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CEE Based Model Questions

Answer Key & Explanations

(Set- B)

Answer Key + Explanations

Zoology

Q Ans. Explanation

1. **B** — Individuals with heritable advantageous variations tend to leave more offspring.
2. **C** — They share an underlying structural plan inherited from a common ancestor.
3. **A** — Fossils document organisms from different geological periods, including transitional forms.
4. **B** — Mammary glands produce milk for nourishing young.
5. **B** — Cnidarians possess specialized stinging cells called cnidocytes.
6. **A** — The standard insect body plan has three tagmata: head, thorax and abdomen.
7. **B** — Chitin forms a tough external cuticle in arthropods.
8. **B** — Amphioxus (Branchiostoma) retains chordate features throughout life.
9. **C** — Malpighian tubules remove nitrogenous wastes from insect haemolymph.
10. **B** — A frog develops through an aquatic tadpole stage.
11. **B** — A true coelom is lined by mesodermal tissue.
12. **C** — Humans convert toxic ammonia to less toxic urea in the liver.
13. **B** — The liver produces bile; the gallbladder stores and concentrates it.
14. **B** — Gastric HCl provides the low pH required for pepsin activity.
15. **C** — Salivary amylase hydrolyses starch into smaller carbohydrates.
16. **C** — Most CO₂ is converted to bicarbonate in red blood cells and carried in plasma.
17. **B** — Thin-walled alveoli provide a large surface for gas exchange.
18. **B** — Diaphragm contraction increases thoracic volume and lowers pressure.
19. **D** — Vitamin K is required for synthesis of several clotting factors.
20. **A** — Iron is central to the haem group that binds oxygen.
21. **A** — Erythropoietin, mainly from the kidneys, stimulates erythropoiesis.
22. **B** — Atrioventricular valves close during ventricular contraction.
23. **A** — Heparin inhibits clotting and is released by mast cells and basophils.

24. **B** — Pulmonary veins return oxygenated blood to the left atrium.
25. **A** — The proximal tubule reabsorbs most filtered glucose under normal conditions.
26. **A** — The loop of Henle establishes the medullary osmotic gradient, supported by vasa recta.
27. **B** — Parathyroid hormone increases blood calcium through effects on bone, kidney and vitamin D activation.
28. **B** — Iodine is an essential component of thyroid hormones T₃ and T₄.
29. **B** — The fovea provides the sharpest central colour vision.
30. **A** — Motor neurons release acetylcholine to trigger muscle-fibre depolarization.
31. **A** — A sarcomere is the repeating contractile unit between Z lines.
32. **B** — Osteoclasts break down bone matrix during remodelling.
33. **B** — Menarche marks the onset of menstruation at puberty.
34. **B** — Maternal and fetal blood are normally separated by a placental barrier.
35. **A** — Progesterone supports the endometrium and helps maintain pregnancy.
36. **A** — Visceral leishmaniasis (kala-azar) is transmitted by infected sandflies.
37. **B** — Hepatitis B virus infects liver cells and can cause inflammation.
38. **A** — BCG provides protection especially against severe childhood TB.
39. **B** — Biogeography examines the geographic distribution of organisms.
40. **A** — Carrying capacity depends on available resources and environmental limits.

Botany

Q Ans. Explanation

41. **B** — The membrane consists of a lipid bilayer with mobile proteins.
42. **B** — Ribosomes translate mRNA into polypeptides.
43. **A** — Lysosomes digest macromolecules and worn-out cellular components.
44. **C** — Prokaryotes have DNA in a nucleoid rather than a membrane-bound nucleus.
45. **B** — Xylem conducts water and dissolved minerals from roots upward.

