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CEE Based Model Questions

Answer Key & Explanations

(Set- A)

Answer Key + Explanations

Zoology

Q	Answer	Explanation
1.	**B —**	Species is the basic unit of biological classification.
2.	**C —**	Echinoderms possess a characteristic water vascular system used in locomotion, feeding and respiration.
3.	**B —**	Chordates characteristically possess a notochord at least during some stage of development.
4.	**B —**	Aschelminthes/Nematoda are pseudocoelomate animals.
5.	**B —**	Homologous structures have common evolutionary origin but may perform different functions, indicating divergent evolution.
6.	**C —**	Sporozoites are injected into humans with the saliva of an infected female *Anopheles* mosquito.
7.	**C —**	Sexual reproduction of *Plasmodium* occurs inside the female *Anopheles* mosquito.
8.	**C —**	*P. falciparum* causes severe and potentially fatal malaria, including cerebral malaria.
9.	**B —**	Typhlosole increases the internal surface area of the intestine, improving absorption.
10.	**C —**	Nephridia are the principal excretory organs of earthworms.
11.	**B —**	Earthworms have a closed circulatory system in which blood remains within vessels.

Q	Answer	Explanation
12.	C —	Adult frogs respire through both lungs and moist skin.
13.	B —	The sinoatrial (SA) node generates the normal rhythmic electrical impulse of the heart.
14.	B —	The left ventricle pumps blood through systemic circulation, requiring greater pressure.
15.	C —	O-negative RBCs lack A, B and Rh(D) antigens and are commonly considered the universal RBC donor type.
16.	B —	ADH increases water reabsorption, particularly in the collecting ducts.
17.	C —	Blood is ultrafiltered through the glomerular capillaries into Bowman's capsule.
18.	B —	The nephron is the structural and functional unit of the kidney.
19.	D —	Fertilization normally occurs in the ampullary region of the fallopian tube.
20.	B —	A mid-cycle LH surge triggers ovulation.
21.	C —	Insulin promotes glucose uptake and storage, thereby lowering blood glucose.
22.	C —	The cerebellum coordinates balance, posture and fine muscular movements.
23.	B —	The neuron is the basic structural and functional unit of the nervous system.
24.	B —	Haemoglobin in RBCs binds and transports most oxygen in blood.
25.	B —	Increased CO_2 and H^+ reduce haemoglobin's affinity for oxygen, facilitating oxygen unloading in tissues.

Q	Answer	Explanation
26.	C —	The small intestine, particularly its villi and microvilli, is the major site of nutrient absorption.
27.	C —	IgG is the most abundant immunoglobulin in normal serum.
28.	D —	IgE plays a major role in immediate hypersensitivity and allergic reactions.
29.	C —	Platelets are essential for formation of the platelet plug and blood clotting.
30.	B —	Thin, single-layered squamous cells allow rapid diffusion, as in alveoli.
31.	B —	Adipose tissue stores energy primarily in the form of triglycerides.
32.	B —	Tuberculosis is caused by the bacterium *Mycobacterium tuberculosis*.
33.	A —	Cholera is caused by the bacterium *Vibrio cholerae*.
34.	B —	Vaccines stimulate the person's own immune system, producing active acquired immunity.
35.	B —	Activated B lymphocytes differentiate into plasma cells that secrete antibodies.
36.	A —	T lymphocytes are central to cell-mediated immunity.
37.	C —	ADH is synthesized in the hypothalamus and released from the posterior pituitary.
38.	B —	Bile salts emulsify large fat globules into smaller droplets, increasing the surface area for lipase action.
39.	C —	Ca^{2+} binds to troponin, causing tropomyosin to move away from actin's myosin-binding sites.

Q	Answer	Explanation
40.	B —	The sliding filament theory explains muscle contraction through relative sliding of actin and myosin filaments.

Botany
Answers + Explanations

41. **B** — Cellulose forms the major structural framework of plant cell walls.
42. **B** — Amino acids are linked by peptide bonds.
43. **C** — Mitochondria generate ATP through aerobic respiration.
44. **C** — Chlorophyll-a is the primary photosynthetic pigment.
45. **B** — Bryophytes depend on water for sexual reproduction, hence the term amphibians.
46. **B** — The gametophyte is the dominant generation in bryophytes.
47. **B** — Gymnosperms produce exposed or "naked" seeds.
48. **B** — Pteridophytes have a dominant, independent sporophyte.
49. **D** — Double fertilization is a defining feature of angiosperms.
50. **C** — Solar energy drives most ecosystems through photosynthesis.
51. **B** — Approximately 10% of energy is transferred to the next trophic level.
52. **C** — Energy pyramids are always upright because energy is lost at each trophic transfer.
53. **B** — Biomagnification increases concentration of persistent toxins at higher trophic levels.

