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CEE Based Model Questions

Answer Key & Explanations

(Set- C)

Answer Key + Explanations

Zoology

Answers + Explanations

1. B — Tight junction Explanation: Tight junctions seal spaces between neighbouring cells and limit leakage between them.

2. C — Collecting duct Explanation: ADH increases water permeability in the collecting ducts, helping concentrate urine.

3. B — SA node Explanation: The sinoatrial node normally initiates the heartbeat through spontaneous electrical depolarization.

4. D —IgG Explanation: Maternal IgG crosses the placenta and provides the newborn with temporary passive immunity.

5. C — Ampulla of the fallopian tube Explanation: The ampullary region of the oviduct is the usual site of fertilization.

6. B —LH Explanation: Luteinizing hormone acts on Leydig cells in the testes to stimulate testosterone production.

7. D — Neither anti-A nor anti-B Explanation: People with AB blood group possess both A and B antigens and normally lack these two antibodies.

8. C —Alveoli Explanation: The thin walls and large surface area of alveoli facilitate oxygen and carbon dioxide diffusion.

9. C —Vitamin K Explanation: Vitamin K is required for the normal functioning of several clotting factors.

10. B —Troponin C Explanation: Calcium binds to troponin, causing tropomyosin to move and expose actin's myosin-binding sites.

11. B —Hypothalamus Explanation: The hypothalamus helps regulate body temperature and coordinates heat-loss and heat-conservation responses.

12. B —DNA ligase Explanation: DNA ligase seals breaks in the sugar-phosphate backbone between adjacent DNA fragments.

13. B —Plasma cells Explanation: Activated B lymphocytes can differentiate into plasma cells that secrete antibodies.

14. B —Sarcomere Explanation: A sarcomere extends between two Z discs and is the repeating unit responsible for muscle contraction.

15. C —Secondary active transport Explanation: Sodium-glucose cotransport uses the sodium gradient maintained by the sodium-potassium pump.

16. B —Calcitonin Explanation: Calcitonin can lower blood calcium partly by inhibiting osteoclast activity.

17. B —Ductus arteriosus Explanation: The ductus arteriosus connects the pulmonary artery to the aorta in fetal circulation and later becomes a ligament.

18. C —Schwann cells Explanation: Schwann cells form myelin around peripheral axons; oligodendrocytes perform this role in the central nervous system.

19. B —mRNA Explanation: Each mRNA codon specifies an amino acid or a stop signal during translation.

20. B —Pepsin Explanation: Pepsin is activated from pepsinogen in the acidic stomach and breaks proteins into smaller peptides.

21. C —Artificial active immunity Explanation: Vaccination stimulates the person's own immune response and can generate immunological memory.

22. B —Iris Explanation: The iris changes pupil diameter through the action of its muscles.

23. B —Urea Explanation: The liver converts toxic ammonia into urea, which is carried to the kidneys for excretion.

24. A —Pineal gland Explanation: Melatonin helps regulate circadian rhythms and the sleep-wake cycle.

25. C —Pachytene Explanation: Crossing over occurs during pachytene of prophase I and contributes to genetic variation.

26. A —Thrombin Explanation: Thrombin converts soluble fibrinogen into fibrin strands that help form a stable clot.

27. B —Reduce surface tension Explanation: Surfactant reduces surface tension inside alveoli and helps prevent their collapse.

28. B —LH surge Explanation: A mid-cycle surge in luteinizing hormone triggers ovulation.

29. A —Cystic duct Explanation: The cystic duct connects the gallbladder to the common hepatic duct region.

30. C —tRNA Explanation: Transfer RNA carries specific amino acids and matches its anticodon with an mRNA codon.

31. B —Creating an osmotic gradient in the renal medulla Explanation: The countercurrent mechanism helps establish the gradient required to concentrate urine.

32. B —Olfactory nerve Explanation: The olfactory nerve is cranial nerve I and carries sensory information for smell.

33. B —Golgi apparatus Explanation: The Golgi apparatus processes proteins and packages them into transport or secretory vesicles.