46. **A** — Suberin-rich Casparian strips regulate apoplastic water movement into the stele.
47. **B** — Root hairs enlarge the surface area for water and mineral uptake.
48. **B** — Cambium between xylem and phloem makes the bundle open.
49. **A** — The epidermis limits water loss and protects against injury and pathogens.
50. **B** — Lenticels permit gaseous exchange through periderm.
51. **B** — PEP carboxylase initially forms a four-carbon compound, oxaloacetate.
52. **B** — Rubisco oxygenation becomes more significant under hot, low-CO₂ conditions.
53. **B** — ATP hydrolysis supplies usable energy for cellular processes.
54. **A** — Cytokinins stimulate cell division and influence shoot development.
55. **B** — Directional growth in response to light is phototropism.
56. **B** — Osmosis is net water movement across a selectively permeable membrane.
57. **B** — Transpiration creates tension that pulls a cohesive water column through xylem.
58. **B** — The fertilized ovule develops into a seed.
59. **B** — After fertilization, the ovary generally matures into a fruit.
60. **A** — The egg apparatus lies at the micropylar end and includes an egg cell plus two synergids.
61. **B** — Microspores develop into pollen grains within the anther.
62. **B** — Endosperm stores or supplies nutrients to the developing embryo.
63. **B** — Parthenocarpy results in fruit development without fertilization, often seedless.
64. **A** — Annual plants germinate, reproduce and die within one season or year.
65. **A** — Totipotency is the capacity of a cell to regenerate a whole plant under suitable conditions.
66. **A** — Agrobacterium can transfer T-DNA into plant cells.
67. **A** — Rhizobium in root nodules converts atmospheric nitrogen into usable nitrogen compounds.
68. **A** — Mycorrhizal fungi improve mineral and water uptake in many plants.
69. **B** — Phytoplankton photosynthesize and form the base of the aquatic food web.
70. **B** — Endemic species naturally occur in a limited geographic area.
71. **B** — Nitrogen-fixing microbes reduce atmospheric N₂ to ammonia.

72. **B** — Lichens can colonize bare rock and help initiate soil formation.
73. **B** — Xerophytes possess features that reduce water loss or improve water storage.
74. **B** — Binomial nomenclature uses genus and species names.
75. **B** — Fungal cell walls contain chitin and other polysaccharides.
76. **A** — Peptidoglycan provides strength to most bacterial cell walls.
77. **B** — Bryophyte sporophytes remain attached to and nutritionally dependent on gametophytes.
78. **B** — Gymnosperms produce naked seeds, often on cones.
79. **C** — A heterozygote $\times$ heterozygote cross gives three dominant-phenotype to one recessive.
80. **A** — A point mutation affects a single nucleotide position.

Chemistry

Q Ans. Explanation

81. **B** — Leading zeros are not significant; 4, 5 and the trailing decimal zero are significant.
82. **B** — Molality uses mass of solvent in kilograms.
83. **A** — Charles's law states $V \propto T$ at constant pressure and amount of gas.
84. **C** — At 25°C, neutral water has $[H^+] = 10^{-7} M$ and pH 7.
85. **A** — Strong acids dissociate extensively in water.
86. **B** — Heat acts like a product in an exothermic reaction, so added heat favours reactants.
87. **B** — More frequent effective collisions generally increase reaction rate.
88. **B** — For a first-order rate law, k has units of inverse time.
89. **C** — The standard hydrogen electrode is assigned zero volts by convention.
90. **B** — Oxidation takes place at the anode in both galvanic and electrolytic cells.
91. **B** — Charge is measured in coulombs.
92. **B** — Nitrogen has three bonding pairs and one lone pair, giving a trigonal pyramidal shape.
93. **D** — Two sp hybrid orbitals point in opposite directions.
94. **C** — Water has a bent shape, so its polar O–H bond dipoles do not cancel.
95. **A** — The O–H groups allow intermolecular hydrogen bonding.