54. **B** — Ecological succession is the progressive change in community composition.
55. **B** — DNA synthesis occurs during S phase.
56. **A** — Crossing over occurs during pachytene of prophase I.
57. **B** — Crossing over exchanges genetic material between homologous chromosomes.
58. **A** — The two alleles of a gene separate during gamete formation.
59. **B** — A test cross uses a homozygous recessive individual.
60. **C** — A typical Mendelian dihybrid cross gives 9:3:3:1.
61. **B** — In codominance, both alleles are expressed in the heterozygote.
62. **B** — Lateral meristems, especially vascular cambium and cork cambium, cause secondary growth.
63. **B** — Xylem conducts water and dissolved minerals.
64. **C** — Phloem transports photosynthetic products and other organic solutes.
65. **B** — Collenchyma provides flexible support to growing parts.
66. **B** — Transpiration is loss of water vapour from aerial plant surfaces.
67. **A** — Changes in guard-cell turgor control stomatal opening.
68. **A** — Auxin promotes cell elongation and mediates phototropism.
69. **C** — Ethylene promotes fruit ripening.
70. **B** — Gibberellins promote elongation and can break seed dormancy.
71. **A** — ABA promotes dormancy and stress responses, including stomatal closure.

72. **C** — Photoperiodism is response to the relative duration of light and dark.
73. **B** — The Calvin cycle occurs in the chloroplast stroma.
74. **B** — Light reactions occur on thylakoid membranes.
75. **C** — Photosynthetic oxygen originates from splitting of water.
76. **C** — 3-PGA is the first stable product of C_3 carbon fixation.
77. **B** — RuBisCO catalyzes carbon fixation in the Calvin cycle.
78. **B** — Mitochondria are the principal ATP-generating organelles.
79. **B** — Middle lamella is rich in pectic substances, particularly calcium pectate.
80. **B** — Stomata regulate gas exchange and water loss.

Chemistry
Answers + Explanations

81. **B** — One mole contains Avogadro's number, 6.022×10^{23} particles.
82. **B** — Empirical formula gives the simplest whole-number ratio of elements.
83. **B** — The limiting reagent is consumed first and determines maximum product.
84. **B** — The azimuthal quantum number determines orbital shape.
85. **B** — Each orbital can accommodate a maximum of two electrons with opposite spins.
86. **B** — No two electrons can possess the same set of four quantum numbers.
87. **B** — Increasing effective nuclear charge pulls electrons closer to the nucleus.

88. **B** — Effective nuclear charge generally increases across a period.
89. **B** — Nitrogen has a particularly stable half-filled $2p^3$ configuration.
90. **B** — Fluorine has the highest electronegativity.
91. **B** — Ionic bonds involve electron transfer and electrostatic attraction.
92. **C** — Carbon is sp^3 hybridized in methane.
93. **B** — sp^2 orbitals form a trigonal planar arrangement.
94. **B** — Equilibrium shifts to counteract an applied change.
95. **B** — Higher pressure favours the side with fewer gas molecules.
96. **A** — pH = −log[H^+], so [H^+] = 10^{-3} M.
97. **C** — Buffers resist significant changes in pH.
98. **B** — Oxidation is loss of electrons.
99. **B** — Reduction is gain of electrons.
100. **B** — Oxygen in peroxide has oxidation state −1.
101. **C** — Catalysts lower activation energy through an alternative reaction pathway.
102. **B** — First-order half-life is independent of initial concentration.
103. **D** — Fluorine is the strongest oxidizing halogen.
104. **D** — In $KMnO_4$, Mn is +7.
105. **C** — Chromium is +6 in dichromate.
106. **C** — Acid + carbonate produces CO_2, water and salt.
107. **B** — Haemoglobin contains iron in its haem group.
108. **B** — Chlorophyll contains magnesium at its centre.
109. **B** — Ligands donate electron pairs to central metal ions.

110. **C** — Coordination number counts directly attached donor atoms.
111. **B** — Saturated acyclic hydrocarbons follow $C_n H_{2n+2}$.
112. **A** — The C=C bond readily undergoes addition reactions.
113. **B** — Markovnikov's rule predicts orientation in addition to unsymmetrical alkenes.
114. **B** — Normal addition of HBr to propene gives mainly 2-bromopropane.
115. **B** — Alcohols contain the hydroxyl (–OH) group.
116. **C** — Aldehydes contain –CHO.
117. **A** — Ketones contain a carbonyl group bonded to two carbon groups.
118. **B** — Primary alcohols oxidize initially to aldehydes.
119. **B** — Secondary alcohols oxidize to ketones.
120. **B** — Aldehydes generally give Tollens' silver-mirror test.
121. **B** — Alcohol + carboxylic acid forms ester + water.
122. **B** — Saponification is alkaline hydrolysis of esters.
123. **B** — Carboxylic acids contain –COOH.
124. **B** — Amino acids have amino and carboxyl groups.
125. **B** — Peptide bonds connect amino acids.
126. **B** — RNA normally contains uracil instead of thymine.
127. **B** — Extensive hydrogen bonding raises water's boiling point.
128. **B** — Molarity = moles of solute/litre of solution.
129. **A** — The ideal gas equation is PV = nRT.

