

“सबसुलभ र गुणस्तरिय शिक्षा, हाम्रो प्रतिबद्धता”

MECEE BL

MODEL EXAM SERIES - I

Date : 2083-06-19

Hints & Solutions



 9866142355

Zoology

1. c)
2. d) • Polar glutamine is replaced by non-polar valine in Hb Beta chain.
3. b) • Cardiac muscles are striated, Involuntary, Striped, Branched, Uninucleated.
4. d) • Brush border epithelium is found in Pct and small intestine
5. d)
6. b)
7. a) • Bacterial synthesize all three vitamin like vitamin K, B9, B12.
But on basis of synthesis, priority given is: Vitamin K > Vitamin B9 > Vitamin B12.
8. a) • Hormones are chemical messengers and are receptor mediated.
9. a) • Function of Loop of Henle's : Conservation of water , Counter current mechanism and Concentration of urine
10. a) • Muscular coordination is governed by Cerebrum
• Muscular Coordination is done by / Controlled by Cerebellum.
11. d)
12. b) • Menopause is caused by low level of estrogen which means permanent cessation of menstruation.
13. b) • Just after fertilization the events are ; Metabolic activation of eggs , Completion of second meiotic division and cleavage starts.
Cortical reaction:
 - This is also known as zona reaction.
 - This process takes place during fertilization.
 - In this process, the cortical granules were released.
14. b) Conical representation (Extension) of anterior surface of thyroid cartilage is Adam's Apple.
15. d) • Most common fiber is collagen fibers
16. a) • Eustachian tube is part of middle ear that connects middle ear with pharynx and equalizes the pressure.
17. a) • Worldwide female cancer- Breast cancer
• Most common type of cancer worldwide- Lung Cancer.
18. c) • Rejection is due to cytotoxic T-cells
• Rejection is suppressed by Suppressor T-cells.
19. d)
20. b) • Von Helmot-Theory of spontaneous generation
• Miller-carried out discharge experiment
• Haeckel-Gave biogenetic law with von bear.
21. b) • Australopithecus- Ancestor of man who stood erect.
22. c) • Most accurate method: Electron-Spin resonance method > Potassium argon method.
23. b) • Dorsal blood segments 14 onwards collected blood from intestine through dorso-intestinal and from sub-neurals through commissural vessel.

24. a)
25. a)
 - Septa-internal segmentation ,muscular partition present all over except first four and 9 and 10th segments.(Due to presence of large gizzard in 9th and 10th segment)
26. c)
 - Mucous glands are present in stratum spongiosum layer of dermis that makes skin slippery.
27. d)
 - Thyroxine promotes metamorphosis of frog.
28. b)
 - Oviduct collects ova from coelomic fluid and is most coiled structure.
29. b)
 - P.falciparum causes Malignant tertian malaria,Cerebral malaria,Black water fever,Severe malaria,Subtertian malaria.
30. d)
 - Erythrocytic cycle-Golgi cycle
 - Post-erythrocytic cycle-Ross cycle.
31. a)
 - Food vacuole of Amoeba is analogous to the alimentary canal of animal or gastrovascular cavity of hydra.
32. d)
 - Phylum porifera means pores bearing animal.
33. a)
34. c)
 - Cysticercus causes most severe form of bladderworm.
35. b)
 - Amphids-Olfactoreceptor>>Chemoreceptor
 - Phasmids-Chemoreceptor.
36. b)
37. c)
 - Water vascular system is exclusively character of Echinodermata.
38. a)
 - Birds are first vertebrates to have warm blood and body temperature is regulated(homiothermous).
39. b)
 - Darwin-Principle of Anthesis
 - Weisman-Theory of Germplasm
 - Spencer-1st game survival of fittest
40. a)
 - In Hemidactylus limbs have clawed digits which are provided with numerous small lamella.They produce suction by vacuum.

