

“सर्वसुलभ र गुणस्तरिय शिक्षा, हाम्रो प्रतिबद्धता”

MECEE BL

MODEL EXAM SERIES - IV

Date : 2083-06-22

Hints & Solutions



 9866142355

Zoology

1. a)
2. a) Mast cells are modified basophils cells of blood which secretes heparin ,histamine and serotonin
3. a) Hyaline cartilage is most abundant type of cartilage.Eg:costal cartilage,articular cartilage.reticular cartilage and embryonic cartilage
Elastic cartilage-With elastic fibers .Eg:Epiglottis,Ear pinna,Eustachian tube
Fibro cartilage-strongest cartilage .Eg:intervertebral discs and pubic symphysis.
4. b)
5. c) One systole+One diastole=cardiac cycle
6. c) Main site for deamination and detoxification is liver.
7. d) Vitamin E>Vitamin C>VitaminA.
8. b) Pineal gland regulates both skin color and circadian rhythm with release of melatonin.
9. d) ADH is concerned with water absorption.
10. d)
11. c)
12. b)
13. b)
14. d) Blastomeres consists of macro and micromeres both.
15. c) Sigmoid curve-hemoglobin saturation
Hyperbolic curve- Myoglobin.
16. a) Bowman's glands are present in olfactory membrane/Schneiderian membrane.
17. a)
18. c) B-Lymphocytes are responsible for humoral immunity.
T- Lymphocytes are responsible for cell mediated immunity.
19. b) Survival of fittest-First used by spencer
Natural selection-Darwin
Mutation theory-Hugo de vries.
20. c)
21. d)
22. d) Father of modern applied ideas of evolution :Buffon
Evolution term first used :Charles Bonnet
Father of concept of Evolution: Empedocels.
23. b) A cocoon of earthworm contains many fertilized eggs but only one zygote undergoes further development while other serves as nurse cells.
24. d) Nephridia extracts water and excretory substances from both blood and coelom by ultrafiltration.

25. b) In 14th segment, mid ventrally.
26. a) Sporogony-Stomach wall of mosquito
RBCs-Erythrocytic cycle
Liver-Pre-erythrocytic cycle
27. b) Schizonts give RBC merozoites which are released in blood along the hemozoin with bursting of RBC.
28. d) Lower jaw is devoid of teeth.
29. b) Frog has two venous system : Renal portal system and Hepatic portal system.
30. a) Vasa efferentia arises from testis and joins Bidder's canal in kidney and finally opens into urinogenital duct.
31. b) Pseudopodia is commonly found in WBCs and Protozoans.
32. b) Fertilization is cross and internal only.
33. b) Sea lily-Antedon
Sea pen-Pennatula
Sea feather-Pennatula
Sea mouse- Aphrodite.
34. d)
35. b) Excretory pore is situated midventrally little behind the mouth.
36. d) Trochophore larva is found in Annelida and Mollusca.
37. d) Biting, Chewing and Cutting type-Cockroach
Chewing and lapping type-Bees and Wasps
Piercing and sucking type-Bugs, Apids, Mosquitoes
Sponging type-Housefly
Siphoning type-Butterflies and Moths
38. c) Marsupials belongs to metatheria(pouched mammals).
39. a) Latitudinal migration.eg: Golden plover
40. a) Prehensile(grasping) tail has commonly syndactyly which is present in Chameleon.

Botany

41. d) Tracheophytes includes all plants having vascular tissues like ferns (club moss, spike moss), gymnosperms and angiosperms.
42. c) The putrefying bacteria are protein decomposing bacteria. The process of breakdown of protein into simplest molecules is called putrefaction.
43. a) WM Stanley (1935) first crystallized tobacco mosaic virus (TMV).
44. d) Mycoplasma have bacterial cell without cell wall and also called joker of plant kingdom.
45. a) Meiosis in zygote (zygotic meiosis) is common character of algae and fungi. In *Spirogyra*, meiosis takes place after karyokinesis in zygospore.