96. **C** — Two H atoms contribute +2 and four O atoms -8, so sulfur is +6.
97. **A** — Let N be x: $x + 4(+1) = +1$, so $x = -3$.
98. **B** — Sodium belongs to Group 1, the alkali metals.
99. **B** — Atoms tend to lose electrons less readily as effective nuclear charge increases across a period.
100. **B** — Bauxite is the major commercial source of aluminium.
101. **B** — Water is reduced at the cathode, producing hydrogen gas.
102. **B** — Haematite (Fe₂O₃) is an important iron ore.
103. **B** — Calcium and magnesium bicarbonates cause temporary hardness.
104. **B** — Washing soda is hydrated sodium carbonate.
105. **B** — The two-carbon alcohol is ethanol.
106. **B** — Substitution preserves the aromatic ring, unlike addition which disrupts aromaticity.
107. **A** — Alkenes and alkynes decolourize bromine water by addition across multiple bonds.
108. **B** — CH₃CHO is a two-carbon aldehyde, ethanal.
109. **A** — Methylamine has one carbon group attached to nitrogen.
110. **B** — Ethene monomers add together to form polyethene.
111. **B** — PVC is produced by polymerization of vinyl chloride.
112. **B** — Soap molecules form micelles that trap oily material in their hydrophobic interiors.
113. **B** — Vinegar is a dilute aqueous solution of acetic (ethanoic) acid.
114. **B** — A primary standard is sufficiently pure and stable for accurate solution preparation.
115. **A** — An indicator changes colour over a pH range near the endpoint.
116. **B** — Components move differently because they interact differently with the two phases.
117. **A** — Ethers have an oxygen atom linking two carbon-containing groups.
118. **B** — Complete combustion in excess oxygen forms carbon dioxide and water.
119. **B** — Bases turn red litmus paper blue.
120. **C** — Group 2 elements usually lose two valence electrons to form +2 ions.

121. **A** — Iron is the industrial catalyst for ammonia synthesis in the Haber process.
122. **B** — Carbon dioxide absorbs infrared radiation and contributes to the greenhouse effect.
123. **A** — Sulfur dioxide and nitrogen oxides form sulfuric and nitric acids in the atmosphere.
124. **B** — Colligative properties depend on the number of dissolved particles.
125. **B** — Raoult's law relates relative vapour-pressure lowering to solute mole fraction.
126. **A** — Each carbon in the C^oC bond is sp-hybridized with linear geometry.
127. **A** — Aldehydes reduce Tollens' reagent to metallic silver; most ketones do not.
128. **A** — Buffer capacity is greatest when weak acid and conjugate base concentrations are comparable.
129. **B** — Graham's law gives rate $\propto 1/\sqrt{\text{molar mass}}$ at the same conditions.
130. **B** — Graphite has delocalized electrons that can move along its layers.

Physics

Q Ans. Explanation

131. **B** — Work = force $\times$ displacement, giving dimensions ML^2T^{-2} .
132. **C** — Its velocity direction changes, requiring inward centripetal acceleration.
133. **B** — Impulse is the integral of force over time and equals Δp .
134. **B** — It is the ratio of frictional force to normal reaction.
135. **B** — Translational equilibrium requires the vector sum of forces to be zero.
136. **B** — Symmetry places the centre of mass at the geometric centre.
137. **B** — For small height changes near Earth, gravitational potential energy change is mgh .
138. **B** — For a circular orbit $v = \sqrt{GM/r}$, so smaller radius means greater orbital speed.
139. **B** — At comparable height, higher flow speed corresponds to lower static pressure.
140. **A** — Surface tension is force per unit length.
141. **C** — Radiation can propagate without a material medium.