Botany

41. c) Endocytosis is the process where cells take in substances by engulfing them. Diffusion and osmosis are related to the movement of substances across membranes, but not bulk transport. Active transport requires energy to move substances against their concentration gradient.
42. c) The cytoskeleton provides structural support, enables cell movement, and facilitates the transport of materials within the cell. Protein synthesis is primarily carried out by ribosomes.
43. d) Lignin deposition in secondary wall makes the cell dead and impermeable.
44. d) The tonoplast is a single, semi-permeable membrane that surrounds the large central vacuole in a plant cell. It regulates the movement of ions and other substances into and out of the vacuole, helping maintain turgor pressure.
45. d) During the zygotene stage of prophase I in meiosis, homologous chromosomes pair up in a process called synapsis.

46. a)
47. a) The process by which an amino acid is attached to its specific tRNA with the help of ATP is called charging of tRNA or aminoacylation of tRNA. This is catalyzed by aminoacyl-tRNA synthetase.
48. a) A promoter is a DNA sequence where RNA polymerase binds to start transcription. It is present upstream of the gene and regulates the initiation of transcription
49. b) The 3:1 phenotypic ratio in the F₂ generation of a monohybrid cross is a direct result of the segregation of alleles during gamete formation. Each parent contributes one allele for a trait, which then segregate independently in the offspring.
50. a) Each birth is an independent event. The sex of previous children does not influence the probability of the next child's sex. The probability of having a boy or a girl is always 1/2.
51. c) Epistasis is a form of gene interaction where one gene (the epistatic gene) masks or suppresses the expression of another, non-allelic gene.
52. d) Allelomorphs, more commonly known as alleles, are different forms of the same gene. For example, the allele for tall plants and the allele for short plants are contrasting characters of the same gene for plant height.
53. c)
54. a) Pollinia are masses of pollen grains that are transferred as a single unit during pollination. They are a characteristic feature of plants in the family Asclepiadaceae (milkweeds) and Orchidaceae (orchids).
55. a)
56. c)
57. b) Interferons are proteins released by host cells in response to the presence of a virus. They signal other cells to heighten their antiviral defenses
58. a) A leaf primordium is initiated by the apical meristem, but the subsequent growth and expansion of the flattened leaf blade (lamina) are primarily driven by the mitotic activity of the marginal meristems, which are located along the edges of the young leaf.
59. c) The vascular cambium is a lateral meristem that produces secondary xylem (wood) toward the inside and secondary phloem toward the outside. As new secondary phloem is produced, it pushes the older layers outward, so the oldest secondary phloem is found outside the vascular cambium just inside primary phloem.
60. b) Exudation (also known as bleeding) is the process by which sap oozes out of a cut or damaged stem. It is caused by root pressure, a positive pressure generated in the roots that pushes water up the stem.
61. c) Glycolysis is the metabolic pathway that converts glucose into pyruvate. Fermentation then proceeds to convert pyruvate into products like lactic acid or ethanol.
62. c) In Moll's half-leaf experiment, a portion of a leaf is enclosed in a bottle with potassium hydroxide (KOH), which absorbs carbon dioxide. The part of the leaf in the bottle fails to perform photosynthesis and produce starch, proving that CO₂ is essential for photosynthesis.

63. b)
64. a) Insectivorous are green plant, have their own chlorophyll and can do photosynthesis. It traps insects to fulfill its nitrogen demand d)
65. d)
66. c)
67. b)
68. d) A temperate phage is a type of virus that can either undergo a lytic cycle (destroying the host cell) or a lysogenic cycle, where its DNA is incorporated into the host's genome without immediate destruction.
69. a)
70. a) The Bakanae disease, also known as "foolish seedling," is a fungal disease of rice caused by *Fusarium moniliforme*. The fungus produces excess gibberellins, causing the infected seedlings to grow abnormally tall and spindly.
71. a)
72. a)
73. d) Azolla is a genus of small, aquatic ferns often found floating on the surface of ponds and rice paddies. It has a symbiotic relationship with the nitrogen-fixing cyanobacterium *Anabaena*, making it a valuable biofertilizer.
74. b) The flower of Solanaceae family is more actinomorphic and slightly zygomorphic because of obliquely placed ovule.
75. d) Fructose is a monosaccharide with six carbon atoms (hexose) and a ketone group (ketose). Glucose is aldohexose
76. c) Loam soil is a mixture of sand, silt, and clay. This combination provides an optimal balance of good drainage, aeration, and water and nutrient retention, making it the most fertile and suitable type of soil for agriculture.
77. a) In-situ conservation is the protection of a species in its natural habitat (e.g., national parks, wildlife reserves). A gene bank is an example of ex-situ conservation, where genetic material is preserved outside the organism's natural environment.
78. b) Psammophytes are plants that are adapted to living in sandy habitats.
79. c)
80. a)

