to Question 33

Q34.

Solution

Concept:
Nitrogen is essential for life but is unavailable to most organisms in its atmospheric form. The nitrogen cycle describes its conversion into usable compounds.
Solution:

(a) Biological Nitrogen Fixation (BNF) is the process where specific prokaryotes convert N_2 gas into ammonia (NH_3).

(b) This is carried out by free-living bacteria like Azotobacter or symbiotic bacteria like Rhizobium.

(c) Nitrification is the conversion of ammonia into nitrates.

(d) Denitrification is the opposite process where nitrates are converted back into atmospheric nitrogen.

Final Answer: Biological Nitrogen Fixation.

Answer: (C)
Go Back to Question 34

Q35.

Solution

Concept:

Chromosomal disorders arise due to the gain or loss of one or more chromosomes. Klinefelter's syndrome is a type of sex-chromosomal aneuploidy.

Solution:

(a) This condition is caused by the presence of an additional X chromosome in a male.

(b) The typical chromosomal constitution of these individuals is 44 autosomes plus XXY.

(c) Affected individuals are generally sterile males with feminized physical features, such as breast development (gynecomastia).

(d) Turner's syndrome, by contrast, is characterized by the absence of one X chromosome ($44 + XO$).

Final Answer: 44 + XXY.

Answer: (B)

Go Back to Question 35

Q36.

Solution

Concept:

Plant tissues consist of various cells that adapt to their roles. Some cells lose their organelles to become more efficient in transport.

Solution:

(a) Sieve tube elements are part of the phloem tissue responsible for the translocation of food.

(b) Mature sieve tube elements possess a peripheral layer of cytoplasm and a large vacuole but lack a nucleus.

(c) Their functions are controlled by the nucleus of the adjacent companion cells.

(d) This structural adaptation allows for an unobstructed flow of nutrients through the tubes.

Final Answer: Sieve tube elements.

Answer: (B)

Go Back to Question 36

Q37.

Solution

Concept:

The production of Red Blood Cells (RBCs) is regulated by hormonal feedback mechanisms to ensure oxygen demands of the body are met.

Solution:

(a) Erythropoiesis is the process of RBC formation.

(b) When oxygen levels in the blood drop, the kidneys detect this change.

(c) The juxtaglomerular cells of the kidney secrete the peptide hormone erythropoietin.

(d) This hormone travels to the bone marrow, where it stimulates the production of new erythrocytes.

Final Answer: Juxtaglomerular cells of kidney.

Answer: (C)

Go Back to Question 37

Q38.

Solution

Concept:

Sexual reproduction involves the union of genetic material from two parents. This terminology describes different stages and types of this union.

Solution:

(a) Syngamy is defined as the complete and permanent fusion of two haploid gametes.

(b) This process results in the formation of a diploid zygote ($2n$).

(c) While plasmogamy refers only to the fusion of cytoplasm, syngamy emphasizes the total fusion of the gametes.

(d) It is the fundamental event in sexual reproduction that restores the diploid number of chromosomes.

Final Answer: Fusion of male and female gametes.

Answer: (C)

Go Back to Question 38

Q39.

Solution

Concept:

Biodiversity conservation is split into two strategies. One involves protecting the species in its natural home, while the other involves moving it to a specialized facility.

Solution:

(a) In-situ conservation means "on-site" conservation of genetic resources in natural populations.

(b) Biosphere reserves, national parks, and wildlife sanctuaries are prime examples of this approach.

(c) Ex-situ conservation includes botanical gardens and cryopreservation, where organisms are kept outside their natural habitats.

(d) Biosphere reserves allow for the conservation of entire ecosystems.

Final Answer: Biosphere Reserve.

Answer: (C)

Go Back to Question 39

Q40.

Solution

Concept:

The liver is the largest gland in the body and performs hundreds of vital functions. Its internal architecture is organized into repeating units.

Solution:

(a) The liver is composed of many polyhedral units known as hepatic lobules.

(b) Each lobule is the structural and functional unit of the organ.

(c) Hepatocytes are the individual liver cells, but they are organized specifically within the lobules.

(d) Each lobule is covered by a thin connective tissue sheath called the Glisson's capsule.

Final Answer: Hepatic lobule.

Answer: (B)

Go Back to Question 40

Q41.

Solution

Concept:

The structure of DNA is defined by the arrangement of nucleotides into a double helix. The stability and specific pairing of these strands are maintained by chemical attractions between nitrogenous bases.

Solution:

(a) The DNA molecule consists of two antiparallel polynucleotide chains.

(b) Adenine pairs with Thymine, while Guanine pairs with Cytosine.

(c) These pairs are held together by hydrogen bonds, which are weak attractions but strong in large numbers.

(d) Specifically, two hydrogen bonds form between A and T, while three hydrogen bonds form between G and C.

Final Answer: Hydrogen bonds.

Answer: (B)

Go Back to Question 41

Q42.

Solution

Concept:

Human diseases are categorized based on the type of pathogen that causes them. Pathogens include bacteria, viruses, fungi, protozoans, and helminthes.

Solution:

(a) Typhoid and Pneumonia are caused by bacteria (Salmonella and Streptococcus respectively).

(b) Malaria is caused by a protozoan parasite called Plasmodium.

(c) The Common Cold is caused by a group of viruses, most commonly the Rhinoviruses.

(d) Viruses are submicroscopic infectious agents that replicate only inside the living cells of an organism.

Final Answer: Common Cold.