34. B —One-way propagation of an action potential Explanation: The recently activated region is temporarily less excitable, helping the impulse move forward.

35. B —Oxytocin Explanation: Oxytocin contracts myoepithelial cells to produce milk let-down; prolactin supports milk production.

36. C —Neutrophils Explanation: Neutrophils usually make up the largest proportion of circulating white blood cells.

37. A —Diabetes mellitus Explanation: Diabetes mellitus is characterized by chronic hyperglycemia

resulting from impaired insulin secretion, action, or both.

38. B —Progesterone Explanation: After ovulation, the corpus luteum secretes progesterone to help maintain the endometrium.

39. B —Mast cell Explanation: Mast cells release histamine and other chemical mediators during immediate hypersensitivity reactions.

40. B —Small intestine Explanation: Villi and microvilli provide a large absorptive surface in the small intestine.

Botany

Answers + Explanations

41. B— Phloem Explanation: Phloem transports sucrose and other organic nutrients throughout the plant.
42. B— Root endodermis Explanation: The Casparian strip regulates water and solute movement into the root's vascular tissue.
43. C— Abscisic acid Explanation: Abscisic acid signals guard cells to close stomata, reducing water loss.
44. B— Oxaloacetate Explanation: PEP carboxylase fixes carbon dioxide into oxaloacetate, a four-carbon compound.
45. A— Nitrogenase Explanation: Nitrogenase reduces atmospheric nitrogen to ammonia.
46. B— Sporophyte Explanation: The diploid sporophyte produces haploid spores through meiosis.
47. B— A zygote and the primary endosperm nucleus Explanation: One male gamete fuses with the egg; the

other fuses with the polar nuclei to initiate endosperm formation.

48. A— Pericycle Explanation: Lateral roots arise endogenously from pericycle cells.
49. B— Oxygenase on RuBP Explanation: Oxygenation of RuBP by Rubisco initiates the photorespiratory pathway.
50. B— Chlorophyll reflects or transmits much of the green light Explanation: Chlorophyll absorbs red and blue wavelengths more strongly than green wavelengths.
51. A— Collenchyma Explanation: Collenchyma consists of living cells with unevenly thickened walls that support growing tissues.
52. B— Microspores Explanation: Microspores develop into pollen grains, which represent the male gametophyte stage.
53. B— Stigma Explanation: The stigma is the receptive surface for pollen during pollination.
54. B— In a ring Explanation: Dicot stems typically have vascular bundles arranged around the central pith.
55. B— Transpiration pull Explanation: Evaporation from leaves creates tension that pulls water upward through the xylem.
56. B— Thigmotropism Explanation: Thigmotropism is a directional growth response to touch.
57. A— Endosperm Explanation: The endosperm of cereal grains stores nutrients, especially starch.
58. B— Pinus Explanation: Pinus produces naked seeds on cone scales rather than enclosing them within fruits.
59. A— Guard-cell turgor Explanation: Water movement changes guard-cell turgor and therefore the stomatal aperture.
60. A— Cytokinin Explanation: Cytokinins promote cell division and can delay ageing in leaves.

61. B— Receptacle Explanation: The edible fleshy tissue is an enlarged receptacle; the small structures on its surface are individual fruits.
62. B— Tobacco mosaic Explanation: Tobacco mosaic disease is caused by tobacco mosaic virus.
63. A— Rhizobium Explanation: Rhizobium forms a symbiotic association with legume roots and fixes atmospheric nitrogen.
64. B— Gametophyte Explanation: Bryophytes have a dominant gametophyte, while their sporophyte remains attached and nutritionally dependent.
65. B— Vascular cambium and cork cambium Explanation: These lateral meristems produce secondary vascular tissues and protective periderm.
66. A— Root cap Explanation: The root cap protects the growing tip and also participates in gravity sensing.
67. B— Chloroplast stroma Explanation: The Calvin cycle uses ATP and NADPH to fix carbon dioxide in the chloroplast stroma.
68. B— Photoperiodism Explanation: Photoperiodism is a response to day and night length that can regulate flowering.
69. A— Companion cells Explanation: Companion cells provide metabolic support to sieve-tube elements and help in phloem loading.
70. B— Annual Explanation: Annual plants germinate, reproduce and die within one growing season.
71. A— Nitrate reductase Explanation: Nitrate reductase converts nitrate to nitrite during nitrogen assimilation.
72. B— Palisade mesophyll Explanation: Palisade mesophyll cells are specialized for capturing light and usually contain numerous chloroplasts.
73. B— Autogamy Explanation: Autogamy is self-pollination within the same flower.