Chemistry

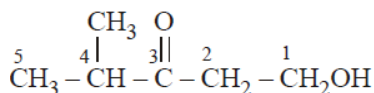
81. b) Cr(24): $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^5, 4s^1$
No of occupied orbitals = $1 + 1 + 3 + 1 + 3 + 5 + 1 = 15$.
82. c) Presence of heavy positive centre (nucleus) was established by Rutherford's experiment.
83. d) The geometry of IF₇ is pentagonal bipyramidal.
84. b) large cation and small anion favours ionic bond.
85. c) In Fe (CO)₅, O.N. of Fe is zero.
86. c) $\text{Cu}^{+2} + 2e \rightarrow \text{Cu}$

2.0 Faradays can deposit copper = 1 mol

2.5 Faradays can deposit copper = $\frac{2.5}{2} = 1.25$ mol.

87. c) $-\frac{2}{3} \frac{d[\text{H}_2]}{dt} = + \frac{d[\text{NH}_3]}{dt}$
88. c) A catalyst decreases the activation energy of the reaction so the rate of reaction increases.
89. a) $4\text{NH}_3(\text{g}) + 5\text{O}_2(\text{g}) \rightarrow 4\text{NO}(\text{g}) + 6\text{H}_2\text{O}(\text{l})$
4 mole + 5 mole $\rightarrow$ 4 mole + 6 mole
 $\Rightarrow$ 1 mole of NH_3 requires = $5/4 = 1.25$ mole of oxygen
90. a) 350-700 nm lies in visible region hence Balmer Series.
91. a)
92. d) The electronegativity of S is least among others hence H-S bond is least polar in nature.
93. a) $\frac{2}{1} = \sqrt{\frac{M_x}{16}} \therefore M_x = 64$
94. a) $\Delta H = \Delta E + P\Delta V$
95. a) $\therefore \Delta n = -1 \therefore K_p = 26 \times (0.0821 \times 523)^{-1} = 0.61 \text{ atm}^{-1}$
96. c)
 $\text{H}_2\text{CO}_3 \rightleftharpoons \text{H}^+ + \text{HCO}_3^- \rightleftharpoons \text{H}^+ + \text{CO}_3^{2-}$
 HCO_3^- can donate and accept H^+ .
97. b) Salt of strong acid and strong base give neutral solution (pH = 7). Hence such salts are not hydrolysed. pH = 7.
98. c) $\text{K}_3[\text{Co}(\text{NO}_2)_6]$, Let O.N. of Co be x then
 $3x(+1) + 1 \times (x) + 6 \times (-1) = 0 \therefore x = +3$
99. a) Salt bridge allows the flow of current by completing circuit. No current will flow and voltage will drop to zero, if salt bridge is removed.
100. a) For zero order reaction $t_{\text{completion}} = a/k$.
101. b) Brownian movement is random motion.
102. b) $\text{Zn} + \text{H}_2\text{SO}_4 \rightleftharpoons \text{ZnSO}_4 + \text{H}_2$
1 mole 1mole
Moles of H_2 produced $\frac{224}{22400} = 0.01$;
Moles of Zn required = 0.01
 $\therefore$ Amount of Zn = $65.39 \times 0.01 = 0.65 \text{ g}$
103. b) NaF due to its largest lattice energy has the highest melting point.
104. c)
105. a) Parke's process
106. b) Highly electropositive elements are obtained by electrolytic reduction.