Answer: (C)

Go Back to Question 42

Q43.

Solution

Concept:
The origin of life on Earth involved a transition from inorganic molecules to complex organic systems. The earliest organisms had to survive in a reducing atmosphere without free oxygen.
Solution:

(a) The first living cells appeared in the primordial soup of the early oceans.

(b) Because there was no free oxygen, these organisms were anaerobic.

(c) They likely obtained energy by breaking down organic molecules available in their environment.

(d) Therefore, they are classified as chemoheterotrophs, meaning they used chemical energy and external organic sources for food.

Final Answer: Chemoheterotrophs.

Answer: (A)
Go Back to Question 43

Q44.

Solution

Concept:
Genetic expression usually follows the rule of one gene influencing one trait. However, some genes have a more widespread impact on the phenotype of an organism.
Solution:

(a) Pleiotropy occurs when a single gene mutation affects multiple, seemingly unrelated physiological or morphological traits.

(b) A classic example is Phenylketonuria (PKU) in humans.

(c) A mutation in one gene results in mental retardation as well as reduced hair and skin pigmentation.

(d) This differs from polygenic inheritance, where many genes control a single trait like human skin color.

Final Answer: One gene controls many traits.

Answer: (B)
Go Back to Question 44

Q45.

Solution

Concept:

Neurons are the structural units of the nervous system. The speed of nerve impulse transmission is enhanced by specific structural adaptations of the axon.

Solution:

(a) Most long axons in the vertebrate nervous system are covered by a fatty myelin sheath.

(b) This sheath is not continuous but is interrupted at regular intervals.

(c) These microscopic gaps are known as the Nodes of Ranvier.

(d) They allow the nerve impulse to jump from node to node, which is a hallmark of myelinated axons.

Final Answer: Myelinated axons.

Answer: (C)

Go Back to Question 45

Q46.

Solution

Concept:

Floral formulas use symbols to represent the different whorls and characteristics of a flower. The Solanaceae family (potato family) has a very distinct set of traits.

Solution:

(a) Flowers in Solanaceae are typically actinomorphic (radial symmetry), not zygomorphic.

(b) The stamens are epipetalous, meaning they are attached to the petals.

(c) The ovary is superior and usually bicarpellary with a swollen placenta.

(d) Monadelphous stamens (fused into one bundle) are a characteristic of the Malvaceae family instead.

Final Answer: Epipetalous stamens.

Answer: (B)

Go Back to Question 46

Q47.

Solution

Concept:

Digestion involves the breakdown of complex macromolecules into simpler forms using specific enzymes secreted by different parts of the alimentary canal.

Solution:

(a) Pepsin is a proteolytic enzyme secreted by the gastric glands of the stomach.

(b) It is secreted in its inactive form, pepsinogen, and activated by hydrochloric acid.

(c) Its primary function is the digestion of proteins.

(d) It breaks down long protein chains into smaller fragments known as proteoses and peptones.

Final Answer: Proteins into proteoses and peptones.

Answer: (B)

Go Back to Question 47

Q48.

Solution

Concept:

Human cells are generally diploid, but gametes are haploid. The total number of chromosomes is divided into autosomes and sex chromosomes.

Solution:

(a) A somatic human cell has 46 chromosomes (23 pairs).

(b) Of these, 44 are autosomes and 2 are sex chromosomes (XX or XY).

(c) During meiosis, the number is halved to produce gametes.

(d) A normal human sperm contains 23 chromosomes in total: 22 autosomes and 1 sex chromosome (either X or Y).

Final Answer: 22.

Answer: (B)

Go Back to Question 48

Q49.

Solution

Concept:

Adaptive radiation is an evolutionary process where an ancestral species evolves into many different forms to adapt to diverse environmental niches.

Solution:

(a) This phenomenon occurs when a lineage enters a new area with many unoccupied ecological opportunities.

(b) Darwin observed this in the Galapagos Islands with finches that developed different beak shapes for different food sources.

(c) Similarly, Australian marsupials evolved from a single ancestor into diverse forms like kangaroos and koalas.

(d) The peppered moth is an example of natural selection (industrial melanism), not radiation.

Final Answer: Darwin's Finches.

Answer: (A)

Go Back to Question 49

Q50.

Solution

Concept:

The inner ear contains organs for both hearing and the maintenance of equilibrium. The vestibular apparatus is specifically responsible for balance.

Solution:

(a) The vestibular apparatus is located above the cochlea.

(b) It consists of three semi-circular canals and the otolith organ.

(c) The otolith organ is composed of two specific parts: the sacculus and the utriculus.

(d) These structures contain sensory hair cells that detect changes in the position of the head with respect to gravity.

Final Answer: Vestibular apparatus.

Answer: (C)

Go Back to Question 50

Q51.

Solution

Concept:

Plant growth regulators are chemical messengers that coordinate various physiological processes. While most hormones are liquid-phase solutes, one specific class exists as a gas.

Solution:

(a) Auxins, Cytokinins, and Abscisic Acid are all non-gaseous organic acids or bases.

(b) Ethylene is a simple gaseous hydrocarbon (C_2H_4) produced by almost all plant parts.

(c) It is famously known as the fruit-ripening hormone because it accelerates the ripening of climacteric fruits like bananas and mangoes.

(d) It also plays a significant role in promoting abscission (shedding) of leaves and flowers and breaking seed dormancy.

Final Answer: Ethylene.

Answer: (B)

Go Back to Question 51

Q52.