130. **B** — At constant temperature, pressure is inversely proportional to volume.

Physics
Answers + Explanations

131. **B** — Newton is the SI unit of force.
132. **C** — Displacement has magnitude and direction.
133. **B** — Slope of velocity-time graph gives acceleration.
134. **A** — One basic equation of uniformly accelerated motion is $v = u + at$.
135. **B** — Maximum range on level ground occurs at 45°.
136. **B** — Newton's first law describes inertia.
137. **A** — Force equals rate of change of momentum; for constant mass, $F = ma$.
138. **A** — Momentum $p = mv$.
139. **B** — Total momentum remains conserved in an isolated system.
140. **B** — Centripetal acceleration points toward the centre.
141. **C** — Gravity provides the centripetal force.
142. **C** — $W = Fs\cos\theta$; at 90°, work is zero.
143. **B** — Kinetic energy = $\frac{1}{2}mv^2$.
144. **B** — Earth's escape velocity is approximately 11.2 km/s.
145. **A** — $v_e = \sqrt{(2GM/R)}$, depending on planetary mass and radius.
146. **B** — Specific heat is heat required per unit mass per degree temperature rise.
147. **C** — Isothermal means constant temperature.

148. **B** — Isobaric means constant pressure.
149. **C** — The first law expresses conservation of energy.
150. **B** — Adiabatic processes involve no heat exchange.
151. **B** — Carnot efficiency rises as source temperature increases relative to sink temperature.
152. **B** — Absolute zero is 0 K ≈ −273.15°C.
153. **A** — Wave speed $v = f\lambda$.
154. **B** — Sound propagates through air as a longitudinal wave.
155. **A** — Maximum amplitude occurs when driving and natural frequencies match.
156. **B** — TIR requires denser-to-rarer propagation and incidence angle above critical angle.
157. **B** — Lens power is measured in dioptres.
158. **B** — A concave lens diverges light and corrects myopia.
159. **B** — A convex lens converges light and corrects hypermetropia.
160. **B** — $P = 1/f$ when f is measured in metres.
161. **B** — Young's experiment demonstrates interference of coherent light.
162. **A** — Ohm's law: $V = IR$.
163. **B** — $R = \rho L/A$, so doubling L doubles R.
164. **B** — R is inversely proportional to cross-sectional area.
165. **C** — Series resistance adds: $R + R = 2R$.
166. **C** — Parallel combination of two equal resistors gives $R/2$.
167. **A** — Electrical power $P = VI$.
168. **B** — Kirchhoff's current/junction law follows conservation of charge.
169. **B** — $F = qvB \sin\theta$ is maximum at 90°.

170. **B** — Faraday discovered electromagnetic induction.
171. **B** — Lenz's law gives the direction opposing the change causing induction.
172. **B** — Transformers work through mutual electromagnetic induction.
173. **A** — $F \propto q_1 q_2 / r^2$.
174. **A** — Electric field is force per unit positive test charge.
175. **B** — Potential = work done per unit charge.
176. **A** — Electric field is the negative spatial gradient of potential.
177. **B** — A dielectric increases capacitance by reducing effective electric field.
178. **B** — Capacitor energy $U = \frac{1}{2}CV^2$.
179. **B** — Parallel capacitances add directly.
180. **A** — Photoelectron maximum kinetic energy increases with photon frequency above threshold.

MAT
Answers + Explanations

181. **C** — Each term is multiplied by 2: 2, 4, 8, 16, 32.
182. **B** — Differences are +3, +5, +7, +9; next is +11, giving 38.
183. **A** — Each letter shifts one position forward: D→E, O→P, G→H.
184. **C** — By Pythagoras, distance = $\sqrt{(5^2 + 3^2)} = \sqrt{34}$ km.

185. **C** — The only definite conclusion is that all doctors are educated.
186. **C** — At 3:00, the hands are 90° apart.
187. **C** — Doubling workers halves time: 5 × 12 = 10 × 6.
188. **C** — 1.20 × 0.80 = 0.96, so the result is 4% lower.
189. **B** — Sum = 150; 150/5 = 30.
190. **C** — x = 12 − 5 = 7.
191. **D** — 9 is not a prime number; 2, 3 and 5 are prime.
192. **B** — The word is simply written backwards.
193. **C** — 10 + 30 = 40 years.
194. **B** — Total = 5, red = 3, so probability = 3/5.
195. **B** — Since square ⊂ rectangle ⊂ quadrilateral, all squares are quadrilaterals.
196. **C** — Letter positions increase by +2, +3, +4, +5; next +6: O + 6 = U.
197. **C** — 0.25x = 40, therefore x = 160.
198. **C** — Speed = distance/time = 120/2 = 60 km/h.
199. **B** — From P > Q > R > S, P is greater than S.
200. **B** — Facing north → right = east → right again = south.

__Best Wishes__