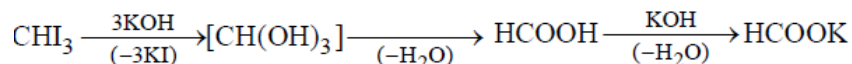
107. b) H_2S has lowest boiling point.
 108. c) FeCl_3 acts as oxidant and H_2SO_3 as reductant.
 109. c) The more the bond energy, the stronger is the bond.
 110. d) Only $\text{Cr}^{3+} [\text{Ar}]3d^3$ contains unpaired electrons hence will give coloured solution.
 111. d) Super conductors are derived from compounds of transition metals.
 112. a)



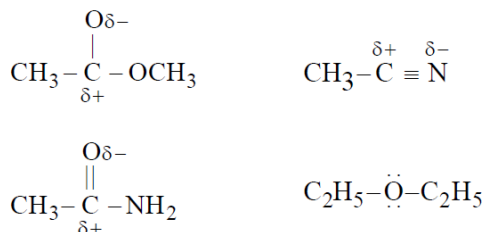
113. d)

$$\begin{array}{cccccc} 1 & 2 & 3 & 4 & 5 & 6 \\ \text{CH}_2 = & \text{CH} - & \text{CH}_2 - & \text{CH}_2 - & \text{C} \equiv & \text{CH} \end{array}$$

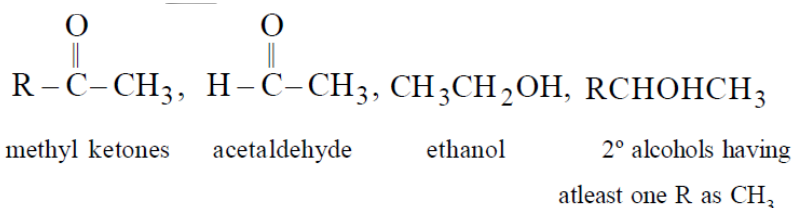
 114. c) There are four isomeric alcohols and three isomeric ethers corresponding to the formula $\text{C}_4\text{H}_{10}\text{O}$; $\text{CH}_3\text{OC}_3\text{H}_7\text{-n}$; $\text{CH}_3\text{OC}_3\text{H}_7\text{-iso}$ and $\text{C}_2\text{H}_5\text{OC}_2\text{H}_5$.
 115. d) 2,2,4-Trimethylpentane is the most branched hydrocarbon among the four given options.
 116. d) Addition of HBr on alkenes is an electrophilic reaction, hence more the number of electron-releasing groups on the double bond easier will be the addition.
 117. a) 2-Butyne ($\text{CH}_3\text{C}\equiv\text{CCH}_3$), being a non-terminal alkyne, does not have acidic hydrogen atom.
 118. d)
 119. c) Allylic bromination by NBS (free-radical reaction).
 120. c)



121. a) Phenol does not react with heated Cu at 300°C .
 122. c) Phenols are more acidic than alcohols, hence phenol and m-chlorophenol are more acidic than benzyl alcohol and cyclohexanol. Further due to $-\text{I}$ effect of Cl , negative charge is more dispersed than that in phenoxide, hence m-chlorophenoxide is more stable causing deprotonation of m-chlorophenol easier than that of phenol.
 123. d) Diethyl ether, being a Lewis base, is not attacked by nucleophiles, while all others contain electrophilic carbon, hence attacked by nucleophiles like OH^- ions.