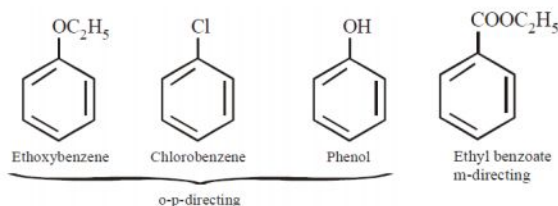
46. a) Dolipore and clamp connections are present in cellular septa of members of Basidiomycetes and few members of Ascomycetes.
47. c) Bryophytes have dependent sporophyte and independent gametophyte. Vascular tissues, root, stem and leaf are also absent in algae and fungi.
48. c) Indusium is kidney shaped sterile structure present on sporophyll of fern which covers sporangia or sorus.
49. d) The pollen grains of *Cycas* and *Pinus* dehiscence at the time of 3 celled and 4 celled stage respectively.
50. c) The climbing tendrils of *Vitis*, *Cucurbita* are modified stems.
51. c) The *Delonix regia* belongs to pea family Fabaceae.
52. c) Flow of minerals in ecosystem is cyclic and closed. It starts from soil or atmosphere and ultimately reaches to soil or atmosphere through mineralization.
53. b) Food chain is the transfer of energy in the form of food from one trophic level to other by eating and being eaten by others from producer to decomposer.
54. b) Pyramid of number is always upright or erect in grassland, forest, pond, lake ecosystem and inverted in tree ecosystem, unstable ecosystem and desert ecosystem, etc.
55. c) Succession is the progressive replacement of plant communities from pioneer to climax community through seral community.
56. a) Pond is shallow fresh water aquatic ecosystem.
57. a) Maximum hydrolytic enzymes are found in organelles like lysosomes and sphaerosomes and catabolic enzymes are found in mitochondria.
58. c) The process of non-separation of homologous chromosome during anaphase I is non-disjunction and separation is disjunction.
59. d) Usually plant cell is made from cellulose which is homopolymer of glucose.
60. b) RNA is polymer of four types nucleotides. Each nucleotide composed of ribose sugar ($C_5H_{10}O_5$), phosphate group and nitrogen bases.
61. b) The polygenic inheritance of two genes produce 5 phenotypes determined by amount of genes in the ratio of 1:4:6:4:1 (single character with several genes).
62. c) Unwindase is the enzyme involved in DNA replication for uncoiling of strands.
63. d) *Drosophila* of plant kingdom is *Neurospora* which is widely used in genetic researches.
64. c) Histone proteins are basic protein associated with DNA for packaging.
65. d) Genetic code is triplet set of nucleotides responsible for coding single amino acid.
66. a) The RNA polymerase reads the template DNA strand in the direction 3' to 5' direction. But the messenger RNA is formed in the 5' to 3' direction. So, the correct option is '5'→3''
67. c) Transfer RNA (tRNA) is also called soluble RNA due to scattering nature in cytoplasm.
68. c) Only single AABB will be produced from selfing of AaBa as in dihybrid cross out of 16 combinations.
69. b) In radial vascular bundles, both xylem and phloem elements are present on different radii without cambium (closed) and found in roots.

70. d) The CO_2 is anti-transpirant which decreases the rate of transpiration, so passive absorption will be decreased when its concentration is increased.
71. c) Photorespiration is metabolic wastage of plants in which RuBP takes atmospheric O_2 instead of CO_2 and produced phosphoglycolic acid (2C), so also called C_2 cycle.
72. c) Anthocyanin and anthoxanthin are the pigments found in vacuoles not in chloroplasts.
73. c) Complete oxidation of single glucose molecule produce 36 ATP (eukaryotes) or 38 ATP (prokaryotes).
74. a) NADP is the terminal electron and proton acceptor during non-cyclic photophosphorylation.
75. d) Natural kinetins (cytokinin) are found in endosperm of coconut (coconut milk) and maize (zeatin) and also called phytoakinin.
76. b) Nucellus may remain as it is even after fertilization and called perisperm.
77. a) After pollination, pollen grain divides further and becomes 3-celled stage representing mature male gametophyte.
78. d) Nuclease enzymes are also called genetic scalpel or molecular scissors and used to cut DNA segments.
79. b) Vaccines are special antigens which activate immune system for synthesis of antibodies against specific pathological agent.
80. c) Tissue culture is widely used to produce clones, mass propagation and micropropagation.

