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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 COn 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 Tn and Tn.

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-COn 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 Nn 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 × 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 µ T at constant pressure and amount of gas.

84. **C —** At 25°C, neutral water has [Hn] = 10nn 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 (FenOn) 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 —** CHnCHO 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 CºC 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 µ 1/Ömolar 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 × displacement, giving dimensions ML^2Tn^2.

132. **C —** Its velocity direction changes, requiring inward centripetal acceleration.

133. **B —** Impulse is the integral of force over time and equals Dp.

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 = Ö(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 ÖT 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 q, and q = 0° 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 kW × 2 h = 0.2 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 = eA/d, so smaller separation gives larger capacitance.

161. **B —** Photon energy equals Planck's constant multiplied by frequency.

162. **B —** Matter wavelength is l = 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 minutes per hour × 6 hours = 30 minutes.

197. **C —** The number is 9 × 4 = 36.

198. **D —** Letter jumps are +3, +4, +5, +6; next is +7. T + 7 wraps past Z to A.

199. **D —** 7 cm × 5 km/cm = 35 km.

200. **C —** There are 12 boys; 12/30 × 100 = 40%.

__Best Wishes__