124. a) $6\text{CH}_2\text{O} + 4\text{NH}_3 \rightarrow (\text{CH}_2)_6\text{N}_4 + 6\text{H}_2\text{O}$
 125. b) Iodoform test (haloform test) is given by following types of compounds



methyl ketones, acetaldehyde, ethanol, 2° alcohols having at least one R as CH₃ when these are treated with NaOH or KOH and halogen or with sodium or potassium hypohalites (NaOX)

126. b)
 127. b)
 128. a) CO₂ is not a ligand.
 129. c) The reagent that can be used to convert a >C=O group to -CH₂- is Zn(Hg)/HCl, which is used in the Clemmensen reduction reaction.
 130. b) The reaction results in a decrease in the amount of gas, so the entropy decreases.

Physics

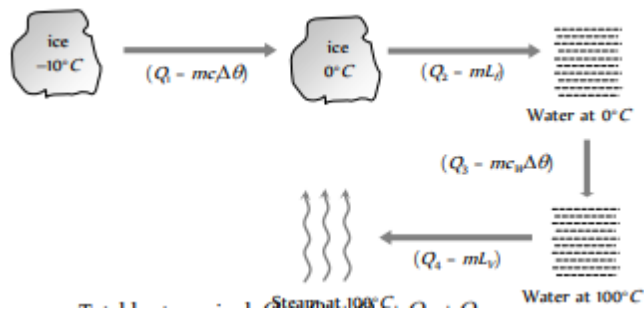
131. c) Stefan's law is $E = \sigma(T^4) \Rightarrow \sigma = \frac{E}{T^4}$ where, $E = \frac{\text{Energy}}{\text{Area} \times \text{Time}} = \frac{\text{Watt}}{\text{m}^2}$

$$\sigma = \frac{\text{Watt} - \text{m}^{-2}}{\text{K}^4} = \text{Watt} - \text{m}^{-2} \text{K}^{-4}$$

 132. c) Because acceleration is a vector quantity
 133. d) Inertia is that property of a body by virtue of which the body is unable to change by itself the state of rest and of uniform linear motion.
 134. d) $\mu = \frac{F}{R} = \frac{F}{mg} = \frac{98}{100 \times 9.8} = \frac{1}{10} = 0.1$
 135. b) Fractional loss in $E_K = \frac{m_2}{m_1 + m_2} = \frac{950}{50 + 950} = \frac{95}{100} \times 100\% = 95\%$
 136. b) $v_e = \sqrt{2gR}$ and $v_0 = \sqrt{gR} \therefore \sqrt{2} v_0 = v_e$
 137. d) For SHM displacement $y = a \sin \omega t$ and acceleration

$$a = \omega^2 y \sin \omega t \text{ these are maximum at } \omega t = \frac{\pi}{2}$$

 138. c) Shear modulus = $\frac{\text{Shear stress}}{\text{Shear strain}} = \frac{F/A}{\theta} = 0$
 139. a) The value of surface tension of a liquid at critical temperature is zero.
 140. d) $h = \frac{2T}{rdg} = \frac{2 \times 75}{0.005 \times 1 \times 10^3} = 30\text{cm}$
 141. a) $\frac{C}{5} = \frac{F - 32}{9} \Rightarrow \frac{t}{5} = \frac{t - 32}{9} \Rightarrow t = -40^\circ$
 142. a) Ice (-10°C) converts into steam as follows
 (c = specific heat of ice, c = specific heat of water)



Total heat required $Q = Q_1 + Q_2 + Q_3 + Q_4$

$$\Rightarrow Q = 1 \times 0.5(10) + 1 \times 80 + 1 \times 1 \times (100 - 0) + 1 \times 540 = 725 \text{ cal}$$

$$= 725 \times 4.2 \text{ J} = 3045 \text{ J}$$

143. d) Thermostat is used in electric apparatus like refrigerator, Iron etc for automatic cut off. Therefore for metallic strips to bend on heating their coefficient of linear expansion should be different.