Chemistry

81. a) Bauxite ore of aluminium is $\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$.
82. a) These are called ores.
83. c) Oxygen is the most abundant element in the earth's crust.
84. d) Froth floatation process is used for the concentration of sulphide ores.
85. c) Electromagnetic separation is used in the concentration of cassiterite.
86. d) The oxides of nitrogen being acidic in nature are soluble in KOH which is an alkali.
87. b) $(\text{NH}_4)_2\text{Cr}_2\text{O}_7 \rightarrow \text{N}_2 + \text{Cr}_2\text{O}_3 + 4\text{H}_2\text{O}$
green
88. b) Red P does not react with NaOH to give PH_3 .
89. d) $\text{K}_2\text{Cr}_2\text{O}_7 + \text{H}_2\text{SO}_4 + 3\text{SO}_2 \rightarrow \text{K}_2\text{SO}_4 + \text{Cr}_2(\text{SO}_4)_3 + \text{H}_2\text{O}$
Green
90. a) $2\text{FeCl}_3 + \text{SO}_2 + 2\text{H}_2\text{O} \rightarrow 2\text{FeCl}_2 + \text{H}_2\text{SO}_4 + 2\text{HCl}$
91. c) U.V rays are absorbed by O_3
92. b) Bohr's model could explain spectrum of hydrogen atom and hydrogen-like species such as He^+ , Li^{2+} , etc.
93. d) Since transition metals can lose electrons from $(n - 1) d$, ns orbitals hence they are valence orbitals.
94. a) Green vitrol is $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$.

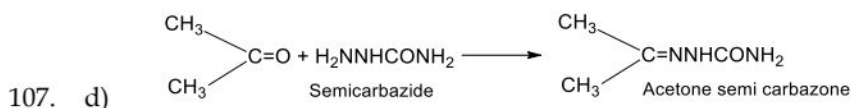
95. d) Alumina provides quick setting of cement and lowers the clinkering temperature but if present in excess lowers the strength.
96. d) p-Dichlorobenzene, being symmetrical, fits closely in the crystal lattice and hence will have the highest melting point
97. c) To produce electrophile.
98. c)



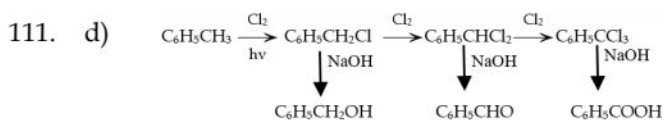
99. c) Due to strong -R effect, -COOR is deactivating group, while all others are activating groups. Recall that all m - directing groups are deactivating groups.
100. a) The +ve inductive effect of CH₃ group on carbanions intensifies negative charge on C⁻ centre and thus, 3^o carbanion is more reactive.
101. a) Follow Saytzeff rule for elimination. 3-halopentane will give only pentene-2.
102. d) CH₃CHClCOOH contains asymmetric carbon atom.
103. d) Essential oil are extracted by steam distillation.
104. d) Ozonolysis of these two produces different products.
105. c) Terminal alkynes are acidic



106. a) Power alcohol is used to generate power.



108. a) Solubility of organic compounds in water decreases with mol. wt. due to increasing hydrophobic character of alkyl or aryl gps.
109. a) Notice + IE of alkyl group which intensifies the -ve charge on carboxylate ion and thus, makes it more reactive. The acid therefore becomes more stable.
110. b) Only primary amines give carbylamine reaction.



112. d) A glyceraldehyde is an ester of glycerol with fatty acids
113. d) Chloramphenicol
114. c) EA increases along the period. N having stable configuration has least EA.
115. b) $2\text{SO}_3 \rightleftharpoons 2\text{SO}_2(\text{g}) + \text{O}_2(\text{g})$
- | | | | |
|---|---|---|---------------|
| 1 | 0 | 0 | Initial moles |
|---|---|---|---------------|