74. B— Xylem Explanation: Xylem conducts water and dissolved minerals through the plant.
75. B— Mitosis Explanation: Mitosis usually maintains chromosome number and produces genetically similar daughter cells.
76. A— One egg and two synergids Explanation: The egg apparatus is located at the micropylar end of the embryo sac.
77. C— Parasitism Explanation: A parasite gains resources from a host while reducing the host's fitness.
78. A— Tuber Explanation: Potato tubers are modified stems with buds called eyes that can develop into new plants.
79. B— Guttation Explanation: Guttation releases liquid xylem sap through hydathodes, often during the night or early morning.
80. A— Initial carbon fixation occurs through PEP carboxylase Explanation: C4 plants initially fix carbon dioxide into a four-carbon compound using PEP carboxylase, helping reduce photorespiration.

Chemistry

Answers + Explanations

81. C— +6 Explanation: Hydrogen contributes +2 and oxygen −8 overall, so sulfur must be +6.
82. B— Azimuthal quantum number Explanation: The azimuthal quantum number lll determines the subshell and orbital shape.
83. B— Hydrogen Explanation: The metal displaces hydrogen from the acid, releasing hydrogen gas.
84. D— NaOH Explanation: Sodium hydroxide is a strong base that dissociates to produce hydroxide ions.

85. C— sp Explanation: Each carbon forms a triple bond and has linear sp hybridization.
86. B— Hydrogen bonding Explanation: Hydrogen bonds form between partially positive hydrogen atoms and lone pairs on neighbouring oxygen atoms.
87. B— Negative Explanation: An exothermic reaction releases heat, so the products have lower enthalpy than the reactants.
88. C— CH_3COOH and CH_3COONa Explanation: A weak acid and its conjugate base resist pH changes when small quantities of acid or base are added.
89. B— s^{-1} Explanation: The rate constant of a first-order reaction has units of inverse time.
90. B— Anode Explanation: Oxidation always occurs at the anode, while reduction occurs at the cathode.
91. C— Fluorine Explanation: Fluorine has the highest electronegativity on the Pauling scale.
92. B— Propanone Explanation: Propanone contains the $CH_3CO–$ group and gives a yellow precipitate of iodoform under suitable conditions.
93. B— 2-bromopropane Explanation: Markovnikov addition places bromine on the more substituted carbon.
94. B— –CHO Explanation: An aldehyde contains a terminal carbonyl group bonded to hydrogen.
95. A— Tollens' reagent Explanation: Aldehydes generally reduce Tollens' reagent to produce a silver mirror; ordinary ketones do not.
96. B— Pyridine Explanation: Pyridine is an aromatic six-membered ring containing one nitrogen atom.
97. B— Chloroethene Explanation: PVC is produced by addition polymerization of chloroethene, also called vinyl chloride.