Solution

Concept:

Aneuploidy is a condition where the chromosomal count is not an exact multiple of the haploid set. Trisomy involves the presence of an extra copy of a specific chromosome.

Solution:

(a) Down's Syndrome was first described by Langdon Down in 1866.

(b) It is caused by the presence of an additional copy of chromosome number 21.

(c) This results in a total of 47 chromosomes instead of the usual 46.

(d) Clinical symptoms include a rounded face, a protruding furrowed tongue, short stature, and mental retardation.

Final Answer: 21.

Answer: (C)

Go Back to Question 52

Q53.

Solution

Concept:

The female gametophyte or embryo sac in angiosperms is a 7-celled, 8-nucleate structure. Specialized apparatuses within these cells guide the pollen tube.

Solution:

(a) The egg apparatus at the micropylar end consists of one egg cell and two synergids.

(b) The synergids have special cellular thickenings at the micropylar tip called the filiform apparatus.

(c) This structure plays a vital role in guiding the pollen tube into the synergid during fertilization.

(d) It facilitates the entry of male gametes into the embryo sac for double fertilization.

Final Answer: Synergids.

Answer: (B)

Go Back to Question 53

Q54.

Solution

Concept:

Air pollutants are classified based on how they are formed in the atmosphere. Primary pollutants are emitted directly from sources, while secondary ones form through reactions.

Solution:

(a) Primary pollutants include Carbon monoxide (CO), Sulfur dioxide (SO_2), and Nitrogen oxides.

(b) Secondary pollutants are not emitted directly; they form when primary pollutants react with other components like water vapor or sunlight.

(c) Ozone (O_3) in the troposphere is a classic secondary pollutant formed by the reaction of Nitrogen oxides and volatile organic compounds.

(d) Another common example is PAN (Peroxyacetyl nitrate).

Final Answer: O_3 (Ozone).

Answer: (C)

Go Back to Question 54

Q55.

Solution

Concept:

The understanding of the plasma membrane structure evolved through various scientific proposals. The most widely accepted model emphasizes the dynamic nature of the lipid bilayer.

Solution:

(a) Early models like the sandwich model were replaced as microscopy improved.

(b) In 1972, Jonathan Singer and Garth Nicolson proposed the Fluid Mosaic Model.

(c) According to this, the membrane is a quasi-fluid structure where proteins are embedded in a sea of phospholipids.

(d) This fluidity is essential for functions like cell growth, secretion, and the formation of intercellular junctions.

Final Answer: Singer and Nicolson.

Answer: (A)

Go Back to Question 55

Q56.

Solution

Concept:

The nephron uses various segments to process filtrate into urine. Some parts are specialized for salt transport, while others are permeable to water.

Solution:

(a) The Loop of Henle is a hairpin-shaped segment of the renal tubule.

(b) It consists of a descending limb and an ascending limb.

(c) Its primary function is the creation of a concentration gradient in the renal medulla.

(d) This mechanism, known as the counter-current multiplier, allows the kidney to produce concentrated urine and conserve water.

Final Answer: Concentration of urine.

Answer: (C)

Go Back to Question 56

Q57.

Solution

Concept:

Restriction enzymes recognize specific sequences of DNA bases. These sequences are usually palindromic, meaning they read the same forward and backward on the two strands.

Solution:

(a) EcoRI is a restriction enzyme isolated from *Escherichia coli* RY 13.

(b) It specifically searches for the sequence GAATTC.

(c) It cuts the DNA between the G and A bases, resulting in sticky ends.

(d) Other sequences like AGCT or GGCC are targets for different enzymes such as AluI or HaeIII.

Final Answer: GAATTC.

Answer: (B)

Go Back to Question 57

Q58.

Solution

Concept:

The adaptive immune system has two main branches: one that uses cells to attack pathogens and one that uses proteins found in body fluids (humors).

Solution:

(a) Humoral immunity involves the production of antibodies by B-lymphocytes.

(b) These antibodies circulate in the blood and lymph to neutralize pathogens.

(c) Cell-mediated immunity is handled by T-lymphocytes, which directly attack infected or cancerous cells.

(d) Macrophages and neutrophils are part of the innate, non-specific immune system.

Final Answer: B-lymphocytes.

Answer: (B)

Go Back to Question 58

Q59.

Solution

Concept:

After ovulation, the ruptured Graafian follicle transforms into a temporary endocrine gland. This structure is vital for the early stages of gestation.

Solution:

(a) The corpus luteum is formed in the ovary during the luteal phase of the menstrual cycle.

(b) It secretes large amounts of progesterone.

(c) Progesterone is essential for the maintenance of the endometrium, which is necessary for the implantation of the fertilized egg.

(d) If pregnancy occurs, the corpus luteum persists; if not, it degenerates into the corpus albicans.

Final Answer: Progesterone.

Answer: (C)

Go Back to Question 59

Q60.

Solution

Concept:

The small intestine is the primary site of digestion and absorption. It is divided into three regions that differ in length and the degree of folding.

Solution:

(a) The duodenum is the short, C-shaped first part.

(b) The jejunum is the middle portion, which is moderately coiled.

(c) The ileum is the final and longest part of the small intestine.

(d) It is characterized by being highly coiled to maximize the surface area for the absorption of nutrients.

Final Answer: Ileum.

Answer: (C)

Go Back to Question 60

Q61.