- 0.5 0.5 0.25 Equilibrium moles
0.5/2 0.5/2 0.25/2 Active mass
- $$K = \frac{[\text{SO}_2]^2[\text{O}_2]}{[\text{SO}_3]^2} = \frac{(0.5/2)^2(0.25/2)}{(0.5/2)^2} = 0.125$$
116. a) $K_{sp} = 4s^3 = 1.7 \times 10^{-10}$, $s = 5.5 \times 10^{-4}$
For others $K_{sp} = s^2$
117. d) In CH_3NH_2 there is a lone pair of electrons on N. All others are Lewis acids.
118. b) Colloidal particles move either towards cathode or towards anode under the influence of applied electric field which is called Electrophoresis.
119. d) ${}_{83}^{213}\text{Bi} \xrightarrow{-(\frac{4}{2}\text{He})} {}_{81}^{209}\text{Tl} \xrightarrow{-(\frac{1}{0}\text{e})} {}_{82}^{209}\text{Pb}$
120. c) According to Hess's law, $\Delta H_{\text{hyd.}} \text{ of } \text{BaCl}_2(\text{s}) = \Delta H_{\text{soln.}}(\text{BaCl}_2) - \Delta H_{\text{soln.}}(\text{BaCl}_2 \cdot 2\text{H}_2\text{O})$
121. c) Properties of the system which depends upon the quantity of matter contained in it is called extensive properties. Examples are: *mass, volume, energy, heat, capacity, enthalpy, entropy, free energy*, etc.
122. b) $u_{\text{CO}_2} = \sqrt{\frac{3RT_1}{44}}$ $u_{\text{N}_2} = \sqrt{\frac{3RT_2}{28}}$
 $\sqrt{\frac{3RT_1}{44}} = \sqrt{\frac{3RT_2}{28}}$ or $\frac{3RT_1}{44} = \frac{3RT_2}{28}$
 $T_2 = \frac{T_1 \times 28}{44} = \frac{294 \times 28}{44} = 187.1 \text{ K}$
123. c) When electrons are trapped in the crystal lattice in place of anion vacancy, the defect in the crystal is known as F - center.
124. a) H atoms in 0.4 mol of $\text{H}_2\text{S} = 2N_A \times 0.4 = 0.8 N_A$
125. b) Apply law of multiple proportions, the ratio of masses of oxygen which combine with same mass of M will be 2 : 3. Hence the formula of 2nd oxide will be M_2O_3 .
126. d) From Arrhenius equation, $k = Ae^{-E_a/RT}$
 $\ln k = \ln A - \left(\frac{E_a}{R}\right) \frac{1}{T} \Rightarrow \ln k = \left(-\frac{E_a}{R}\right) \frac{1}{T} + \ln A$
127. b) The balanced equation is, $\text{Cr}_2\text{O}_7^{2-} + 6\text{Fe}^{2+} + 14\text{H}^+ \rightarrow \text{Cr}^{3+} + 6\text{Fe}^{3+} + 7\text{H}_2\text{O}$
128. c) $\text{Ag}^+ + 1\text{e}^- \rightarrow \text{Ag}$. Number of moles of electron = number of faradays.
129. d) H_2O_2 has an open book like structure with each O atom assuming sp^3 hybridisation.
130. c) The unpaired electron in chlorine is in $3p$ subshell. For $3p$ subshell, $n = 3$ and $l = 1$.

Physics

131. d) $[h] = [\text{Angular momentum}] = [\text{ML}^2\text{T}^{-1}]$
132. a) When two particles move towards each other then

$$v_1 + v_2 = 6 \dots\dots (i)$$

When these particles moves in the same direction then

$$v_1 - v_2 = 4 \dots\dots (ii)$$

By solving $v_1 = 5\text{m/s}$ and $v_2 = 1\text{ m/s}$

133. b) $\vec{F} = \frac{d\vec{p}}{dt}$ = rate of change of momentum

As balls collide elastically hence, rate of change of momentum of ball = $n[\mu - (-\mu)] = 2m\mu$ i.e. $F = 2m\mu$

134. c) When work is done on a body by an external force, it's both kinetic and potential energies may increase.

135. a) $E = \frac{P^2}{2m}$ if $P = \text{constant}$ then $E \propto \frac{1}{m}$

136. c) $\frac{v_p}{v_e} = \sqrt{\frac{g_p}{g_e} \times \frac{R_p}{R_e}} = \sqrt{2 \times 2} = 2 \Rightarrow v_p = 2 \times v_e = 2 \times 11.2 = 22.4\text{ km/s}$

137. d) $U = \frac{1}{2} \left(\frac{YA}{L} \right) l^2 \therefore U \propto l^2$

$$\frac{U_2}{U_1} = \left(\frac{l_2}{l_1} \right)^2 = \left(\frac{10}{2} \right)^2 = 25 \Rightarrow U_2 = 25U_1 \text{ i.e. potential energy of the spring will be } 25U$$