144. c)
$$(C_V)_{\text{mix}} = \frac{\mu_1 C_{V1} + \mu_2 C_{V2}}{\mu_1 + \mu_2} = \frac{1 \times \frac{3}{2}R + 1 \times \frac{5}{2}R}{1 + 1} = 2R$$

$$\left((C_V)_{\text{mono}} = \frac{3}{2}R, (C_V)_{\text{di}} = \frac{5}{2}R \right)$$

145. c) Internal energy depends only on the temperature of the gas

146. d) For cooking utensils, low specific heat is preferred for its material as it should need less heat to raise its temperature and it should have high conductivity, because, it should transfer heat quickly.

147. b)
$$\mu = \frac{\sin i}{\sin A/2} \Rightarrow \sqrt{2} = \frac{\sin i}{\sin\left(\frac{60}{2}\right)} \Rightarrow \sqrt{2} \times \sin 30 = \sin i \Rightarrow i = 45^\circ$$

148. b) According to Rayleigh's law of scattering, intensity scattered is inversely proportional to the fourth power of wavelength. So red is least scattered and sun appears Red.

149. b)
$$\mu = \frac{c}{v} \Rightarrow \mu = \frac{c}{c/2} = 2 \text{ also for total internal reflection}$$

$$i > c \Rightarrow \sin i \geq \sin c \Rightarrow \sin i \geq \frac{1}{\mu}$$

$$\text{Hence } i \geq \sin^{-1}\left(\frac{1}{\mu}\right) \text{ or } i \geq 30^\circ$$

150. c)
$$\frac{I_1}{O} = \frac{v}{u} \text{ and } \frac{I_2}{O} = \frac{u}{v} \Rightarrow O^2 = I_1 I_2$$

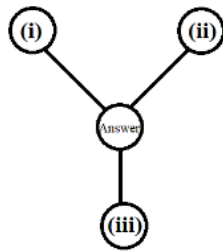
151. d)
$$\beta = \frac{\lambda D}{d} \Rightarrow \text{if } D \text{ becomes twice and } d \text{ becomes half so } \beta \text{ becomes four times}$$

152. d) When light is incident on a diffraction grating, the zero order principal maximum will be white only.

153. c) Phase difference = $\frac{2\pi}{\lambda} \times \text{path difference}$
 $\Rightarrow 1.6\pi = \frac{2\pi}{\lambda} \times 40 \Rightarrow \lambda = 50\text{cm} = 0.5\text{m}$
 $\Rightarrow v = n\lambda \Rightarrow 330 = 0.5 \times n \Rightarrow n = 660\text{Hz}$
154. c) Loudness depends upon intensity while pitch depends upon frequency.
155. b) Only odd harmonics are present.
156. c) $E_K = \text{workdone} = FS = qEy$
157. d) The dielectric constant of metal is infinite.
158. c) $C' = \frac{\epsilon_0 A}{d - t\left(1 - \frac{1}{k}\right)}$ $C = \frac{\epsilon_0 A}{d}$
 $d \gg t$ so $t = 0$
 $C' = \frac{\epsilon_0 A}{d} = C$
159. c) $v_d = \frac{J}{ne} \Rightarrow v_d \propto J$ (current density)
 $J_1 = \frac{i}{A}$ and $J_2 = \frac{2i}{2A} = \frac{i}{A} = J_1$; $\therefore (v_d)_1 = (v_d)_2 = v$
160. c) Resistance of 1 ohm group = $\frac{K}{n} = \frac{1}{3} \Omega$
This is in series with $\frac{2}{3} \Omega$ resistor
 $\therefore$ Total resistance = $\frac{2}{3} + \frac{1}{3} = \frac{3}{3} \Omega = 1\Omega$
161. c) $S = \frac{i_g G}{(i - i_g)} = \frac{1 \times 0.018}{10 - 1} = \frac{0.018}{9} = 0.002\Omega$
162. c) Resistance of carbon filament decreases with temperature while that of tungsten increases with temperature.
In series $P_{\text{consumed}} \propto R$ i.e. tungsten bulb will glow more brightly.
163. a) In adjoining loops of spring, the current being in the same direction, there will be attraction. Due to which the spring gets compressed.
164. c) A diamagnetic substance is repelled by both the North and South poles of the magnet.
165. a) For a straight conductor, $L = 0$ because its area of cross section is negligible.
166. a) $I = \frac{V}{R} = \frac{100}{10} = 10\text{A}$
Energy stored = $\frac{1}{2} LI^2 = \frac{1}{2} \times 5 \times 10^2 = 250\text{J}$
167. b) Power in a circuit is consumed only on account of resistance which must be zero for wattless current.