Solution

Concept:

Incomplete dominance is a form of intermediate inheritance in which one allele for a specific trait is not completely expressed over its paired allele. This results in a third phenotype where the expressed physical trait is a combination of the phenotypes of both alleles.

Solution:

(a) In Mendel's pea plants, dominance was absolute. However, in Snapdragons (Antirrhinum majus), crossing a true-breeding red flower with a true-breeding white flower produces pink flowers.

(b) This happens because the red allele is not completely dominant over the white allele.

(c) When the pink F1 generation is self-pollinated, the F2 ratio is 1 Red : 2 Pink : 1 White.

(d) This shows that the genotypic and phenotypic ratios are identical (1:2:1) in cases of incomplete dominance.

Final Answer: Snap Dragon (Antirrhinum sp.).

Answer: (B)

Go Back to Question 61

Q62.

Solution

Concept:

Transpiration is the process of water movement through a plant and its evaporation from aerial parts, such as leaves, stems, and flowers. It serves several vital physiological functions.

Solution:

(a) Transpiration creates a suction force known as the transpiration pull, which facilitates the ascent of sap (water and minerals) from roots to leaves.

(b) As water evaporates, it absorbs latent heat from the leaf surface, providing a significant cooling effect (often 10 to 15 degrees).

(c) It helps in the absorption of minerals from the soil by maintaining a constant flow of water.

(d) It also maintains the turgidity of cells, which keeps the plant structure upright.

Final Answer: All of the above.

Answer: (D)

Go Back to Question 62

Q63.

Solution

Concept:

Colostrum is the yellowish fluid secreted by the mother during the initial days of lactation. It is crucial for providing newborn infants with natural passive immunity.

Solution:

(a) Newborns have an immature immune system and cannot produce enough antibodies.

(b) Colostrum is rich in antibodies, specifically Immunoglobulin A (IgA).

(c) IgA acts as a first line of defense, protecting the infant's gastrointestinal tract and respiratory system from pathogens.

(d) This transfer of pre-formed antibodies from mother to child is a classic example of natural passive immunity.

Final Answer: IgA.

Answer: (C)

Go Back to Question 63

Q64.

Solution

Concept:

Animal tissues are classified based on the shape and function of their cells. Epithelial tissue covers body surfaces and lines internal organs and cavities.

Solution:

(a) Simple squamous epithelium is composed of a single thin layer of flattened cells with irregular boundaries.

(b) It is found in locations where filtration or diffusion occurs, such as the air sacs of lungs and the walls of blood vessels.

(c) In the context of blood vessels, this lining is specifically called the endothelium.

(d) Its extreme thinness allows for the efficient exchange of gases and nutrients between the blood and surrounding tissues.

Final Answer: Squamous.

Answer: (C)

Go Back to Question 64

Q65.

Solution

Concept:

Ecological pyramids represent the relationship between different trophic levels in terms of biomass, number, or energy. Most pyramids can be upright or inverted, but energy follows a strict law.

Solution:

(a) The pyramid of energy represents the total amount of energy utilized by organisms at each trophic level.

(b) According to Lindeman's 10 percent law, only about 10 percent of energy is transferred from one trophic level to the next.

(c) Energy is lost as heat during metabolic processes at every stage.

(d) Therefore, the energy available always decreases as we move to higher levels, making the pyramid always upright.

Final Answer: Always upright.

Answer: (A)

Go Back to Question 65

Q66.

Solution

Concept:

The human heart is myogenic, meaning its rhythm is generated by specialized nodal tissue. The Sino-Atrial Node (SAN) is the primary pacemaker of the heart.

Solution:

(a) Nodal tissue is distributed throughout the heart, but the SAN is located in the upper right corner of the right atrium.

(b) It can generate action potentials without external stimuli, typically 70 to 75 times per minute.

(c) It initiates and maintains the rhythmic contractile activity of the heart.

(d) The electrical impulse then travels to the Atrio-Ventricular Node (AVN) located in the lower-left corner of the same atrium.

Final Answer: Right atrium.

Answer: (B)

Go Back to Question 66

Q67.

Solution

Concept:
DNA fingerprinting is a forensic technique used to identify individuals based on unique patterns in their DNA. It focuses on regions of the genome that do not code for proteins.
Solution:

(a) About 99.9 percent of the DNA sequence is the same in all humans.

(b) DNA fingerprinting targets repetitive DNA sequences called satellite DNA.

(c) Specifically, it uses Variable Number Tandem Repeats (VNTRs), which are highly polymorphic.

(d) The size and number of these repeats vary from person to person, creating a unique profile similar to a physical fingerprint.

Final Answer: Satellite DNA (VNTRs).

Answer: (B)
Go Back to Question 67

Q68.

Solution

Concept:
Polyploidy is a condition where an organism has more than two complete sets of chromosomes. This is very common in plants and often leads to larger fruit or grain size.
Solution:

(a) Many of the world's most important crops are polyploids.

(b) Common bread wheat (Triticum aestivum) is a hexaploid, meaning it has six sets of chromosomes ($6n = 42$).

(c) This occurred through the hybridization of three different ancestral diploid species.

(d) Rice, peas, and maize are typically diploid ($2n$) organisms in their standard cultivated forms.

Final Answer: Wheat.

Answer: (A)
Go Back to Question 68

Q69.

Solution

Concept:

The human skeletal system includes bones of the axial and appendicular skeleton. The skull consists of cranial and facial bones, along with a few unique individual bones.