138. d) Let x be the point where $KE = PE$

$$\text{Hence } \frac{1}{2} m\omega^2(a^2 - x^2) = \frac{1}{2} m\omega^2 x^2 \Rightarrow 2x^2 = a^2 \Rightarrow x = \frac{a}{\sqrt{2}} = \frac{4}{\sqrt{2}} = 2\sqrt{2}\text{ cm}$$

139. c) Force on each side = $2TL$

(due to two surfaces)

$$\therefore \text{Force on the frame} = 4(2TL) = 8TL$$

140. a) $Av = \text{constant}$

$$v \propto \frac{1}{A}, \text{ since } A = \text{min}, v = \text{max}$$

$$P + \frac{1}{2} \rho v^2 = \text{constant}$$

Since $v = \text{max}$, $P = \text{least}$

141. c) $\frac{F - 32}{9} = \frac{K - 273}{5} \Rightarrow \frac{F - 32}{9} = \frac{0 - 273}{5}$

$$\Rightarrow F = -459.4^\circ\text{F} \approx 460^\circ\text{F}$$

142. d) Since, the coefficient of linear expansion of brass is greater than that of steel. On cooling, the brass contracts more, so, it get loosened.

143. d) $W = JQ$

$$\Rightarrow W = 4.2 \times 200 = 840\text{ J}$$

144. d) Heat always refers to energy in transit from one body to another because of temperature difference.
145. c) For isothermal process $PV = \text{constant}$
 $\Rightarrow \left(\frac{dP}{dV}\right) = \frac{-P}{V} = \text{slope of isothermal curve}$
 For adiabatic $PV^\gamma = \text{constant}$
 $\Rightarrow \frac{dP}{dV} = \frac{-P}{V} = \text{slope of adiabatic curve}$
 Clearly, $\left(\frac{dP}{dV}\right)_{\text{adiabatic}} = \gamma \left(\frac{dP}{dV}\right)_{\text{isothermal}}$
146. d) In steady state there is no absorption of heat in any position. Heat passes on or is radiated from its surface. Therefore, in steady state the temperature of the body does not change with time but can be different at different points of the body
147. a) A convex lens Converges light rays
148. a) $\mu = \frac{\sin\left(\frac{A + \delta_m}{2}\right)}{\sin(A/2)} = \frac{\sin 45^\circ}{\sin 30^\circ} = \sqrt{2}$
149. d) $r = \frac{h}{\sqrt{\mu^2 - 1}} = \frac{12}{\sqrt{\left(\frac{4}{3}\right)^2 - 1}} = \frac{12 \times 3}{\sqrt{16 - 9}} = \frac{36}{\sqrt{7}} \text{ cm}$
150. a) $P = P_1 + P_2 = 12 - 2 = 10\text{D}$
 $f = \frac{1}{P} = \frac{1}{10} \text{ m} = \frac{100}{10} \text{ cm} = 10\text{cm}$
151. b) In interference energy is redistribution
152. c) It is caused due to turning of light around corners.
153. a) Beats period $= \frac{1}{30 - 20} = 0.1 \text{ sec}$
 $\Delta\phi = \frac{2\pi}{T} \Delta t = \frac{2\pi}{0.1} \times 0.6 = 2\pi \times 6 = 12\pi \text{ or zero}$
154. b) $v = 330\text{m/s}$; $n = 165 \text{ Hz.}$
 Distance between two successive nodes $= \frac{\lambda}{2} = \frac{v}{2n} = \frac{330}{2 \times 165} = 1\text{m}$
155. d) No change in frequency
156. c) $1.6 \times 10^{-19} \text{ Coulomb.}$ All other charges are its integral multiple.
157. c) A movable charge produces electric field and magnetic field both.
158. a) $\frac{1}{C_s} = \frac{1}{3} + \frac{1}{9} + \frac{1}{18} = \frac{1}{2} \mu\text{F}$ $C_s = 2\mu\text{F}$
 $C_p = 3 + 9 + 18 = 30\mu\text{F}$ $\frac{C_s}{C_p} = \frac{2}{30} = 1:15$