98. B— Charles's law Explanation: At constant pressure, the volume of a fixed amount of gas is proportional to its absolute temperature.
99. B— Fewer gaseous molecules Explanation: According to Le Chatelier's principle, increased pressure favours the side with fewer moles of gas, if the numbers differ.
100. C— NH_4Cl Explanation: The ammonium ion reacts with water to produce hydronium ions, making the solution acidic.
101. B— 0.25 M Explanation: Molarity = moles ÷ volume in litres = 0.5 ÷ 2 = 0.25 M.
102. A— Lithium Explanation: Lithium has the most negative standard reduction potential among these alkali metals in aqueous solution.
103. C— Al_2O_3 Explanation: Aluminium oxide reacts with both acids and bases.
104. C— Functional group isomerism Explanation: Both have the molecular formula C_2H_6O, but ethanol is an alcohol and dimethyl ether is an ether.
105. A— Cold, dilute alkaline $KMnO_4$ Explanation: Under suitable conditions, potassium permanganate adds hydroxyl groups across a carbon-carbon double bond.
106. C— Electron Explanation: An electron has far less mass than a proton or neutron.
107. B— 18 Explanation: Maximum shell capacity is 2n22n^22n2, giving 2(3)2=182(3)^2=182(3)2=18.
108. B— Fractional distillation Explanation: A fractionating column permits repeated vaporization and condensation, improving separation.
109. C— Elevation of boiling point Explanation: Boiling-point elevation depends primarily on the number of dissolved solute particles.

110. C— Ethanoic acid Explanation: Vinegar is a dilute aqueous solution of ethanoic acid, also called acetic acid.
111. A— Bromine solution Explanation: Alkenes and alkynes commonly decolourize bromine solution through addition reactions.
112. B— BF_3 Explanation: Boron in BF_3 has three bonding pairs and no lone pair, giving a trigonal planar shape.
113. A— Iron Explanation: Finely divided iron catalyses the synthesis of ammonia from nitrogen and hydrogen.
114. B— They have the same protons but different neutrons Explanation: Isotopes are atoms of the same element with different numbers of neutrons.
115. C— Tert-butyl chloride Explanation: It can form a relatively stable tertiary carbocation, favouring the SN1 mechanism.
116. B— HPO_4^{2-} Explanation: Loss of one proton from $H_2PO_4^-$ forms HPO_4^{2-}.
117. B. Aluminium Explanation: Bauxite is the principal ore used to obtain aluminium.
118. C— Carbon dioxide Explanation: Carbon dioxide reacts with limewater to form insoluble calcium carbonate.
119. C— Sodium chloride Explanation: Sodium chloride dissociates almost completely into ions in water.
120. A— $CH_3COOCH_2CH_3$ Explanation: Esters contain the –COO– functional linkage; this compound is ethyl ethanoate.
121. A— Avogadro's law Explanation: At fixed temperature and pressure, gas volume is proportional to the number of moles.

122. B— A catalyst Explanation: A catalyst speeds up the forward and reverse reactions but does not change the equilibrium constant.
123. C— 3 Explanation: HCl ionizes almost completely, so H+≈10−3H+ \approx 10^{-3}H+≈10−3 M and pH is approximately 3.
124. A— Propan-1-ol Explanation: The carbon bearing the –OH group in propan-1-ol is attached to only one other carbon.
125. B— Iron Explanation: Ferrous iron in heme binds oxygen reversibly.
126. C— BF_3 Explanation: BF_3 can accept an electron pair because boron has an incomplete octet.
127. D— +7 Explanation: Potassium is +1 and the four oxygen atoms total −8, so manganese must be +7.
128. C— Solid melting to liquid Explanation: Melting generally increases molecular freedom and the number of accessible microstates.
129. C— Nylon-6,6 Explanation: Nylon-6,6 is formed from a diamine and a dicarboxylic acid with elimination of small molecules such as water.
130. C— It provides an alternative pathway with lower activation energy Explanation: A catalyst increases reaction rate without being consumed overall or changing the equilibrium constant.

Physics

Answers + Explanations

131. B— 7 m east Explanation: Taking east as positive, displacement = 12 − 5 = 7 m east.
132. B— Acceleration Explanation: Acceleration is the rate of change of velocity with time.