Solution:

(a) The hyoid bone is a single, U-shaped bone located at the base of the buccal cavity.

(b) It is unique because it does not articulate directly with any other bone in the body.

(c) It provides an attachment point for the muscles of the tongue and the floor of the mouth.

(d) It plays a critical role in speech and swallowing.

Final Answer: Hyoid.

Answer: (B)

Go Back to Question 69

Q70.

Solution

Concept:

Vitamins are essential organic micronutrients required for various metabolic functions. Each vitamin has a specific chemical name and a corresponding deficiency disease.

Solution:

(a) Thiamine is the chemical name for Vitamin B1; its deficiency causes Beriberi.

(b) Ascorbic acid is Vitamin C, found in citrus fruits and essential for collagen synthesis.

(c) Retinol is Vitamin A, which is crucial for vision and epithelial health.

(d) Calciferol is Vitamin D, which regulates calcium absorption and bone health.

Final Answer: (i)-(b), (ii)-(a), (iii)-(d), (iv)-(c).

Answer: (A)

Go Back to Question 70

Q71.

Solution

Concept:

Amniocentesis is a medical procedure used in prenatal diagnosis. It involves the extraction of a small amount of amniotic fluid, which contains fetal cells, to examine the health of the developing fetus.

Solution:

(a) The fetal cells collected are cultured and analyzed for chromosomal patterns (karyotyping).

(b) This allows for the detection of genetic disorders like Down's Syndrome, Edwards Syndrome, or Turner's Syndrome.

(c) Because the karyotype reveals the sex chromosomes (XX or XY), the sex of the fetus can also be determined.

(d) While it is a vital diagnostic tool for chromosomal abnormalities, its use for sex determination is legally banned in many regions to prevent female feticide.

Final Answer: Both B and C.

Answer: (D)

Go Back to Question 71

Q72.

Solution

Concept:

Megasporogenesis is the process of formation of megaspores from the megaspore mother cell. In most flowering plants, only one of the four produced megaspores is functional.

Solution:

(a) The three megaspores located toward the micropylar end usually degenerate.

(b) The remaining functional megaspore undergoes three sequential mitotic divisions.

(c) These divisions result in the formation of the 8-nucleate, 7-celled female gametophyte.

(d) This female gametophyte is commonly known as the embryo sac, which houses the egg cell.

Final Answer: Embryo sac.

Answer: (B)

Go Back to Question 72

Q73.

Solution

Concept:

C4 plants are adapted to dry, tropical environments. They use a specialized mechanism to fix carbon dioxide that minimizes the wasteful process of photorespiration.

Solution:

(a) C4 plants possess Kranz anatomy, characterized by bundle sheath cells surrounding the vascular bundles.

(b) Maize (corn), Sugarcane, and Sorghum are classic examples of C4 plants.

(c) Wheat, Rice, and Potato follow the C3 pathway, which is less efficient at high temperatures and low CO2 concentrations.

(d) C4 plants are highly productive because they can maintain photosynthesis even when stomata are partially closed.

Final Answer: Maize.

Answer: (C)

Go Back to Question 73

Q74.

Solution

Concept:

The Central Dogma is the fundamental framework of molecular biology. It explains the flow of genetic information within a biological system.

Solution:

(a) It was first proposed by Francis Crick in 1958.

(b) The flow starts with DNA, which can replicate itself.

(c) Information is then transcribed from DNA into messenger RNA (mRNA).

(d) Finally, the mRNA is translated into a sequence of amino acids to form a protein.

Final Answer: DNA → RNA → Protein.

Answer: (B)

Go Back to Question 74

Q75.

Solution

Concept:

Symbiosis is a close and long-term biological interaction between two different species. Mycorrhiza is a mutually beneficial relationship essential for soil ecology.

Solution:

(a) Mycorrhiza is the association between specialized fungi and the roots of higher plants (like Pinus).

(b) The fungus helps the plant by absorbing phosphorus and water from the soil more efficiently.

(c) In return, the plant provides the fungus with energy-rich sugars produced through photosynthesis.

(d) Algae and fungi together form lichens, which is a different type of symbiotic relationship.

Final Answer: Fungi and Roots of higher plants.

Answer: (B)

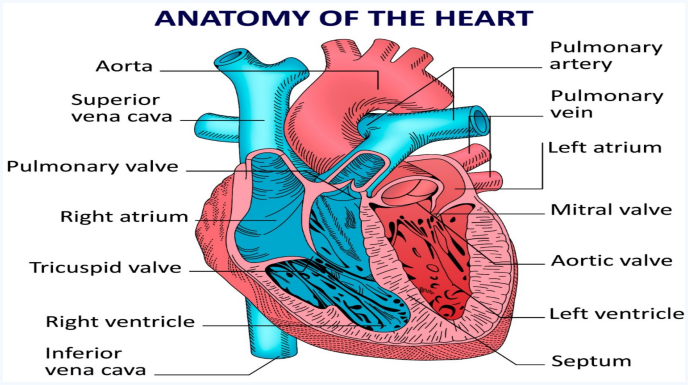
Go Back to Question 75

Q76.

Solution

Concept:

The heart contains valves that ensure blood flows in only one direction. These valves prevent the backflow of blood when the heart chambers contract.



Solution:

(a) The right side of the heart deals with deoxygenated blood.

(b) The opening between the right atrium and right ventricle is guarded by the tricuspid valve.

(c) It consists of three muscular flaps or cusps.