159. b) Because as temperature increases, the resistivity increased and hence the relaxation time decreases for conductors $\left(r \propto \frac{1}{\rho}\right)$
160. c) To convert a galvanometer into an ammeter a low value resistance is to be connected in parallel to it called shunt.
161. d) $I = \frac{E}{R + r}$
 $I \approx \frac{E}{R}$ so, $R + r \approx r$ i.e. internal resistance must be very large as compared to load resistance.
162. d) Resistance of the bulb = $\frac{V^2}{P_{\text{rotate}}} = \frac{220 \times 220}{100} = 484\Omega$
 When connected with no V, the power consumed
 $P_{\text{consumed}} = \frac{V^2}{R} = \frac{110 \times 110}{484} = 25W$
163. b) For charge particles, if they are moving freely in space, electrostatic force is dominant over magnetic force between them. Hence due to electric force they repel each other.
164. b) $\theta = \frac{NiAB}{C} \Rightarrow \theta \propto N$ (number of turns)
165. d) A line passing through places having zero value of magnetic dip is called Aclinic line.
166. b) To induce an e.m.f. in a coil, the linking magnetic flux can either increase or decrease.
167. a) In a pure inductor (zero resistance), voltage leads the current by 90 i.e. $\pi / 2$
168. d) $qE = mg \Rightarrow mg = \frac{qV}{d}$
169. b) $\lambda = \frac{h}{\sqrt{2mE}} \Rightarrow E = \frac{h^2}{2m\lambda^2} = \frac{(6.6 \times 10^{-34})^2}{2 \times 9.1 \times 10^{-31} \times (0.3 \times 10^{-9})^2} = 2.65 \times 10^{-18}J = 16.8eV$
170. d) Greater the number of electrons striking the anode, larger is the number of X-ray photons emitted.
171. d) Bohr radius $r = \frac{\epsilon_0 n^2 h^2}{\pi Z m e^2}$; $\therefore r \propto n^2$
172. d) $\Delta m = \frac{2.23}{931} = 0.0024$
173. c) Average life = $\frac{1}{\lambda} = \frac{1600}{0.693} = 2308$ years
174. b) Since $n_e > n_h$; the semiconductor is N-type.
175. c) N-type semiconductors are neutral because neutral atoms are added during doping.
176. b) Filter circuits are used to get smooth dc. π -filter is the best filter.
177. c) In reverse bias no current flows
178. c)
179. d) Gluons

180. d) According to the pulsating theory the expansion and contraction of the universe repeats after every 80 billion years.

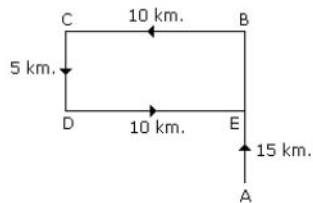
MAT

181. c) Net ascent of the Ant in 1 hour = (30 - 20) feet = 10 feet. So, an Ant ascends 70 feet in 7 hours i.e. till 5 p.m. Clearly, in the next 1 hour i.e. till 6 p.m. the ant ascends remaining 30 feet to touch the flag.
182. a) Only one such symbol is there in the given arrangement. It is **4@5**.
183. d)
184. a) $1000 \times 85\% = 850$
185. b) Father's wife $\rightarrow$ mother. Hence, the daughter of the mother means sister and sister's younger brother means brother. Therefore, the boy is the brother of Robin.
186. d) The correct order is :

Infant Child Adolescent Adult Old Death

1 5 4 3 2 6

187. b) In all other groups, the first and second letters occupy the same position (from the beginning and the end respectively). The second letter is moved one step backward to obtain the third letter.
188. d) Page is in Chapter and Chapter is in book.
189. c)



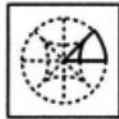
Therefore, it is clear that he is in the North from his house.

190. d) Corresponding word coding.
191. c) Sum of opposite letters=25
192. a) The day before yesterday was two days ago; the day after the day before yesterday was yesterday; two days after that (yesterday) is tomorrow.
193. c) Let no. of spade= x , then diamonds=2x. diamonds+hearts=6 $\Rightarrow$ diamonds =2 then spades=1, Club= 7-1=6
194. a) Using the concept of $d = vt$.
195. c) Let there be x pupils in the class.

$$\text{Total increase in marks} = \left(x \times \frac{1}{2} \right) = \frac{x}{2}$$

$$\therefore \frac{x}{2} = (83 - 63) \Rightarrow \frac{x}{2} = 20 \Rightarrow x = 40$$

196. a) From figure analysis: Black circle=F, single star=X, three star=Z.
197. a) $6+6-1+9$
198. c) Pattern: +15,+17,-19,-21,+23,+25, ...
199. b)



200. c) From figure (i) and (ii), there is two faces common then rest faces are opposite of each other.

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