133. C— 6 N Explanation: From Newton's second law, F=ma=2×3=6F=ma=2\times3=6F=ma=2×3=6 N.
134. B— ML−1T−2ML^{-1}T^{-2}ML−1T−2 Explanation: Pressure = force/area, giving the dimensions ML−1T−2ML^{-1}T^{-2}ML−1T−2.
135. C— Zero Explanation: Gravity acts vertically, so the horizontal component of velocity remains constant.
136. C— Zero Explanation: Centripetal force is perpendicular to the instantaneous displacement, so it does no work.
137. C— Four times Explanation: Since KE=12mv2KE=\frac12mv^2KE=21mv2, doubling speed multiplies kinetic energy by four.
138. B— Watt Explanation: Power is the rate of energy transfer, measured in joules per second or watts.
139. C— Both momentum and kinetic energy Explanation: An elastic collision conserves both total momentum and total kinetic energy.
140. B— mghmghmgh Explanation: For small height changes near Earth's surface, the change in gravitational potential energy is mghmghmgh.
141. A— Force is proportional to extension Explanation: Within its elastic limit, spring force is proportional to displacement from equilibrium.
142. C— Length and gravitational acceleration Explanation: T=2πL/gT=2\pi\sqrt{L/g}T=2πL/g for small oscillations.
143. C— Radiation Explanation: Radiation transfers energy through electromagnetic waves and does not require a material medium.
144. A— 1 K Explanation: Specific heat capacity is the energy required per unit mass per kelvin of temperature rise.

145. B— Phase and internal energy without a temperature rise during the change Explanation: Latent heat changes the phase and molecular arrangement while the temperature remains approximately constant.
146. B— Double Explanation: Boyle's law states that pressure is inversely proportional to volume at constant temperature.
147. A— Absolute temperature increases Explanation: For a given gas, rms speed is proportional to the square root of absolute temperature.
148. C— Energy Explanation: It relates heat supplied, work done and the change in internal energy.
149. A— Increasing temperature Explanation: Under ordinary conditions, sound travels faster in warmer air.
150. C— 200 m/s Explanation: Wave speed v=fλ=50×4=200v=f\lambda=50\times4=200v=fλ=50×4=200 m/s.
151. C— Dispersion Explanation: Different wavelengths refract by different amounts in glass.
152. B— Real, inverted and the same size Explanation: The image forms at the centre of curvature and has the same size as the object.
153. B— +2 D Explanation: Lens power P=1/f=1/0.5=+2P=1/f=1/0.5=+2P=1/f=1/0.5=+2 dioptres.
154. B— From a denser to a rarer medium at an angle greater than the critical angle Explanation: Both the direction of travel and the angle of incidence must satisfy these conditions.
155. B— Coulomb Explanation: One coulomb is the charge transferred by a current of one ampere in one second.

156. C— 3 Ω Explanation: Two equal resistors in parallel have equivalent resistance R/2=3R/2=3R/2=3 Ω.
157. B— 6 Ω Explanation: By Ohm's law, R=V/I=12/2=6R=V/I=12/2=6R=V/I=12/2=6 Ω.
158. A— P=VIP=VIP=VI Explanation: Electrical power equals voltage multiplied by current; equivalent formulas include I2RI^2RI2R and V2/RV^2/RV2/R.
159. B— Concentric circles Explanation: The right-hand grip rule gives the circular direction of the magnetic field.
160. B— Lenz's law Explanation: The induced current acts in a direction that opposes the change in magnetic flux causing it.
161. B— Mutual induction Explanation: Changing current in the primary coil creates changing magnetic flux that induces voltage in the secondary coil.
162. B— Silicon Explanation: Silicon's electrical conductivity can be controlled through doping and applied electric fields.
163. B— Decreases Explanation: Forward bias lowers the potential barrier and narrows the depletion region.
164. B— Particle nature of light Explanation: The photoelectric effect is explained by light transferring energy in discrete photons.
165. B— Half the original undecayed nuclei to remain Explanation: After one half-life, half of the original radioactive nuclei remain undecayed.
166. C— +2e+2e+2e Explanation: An alpha particle is a helium nucleus containing two protons and two neutrons.
167. D— Gamma rays Explanation: Gamma rays occupy the highest-frequency and shortest-wavelength region among these options.