(d) The bicuspid or mitral valve is located on the left side, between the left atrium and left ventricle.

Final Answer: Tricuspid valve.

Answer: (C)

Go Back to Question 76

Q77.

Solution

Concept:

RNA interference (RNAi) is a biological process in which RNA molecules inhibit gene expression. It is used in agriculture to create pest-resistant crop varieties.

Solution:

(a) RNAi is a natural cellular defense mechanism in all eukaryotic organisms.

(b) It involves silencing a specific mRNA due to a complementary double-stranded RNA (dsRNA) molecule.

(c) This technology has been successfully used to protect tobacco plants from the nematode *Meloidogyne incognita*.

(d) By silencing nematode-specific genes, the plant becomes an inhospitable host, preventing infestation.

Final Answer: Nematodes.

Answer: (C)

Go Back to Question 77

Q78.

Solution

Concept:

The cerebrum is the largest part of the human brain. It is divided into two halves that must communicate to coordinate complex sensory and motor functions.

Solution:

(a) The brain is divided into the left and right cerebral hemispheres.

(b) These hemispheres are physically separated by a deep longitudinal fissure.

(c) They are connected internally by a large, arched bridge of myelinated nerve fibers.

(d) This structure is called the corpus callosum, and it allows for the rapid exchange of information between the two sides.

Final Answer: Two cerebral hemispheres.

Answer: (B)

Go Back to Question 78

Q79.

Solution

Concept:

Intercellular junctions are specialized structures that provide contact between neighboring cells or between a cell and the extracellular matrix.

Solution:

(a) Tight junctions fuse the membranes of adjacent cells together to form a barrier.

(b) Their primary function is to prevent substances from leaking across a layer of cells.

(c) Adhering junctions perform cementing to keep neighboring cells together physically.

(d) Gap junctions facilitate communication by allowing the passage of small ions and molecules between cells.

Final Answer: Tight junction.

Answer: (C)

Go Back to Question 79

Q80.

Solution

Concept:

Early embryonic development involves a series of rapid mitotic divisions called cleavage. This transforms the single-celled zygote into a multicellular organism.

Solution:

(a) Cleavage begins as the zygote moves through the isthmus of the fallopian tube toward the uterus.

(b) It produces daughter cells called blastomeres.

(c) The embryo with 8 to 16 blastomeres looks like a solid ball or a mulberry.

(d) This stage is called the morula, which then continues to transform into a hollow blastocyst.

Final Answer: Morula.

Answer: (C)

Go Back to Question 80

Q81.

Solution

Concept:
Genetic mapping is a technique used to determine the relative distance and order of genes on a chromosome based on the frequency of recombination between them.
Solution:

(a) T.H. Morgan discovered the phenomenon of linkage while working with Drosophila.

(b) His student, Alfred Sturtevant, realized that the frequency of recombination could be used as a measure of the distance between genes.

(c) Sturtevant used this data to construct the very first genetic map, representing the linear arrangement of genes on a chromosome.

(d) One map unit (centimorgan) is defined as a 1 percent chance of recombination.

Final Answer: Alfred Sturtevant.

Answer: (B)
Go Back to Question 81

Q82.

Solution

Concept:
Animal symmetry refers to the balanced distribution of duplicate body parts or shapes within the body of an organism. Bilateral symmetry allows for more efficient directional movement.
Solution:

(a) Sponges are mostly asymmetrical. Jellyfish show radial symmetry.

(b) Adult starfish show pentamerous radial symmetry, although their larvae are bilateral.

(c) Earthworms (Annelida) possess a body plan where the left and right halves are identical when cut along a single median plane.

(d) This bilateral symmetry is typically associated with cephalization, the concentration of sense organs at the anterior end.

Final Answer: Earthworm.

Answer: (C)
Go Back to Question 82

Q83.

Solution

Concept:

The light-dependent reaction of photosynthesis involves the splitting of water molecules to provide electrons for the electron transport chain and to release oxygen.

Solution:

(a) Photolysis of water is associated with Photosystem II (PSII).

(b) This reaction occurs on the inner side of the thylakoid membrane, releasing protons and oxygen into the thylakoid lumen.

(c) The thylakoids are arranged in stacks called grana within the chloroplast.

(d) Stroma is the site for the dark reactions, while mitochondria are involved in respiration, not photolysis.

Final Answer: Grana (Thylakoid lumen).

Answer: (B)

Go Back to Question 83

Q84.

Solution

Concept:

The ozone layer protects Earth from harmful ultraviolet radiation. However, certain pollutants cause its thinning, leading to the formation of an ozone hole.

Solution:

(a) The thinning of the ozone layer is most severe in certain geographic locations due to specific climatic conditions.

(b) The formation of polar stratospheric clouds and unique wind patterns (polar vortex) accelerate ozone depletion.

(c) This phenomenon is most prominent over the Antarctic region during the spring months.

(d) The Montreal Protocol was established to phase out the chemicals responsible for this damage.

Final Answer: Antarctic region.

Answer: (B)

Go Back to Question 84

Q85.

Solution

Concept:

The body has a specialized system for handling sudden stress or danger. This involves the rapid release of hormones that prepare the body for "fight or flight."

Solution:

(a) Adrenaline (epinephrine) and noradrenaline are secreted by the adrenal medulla.

(b) These are called emergency hormones because they are secreted in response to stress.

(c) They increase heart rate, breathing rate, alertness, and the breakdown of glycogen into glucose for quick energy.