168. c) Higher the voltage, higher is the KE. Higher the work function, smaller is the KE.
169. a) $mvr = \frac{nh}{2\pi}$ According to Bohr's theory
 $\Rightarrow 2\pi r = n\left(\frac{h}{mv}\right) = n\lambda$ for $n = 1, \lambda = 2\pi r$
170. c) $E = hv \Rightarrow v = \frac{E}{h} = \frac{66 \times 1.6 \times 10^{-19}}{6.6 \times 10^{-34}} = 16 \times 10^{15} \text{ Hz}$
171. c) $K_{\max} = \frac{hc}{\lambda} - W_0 = \frac{6.4 \times 10^{-34} \times 3 \times 10^8}{6400 \times 10^{-10}} - 1.6 \times 10^{-19} = 1.4 \times 10^{-19} \text{ J}$
172. b) $\lambda_{\min} = \frac{hc}{eV}$ where h, c and e are constants.
Hence $\lambda_{\min} \propto \frac{1}{V}$
173. b) Energy required to knock out the electron in the n orbit
 $= + \frac{13.6}{n^2} \text{ eV} \Rightarrow E_3 = + \frac{13.6}{9} \text{ eV}$
174. d)
175. a) In a full wave rectifier, two diodes work alternately.
176. b) NAND and NOR gate are called universal gates primarily because they can be combined to produce OR, AND and NOT gates.
177. d) Fixed or immobile ions gives rise to depletion layer.
178. c) Venus appears brighter as it is nearest to the earth and the light of sun reflected from sun reaches earth with greater intensity.
179. b)
180. a) Gravitational force is the weakest fundamental force.
- MAT**
181. c) Reptile's example is lizard and Daisy is an example of Flower.
182. b) Here, we can break the sequence into 2/2 alphabets each where two are in order and other two are in reverse order as following: X, W $\leftarrow$, Y, Z $\rightarrow$, B, A $\leftarrow$, C, D $\rightarrow$, F, E $\leftarrow$ Thus, the correct option will be b.F.
183. b)
184. c) all are different professions.
185. d)
186. b) If R's speed be X , Q's speed $3x$, P's speed $= 6x$ ratio of speed of P and R = $6 : 1$.
 $\Rightarrow 42y = 61 = y = 7 \text{ minute}$
187. c) Except 14, all others are odd number.
188. d) 0 heads: TTT $\rightarrow$ 1 outcome, 1 head: HTT, THT, TTH $\rightarrow$ 3 outcomes, 2 heads: HHT, HTH, THH $\rightarrow$ 3 outcomes, Total favorable = $1 + 3 + 3 = 7$ outcomes. Probability (at most 2 heads) = $\frac{\text{favorable outcomes}}{\text{total outcomes}} = \frac{7}{8}$

189. b) Use option verification method, The required number is 24.
 190. d) use option verification method.
 191. b) $R_3 = 2R_2 - R_1$
 192. d) second and fourth letters are constant but first and third letters are 2 step for each consecutive terms.
 193. c) Centered number = bottom number $\times$ (sum of other two numbers)
 194. b) Sum of positional values of vertically opposite letters is 17.
 195. b) The pattern is : -2,-5,-2,-5,-2, ...
 196. a) The common part from (i) and (ii) figures and common part of (i) and (iii) figures are taken to make the answer figure.



197. d)
 198. d)
 199. a)
 200. d) Except figure (4), others have 2 black and 2 white boxes.

==== Best of Luck =====