168. B— Momentum Explanation: The de Broglie relation is λ=h/p\lambda=h/pλ=h/p.
169. A— hc/λhc/\lambdahc/λ Explanation: Photon energy is E=hν=hc/λE=h\nu=hc/\lambdaE=hν=hc/λ.
170. C— Between the lens and its focal point Explanation: An object inside the focal length of a converging lens produces a virtual, erect and magnified image.
171. B— Zero Explanation: The force is F=qvBsin⁡θF=qvB\sin\thetaF=qvBsinθ; for parallel motion, θ=0∘\theta=0^\circθ=0∘.
172. C— Work Explanation: Work has magnitude but no direction, so it is a scalar.
173. B— 4 m/s Explanation: Momentum p=mvp=mvp=mv, so v=p/m=20/5=4v=p/m=20/5=4v=p/m=20/5=4 m/s.
174. C— Dimensionless Explanation: It is the ratio of frictional force to normal reaction, so the units cancel.
175. B— Useful output energy divided by input energy × 100% Explanation: Efficiency measures the fraction of input energy converted into useful output.
176. B— Concave lens Explanation: A diverging lens helps focus images of distant objects onto the retina in myopic eyes.
177. B— The same Explanation: A series circuit has only one path for current.
178. C— 1/r21/r^21/r2 Explanation: The electrostatic force is inversely proportional to the square of the distance between the charges.
179. B— Generator Explanation: A generator induces an electromotive force by changing the magnetic flux through a coil.

180. B— 9.8 m/s^2 Explanation: The standard approximate value of gravitational acceleration near Earth's surface is 9.8 m/s^2.

MAT

Answers + Explanations

181. C— 127 Explanation: Each number is multiplied by 2 and then increased by 1: 63×2+1=12763\times2+1=12763×2+1=127.
182. D— Cube Explanation: A cube is three-dimensional, while the other shapes are two-dimensional.
183. A— DBSF Explanation: C→D, A→B, R→S and E→F.
184. C— C Explanation: The height order is A > B > C.
185. B— Eat Explanation: A book is read, and food is eaten.
186. B— Friday Explanation: Seventeen days equal two weeks and three additional days. Tuesday plus three days is Friday.
187. C— 42 Explanation: The pattern is n(n+1)n(n+1)n(n+1): 1×2,2×3,3×4,…1×2, 2×3, 3×4,\ldots1×2,2×3,3×4,…. The next number is 6×7=426×7=426×7=42.
188. D— Carrot Explanation: Carrot is a root vegetable; the others are flowers.
189. B— 6 days Explanation: Total work = 5×12=605×12=605×12=60 worker-days. Therefore, 60÷10=660÷10=660÷10=6 days.
190. C— 90° Explanation: At 3:00, the minute hand points to 12 and the hour hand points to 3.
191. A— 2, 4, 3, 1 Explanation: The correct sequence is infant, child, adolescent and adult.

192. C— All roses are flowers Explanation: This conclusion is directly stated in the premise; the other conclusions are not guaranteed.
193. C— U Explanation: The letter-position increments are +2, +3, +4, +5 and then +6. O is the 15th letter, so 15 + 6 = 21, which is U.
194. C— South Explanation: The first right turn faces east; the second faces south.
195. C— Rs. 75 Explanation: Cost per pen = Rs. 120 ÷ 8 = Rs. 15. Five pens cost Rs. 75.
196. D— 45 Explanation: 16, 25 and 36 are perfect squares; 45 is not.**B** — From P > Q > R > S, P is greater than S.
197. B— Pressure Explanation: A thermometer measures temperature, while a barometer measures atmospheric pressure.
198. A— 4157 Explanation: D = 4, O = 15 and G = 7, giving 4157.
199. B— 2/5 Explanation: Probability = favourable outcomes ÷ total outcomes = 4/10=2/54/10=2/54/10=2/5.
200. A— Teacher : School Explanation: A hospital is a common workplace for a doctor, just as a school is a common workplace for a teacher.

__Best Wishes__