(d) Insulin and glucagon regulate blood sugar, while thyroxine regulates general metabolism.

Final Answer: Adrenaline.

Answer: (B)

Go Back to Question 85

Q86.

Solution

Concept:

The Basal Metabolic Rate (BMR) is the rate at which the body uses energy while at rest to maintain vital functions such as breathing and keeping warm.

Solution:

(a) The thyroid gland secretes iodinated hormones, primarily thyroxine (T4) and triiodothyronine (T3).

(b) These hormones play a critical role in regulating the metabolic rate of all body cells.

(c) They increase the consumption of oxygen and the breakdown of nutrients to produce heat and energy.

(d) Hyperthyroidism leads to an increased BMR, while hypothyroidism significantly lowers it.

Final Answer: Thyroxine.

Answer: (B)

Go Back to Question 86

Q87.

Solution

Concept:
Spermiogenesis is the transformation of spermatids into mature spermatozoa. This involves the formation of specialized structures required for fertilization.

Solution:

(a) The head of the sperm contains the nucleus and an anterior cap-like structure called the acrosome.

(b) The acrosome is filled with enzymes (hyaluronidase) that help the sperm penetrate the ovum.

(c) This structure is derived from the Golgi body of the spermatid during its maturation.

(d) The mitochondria of the spermatid move to the middle piece to provide energy for swimming.

Final Answer: Golgi body.

Answer: (C)

Go Back to Question 87

Q88.

Solution

Concept:
Alternation of generations in plants involves transitions between haploid (n) and diploid (2n) stages. Different structures represent different chromosomal states.

Solution:

(a) The zygote is formed by the fusion of gametes, making it diploid ($2n$).

(b) The nucellus is maternal sporophytic tissue, which is also diploid ($2n$).

(c) The endosperm in angiosperms is typically triploid ($3n$).

(d) The pollen grain is the male gametophyte; it is produced via meiosis and is therefore a haploid or monoploid (n) structure.

Final Answer: Pollen grain.

Answer: (C)

Go Back to Question 88

Q89.

Solution

Concept:

Succession is the process by which the structure of a biological community evolves over time. It is categorized based on the starting environment.

Solution:

(a) Hydrarch succession occurs in water bodies like ponds or lakes.

(b) Xerarch succession occurs in very dry areas, such as bare rocks or sand dunes.

(c) On bare rock, the pioneer species are usually lichens, which secrete acids to dissolve the rock into soil.

(d) Halosere refers to succession in saline environments like salt marshes.

Final Answer: Xerarch.

Answer: (B)

Go Back to Question 89

Q90.

Solution

Concept:

The pancreas secretes several inactive enzymes (proenzymes) into the small intestine. These must be activated by specific intestinal secretions to function.

Solution:

(a) Trypsinogen is an inactive enzyme present in the pancreatic juice.

(b) It is activated into the powerful protease trypsin by the enzyme enterokinase.

(c) Enterokinase is secreted by the intestinal mucosa (succus entericus).

(d) Once trypsin is formed, it goes on to activate other proenzymes like chymotrypsinogen and procarboxypeptidase.

Final Answer: Trypsinogen.

Answer: (B)

Go Back to Question 90

Q91.

Solution

Concept:
The genetic code is the set of rules by which information encoded within genetic material is translated into proteins by living cells. It possesses several unique characteristics like being universal and non-overlapping.
Solution:

(a) The genetic code is degenerate, meaning that some amino acids are coded by more than one codon.

(b) For example, the amino acid Valine is coded by GUA, GUG, GUC, and GUU.

(c) It is unambiguous because one specific codon always codes for only one specific amino acid.

(d) The code is read in mRNA in a continuous fashion without any internal punctuation or gaps.

Final Answer: Degenerate.

Answer: (B)
Go Back to Question 91

Q92.

Solution

Concept:
Transcription is the first step of gene expression, where a particular segment of DNA is copied into RNA by the enzyme RNA polymerase. This process requires specific start and stop signals.
Solution:

(a) In prokaryotes, a single RNA polymerase is responsible for the synthesis of all types of RNA.

(b) The enzyme requires an initiation factor called the sigma factor (σ) to recognize the promoter region.

(c) The termination of transcription is governed by a specific protein factor called the rho factor (ρ).

(d) The rho factor binds to the nascent RNA chain and facilitates the release of the RNA and the polymerase from the DNA template.

Final Answer: Rho factor.

Answer: (C)
Go Back to Question 92

Q93.

Solution

Concept:

Phytohormones are categorized based on their primary effect on plant growth. Some hormones promote growth and division, while others act as inhibitors during stress.

Solution:

(a) Abscisic Acid (ABA) is widely known as the stress hormone of plants.

(b) It promotes the closure of stomata in the epidermis to prevent water loss during drought conditions.

(c) It also induces seed dormancy, ensuring that seeds germinate only under favorable environmental conditions.

(d) Conversely, Gibberellins are used to break seed dormancy and promote stem elongation.

Final Answer: Abscisic acid.

Answer: (B)

Go Back to Question 93

Q94.

Solution

Concept:

The Hardy-Weinberg principle states that allele frequencies in a population remain constant from generation to generation in the absence of evolutionary influences.

Solution:

(a) The principle is expressed by the equation $p^2 + 2pq + q^2 = 1$.

(b) Factors that disturb this equilibrium include gene flow, genetic drift, and natural selection.

(c) Genetic drift is the change in the frequency of an existing gene variant in a population due to random sampling of organisms.