142. **B** — Latent heat changes phase without changing temperature.
143. **C** — The Carnot engine sets the maximum efficiency between two reservoirs.
144. **C** — Ideal-gas internal energy is a function of temperature.
145. **B** — Molecular rms speed is proportional to $\sqrt{T}$ for a given gas.
146. **B** — Frequency $f = 1/T$, where T is the period.
147. **B** — Shorter visible wavelengths scatter more strongly in the atmosphere.
148. **B** — Convex mirrors diverge reflected rays and produce a virtual diminished image.
149. **A** — For a denser medium, $\sin C = 1/n$; larger n gives smaller critical angle.
150. **B** — Resolution improves with shorter wavelength and greater numerical aperture.
151. **B** — Magnetic flux is measured in webers.
152. **C** — $F = qvB \sin \theta$, and $\theta = 0^\circ$ gives zero force.
153. **B** — Greater lattice vibrations cause more electron scattering.
154. **C** — For n equal parallel resistors, equivalent resistance is R/n .
155. **A** — Energy = $0.1 \text{ kW} \times 2 \text{ h} = 0.2 \text{ kWh}$.
156. **B** — A fuse melts when excessive current produces enough heating.
157. **A** — For a given material, drift velocity is proportional to applied electric field.
158. **B** — Transformer induction requires changing magnetic flux through the secondary coil.
159. **B** — Free charges redistribute until the internal electrostatic field vanishes.
160. **B** — $C = \epsilon A/d$, so smaller separation gives larger capacitance.
161. **B** — Photon energy equals Planck's constant multiplied by frequency.
162. **B** — Matter wavelength is $\lambda = h/p$.
163. **B** — A photon must have at least the work-function energy.
164. **B** — After one half-life, half the original radioactive nuclei remain.
165. **B** — An alpha particle contains two protons and two neutrons.
166. **B** — Beta-minus radiation consists of electrons.
167. **B** — Fission divides a heavy nucleus, releasing energy and often neutrons.

168. **B** — Hydrogen nuclei fuse to form helium and release energy.
169. **A** — Thermal energy creates more charge carriers in semiconductors.
170. **B** — An AND gate produces a high output only for two high inputs.
171. **B** — A NOT gate inverts its input.
172. **B** — Work function is the minimum energy required for photoelectric emission.
173. **B** — Electron diffraction demonstrates interference behaviour of matter waves.
174. **B** — Rapid deceleration of electrons at the target generates bremsstrahlung X-rays.
175. **C** — One becquerel represents one nuclear decay per second.
176. **B** — Forward bias lowers the potential barrier and permits substantial current.
177. **A** — An OR gate outputs 1 if at least one input is 1.
178. **A** — Einstein's relation converts mass difference into energy.
179. **B** — Inductance is measured in henries (H).
180. **B** — At resonance, inductive and capacitive reactances cancel, leaving resistance.

MAT

Q Ans. Explanation

181. **A** — Concise means expressing something clearly in few words.
182. **C** — A circle has no straight sides; the others are polygons.
183. **A** — The conclusion follows directly from the two premises.
184. **C** — Each term is multiplied by 2.
185. **C** — These are squares 1^2 through 5^2 ; next is $6^2 = 36$.
186. **A** — Each letter advances one place: P®Q, A®B, G®H, E®F.
187. **A** — East and west movements cancel, leaving 4 m north.
188. **B** — Ten days is one week plus three days: Wednesday + 3 = Saturday.
189. **C** — 15% of 1,000 is 150; $1,000 - 150 = 850$.
190. **C** — Each pen costs Rs. 15, so seven cost Rs. 105.
191. **C** — Differences are 3, 5, 7, 9; next difference 11 gives 37.

192. **C** — The order is $A > B > C$, so C is shortest.
193. **A** — A hospital is a typical workplace for a doctor; a school is for a teacher.
194. **C** — Only the eight corner cubes have three painted faces.
195. **B** — Alphabetical order is A, C, E, R; the middle letters are C and E.
196. **C** — $5 \text{ minutes per hour} \times 6 \text{ hours} = 30 \text{ minutes}$.
197. **C** — The number is $9 \times 4 = 36$.
198. **D** — Letter jumps are +3, +4, +5, +6; next is +7. T + 7 wraps past Z to A.
199. **D** — $7 \text{ cm} \times 5 \text{ km/cm} = 35 \text{ km}$.
200. **C** — There are 12 boys; $12/30 \times 100 = 40\%$.

__Best Wishes__