(d) It has a much more significant effect in small, isolated populations than in large ones.

Final Answer: Genetic drift.

Answer: (B)

Go Back to Question 94

Q95.

Solution

Concept:

The kidney's ability to concentrate urine depends on the structural arrangement of the nephrons and the surrounding capillaries in the renal medulla.

Solution:

(a) The vasa recta are a series of straight capillaries in the medulla that lie parallel to the loop of Henle.

(b) They function as counter-current exchangers, preserving the osmotic gradient established by the loop.

(c) This gradient is essential for the reabsorption of water from the collecting duct.

(d) In many cortical nephrons, the vasa recta is highly reduced or completely absent.

Final Answer: Vasa recta.

Answer: (D)

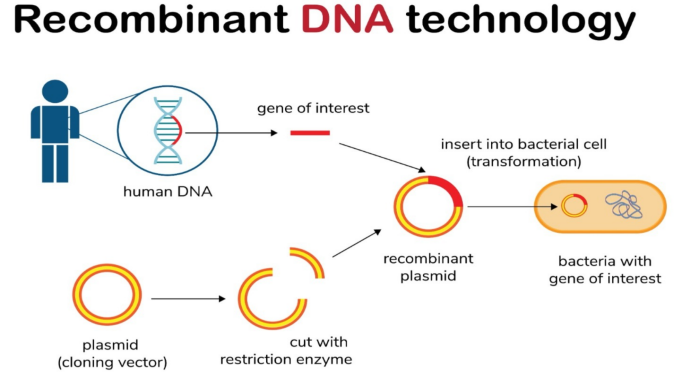
Go Back to Question 95

Q96.

Solution

Concept:

Genetic engineering involves the use of vectors to deliver foreign DNA into a host cell. Plasmids are the most commonly used vectors in molecular cloning.



Solution:

(a) A plasmid is a small, circular, double-stranded DNA molecule that is distinct from a cell's chromosomal DNA.

(b) They occur naturally in bacterial cells and sometimes in eukaryotes like yeast.

(c) Plasmids can replicate independently of the host's genomic DNA.

(d) They often carry genes that provide a survival advantage, such as antibiotic resistance.

Final Answer: Circular extrachromosomal DNA.

Answer: (B)

Go Back to Question 96

Q97.

Solution

Concept:

Microbes are used in various industrial processes, including the production of beverages and chemicals. Different species of fungi and bacteria produce specific metabolites.

Solution:

(a) Citric acid is a weak organic acid widely used as a preservative and flavoring agent.

(b) It is produced commercially through the fermentation of carbohydrates.

(c) The fungus used for this large-scale production is *Aspergillus niger*.

(d) *Acetobacter aceti* is used for vinegar production, while *Lactobacillus* is used for curdling milk.

Final Answer: *Aspergillus niger*.

Answer: (A)

Go Back to Question 97

Q98.

Solution

Concept:

An ecosystem has two major components: biotic (living) and abiotic (non-living). These components interact to form a functional unit of nature.

Solution:

(a) Abiotic factors include physical and chemical elements like temperature, light, soil, and water.

(b) Biotic factors include producers, consumers, and decomposers.

(c) Decomposers (saprotrophs) like bacteria and fungi break down dead organic matter.

(d) Although they are microscopic, they are living organisms and therefore constitute a biotic component.

Final Answer: Decomposers.

Answer: (C)

Go Back to Question 98

Q99.

Solution

Concept:

The human respiratory system is protected by various mechanisms that prevent the entry of foreign particles and pathogens into the delicate lung tissue.

Solution:

(a) The trachea and bronchi are lined with a specialized type of tissue called ciliated epithelium.

(b) These cells have tiny hair-like projections called cilia on their surface.

(c) Interspersed among these cells are goblet cells that secrete sticky mucus.

(d) The rhythmic movement of cilia pushes the mucus and trapped dust particles upward toward the pharynx to be swallowed or expelled.

Final Answer: Ciliated epithelium.

Answer: (B)

Go Back to Question 99

Q100.

Solution

Concept:

Evolutionary theories seek to explain the diversity of life on Earth. The most influential theory was proposed in the 19th century based on extensive observations of nature.

Solution:

(a) Charles Darwin proposed the theory of evolution by natural selection in his 1859 book.

(b) He suggested that individuals with traits better suited to their environment are more likely to survive and reproduce.

(c) This process leads to the gradual change of species over long periods.

(d) Lamarck proposed the theory of inheritance of acquired characteristics, which is different from Darwin's concept of natural selection.

Final Answer: Charles Darwin.

Answer: (B)

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Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	D	2	B	3	C	4	B	5	C
6	B	7	C	8	C	9	B	10	A
11	C	12	B	13	B	14	B	15	A
16	B	17	C	18	C	19	C	20	C
21	B	22	C	23	D	24	A	25	D
26	C	27	C	28	B	29	C	30	D
31	C	32	B	33	B	34	C	35	B
36	B	37	C	38	C	39	C	40	B
41	B	42	C	43	A	44	B	45	C
46	B	47	B	48	B	49	A	50	C
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66	B	67	B	68	A	69	B	70	A
71	D	72	B	73	C	74	B	75	B
76	C	77	C	78	B	79	C	80	C
81	B	82	C	83	B	84	B	85	B
86	B	87	C	88	C	89	B	90	B
91	B	92	C	93	B	94	B	95	D
96	B	97	A	98	C	99	B	100	B