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IOM

Model Entrance Exam

2075

Day Shift

(Set-XII B)

Date: 2075/04/19

Hints and Solutions

NAME

Solutions for IOM Model Entrance Exam set -XII B (2075-04-19)

Physics

1. c) [Torque] = [Potential energy] = [ML²T⁻²]
2. a) Displacement = $\sqrt{3^2 + 4^2 + 5^2} = \sqrt{50} = 5\sqrt{2}$ m
3. c) $R_1 = \frac{u^2 \sin 2\theta}{g}$ $R_2 = \frac{u^2 \sin 2(90^\circ - \theta)}{g} = \frac{u^2 \sin 2\theta}{g}$
 $R_1 = R_2$

4. a) Stopping distance $\propto u^2$
 $\frac{s_2}{s_1} = \left(\frac{u_2}{u_1}\right)^2 = \left(\frac{80}{40}\right)^2 = 4$ $s_2 = 4s_1 = 4 \times 2 = 8$ m

5. a)

6. b) $T = 2\pi\sqrt{\frac{R}{g}} = 84.6$ min

Hence, time to reach the ball from one end to the other end of the tunnel t
 $= \frac{T}{2} = \frac{84.6}{2} = 42.3$ min

7. a)

8. a) $\lambda_m \propto \frac{1}{T}$ $\frac{T_1}{T_2} = \frac{\lambda_{m2}}{\lambda_{m1}} = \frac{4800}{3500} = \frac{4}{3}$

9. b)

10. c)

11. c) $V_{IM} = 2(V_0 + V_M) = 2(4 + 0) = 8$ m/s

12. d) $\frac{1}{F} = \frac{2}{f_l} + \frac{1}{f_m} = 2(\mu - 1) \left(\frac{1}{R} + \frac{1}{\infty} \right) + \frac{2}{R}$

$$\frac{1}{F} = \frac{2(\mu - 1)}{R} \quad F = \frac{R}{2(\mu - 1)} = \frac{f_l}{2} = \frac{20}{2} = 10 \text{ cm}$$

13. c) $C = \frac{\epsilon_r \epsilon_0 A}{d}$ $C \propto A$ $C \propto \frac{1}{d}$

14. d) $R = \frac{V^2}{P} = \frac{(115)^2}{1250} = 10.58 \Omega = 10.6 \Omega$

15. c)

16. c)

17. d) $E = 20\theta - \frac{\theta^2}{20}$ $E = a\theta + b\theta^2$, we get

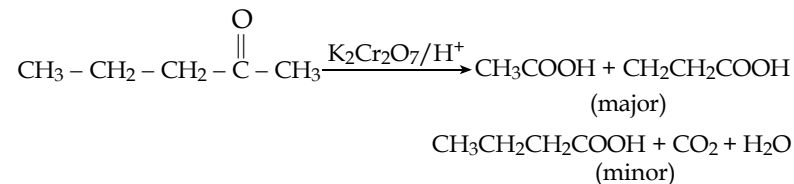
$$a = 20, b = -\frac{1}{20} \quad \theta_n = -\frac{a}{2b} = \frac{-20}{2 \times -\frac{1}{20}} = 200^\circ \text{C}$$

18. c)
19. a)
20. d)

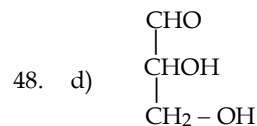
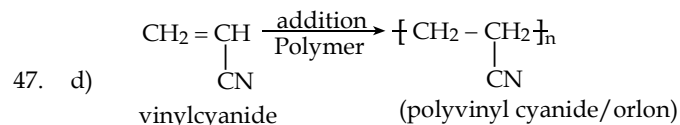
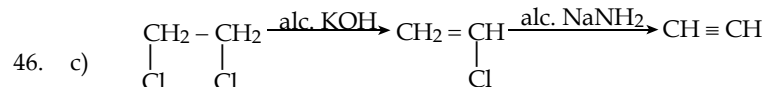
Chemistry

21. c) Different resonating forms should have same arrangement of atoms.
22. b) A dative bond is not present in CO₂ molecule.
23. d) MnC₂O₄; x + (-2) = 0 or x = +2.
24. a) The solution becomes basic.
25. c) Cu²⁺ + 2e⁻ → Cu
26. b) Calamine is an ore of Zn containing ZnCO₃.
27. a) PbO₂ is lead dioxide.
28. c) Radium is radioactive and thus decompose instantaneously.
29. a) N in N₂O₃ and HNO₂ has +3 oxidation number.
30. b) Sulphur has maximum catenation ability in group 16. The order of catenation ability is:
C>Si≈S>P>N>O
31. b) Chlorine forms maximum (six) oxides.
32. d) Rate constant of all reactions is independent of conc. of reactants.
33. d) $\text{HCO}_3^- \xrightarrow{-\text{H}^+} \text{CO}_3^{2-}$
Acid Conjugate base
34. c) $\text{PCl}_5(\text{g}) \rightleftharpoons \text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g})$
1 - xxx
Total no. of moles = 1-x+x+x = 1+x
 $P_{\text{PCl}_3} = \frac{\text{Moles of PCl}_3}{\text{Total no moles}} \times \text{Total pressure} = \frac{x}{1+x} \times P.$
35. c) $[\text{KOH}] = \frac{5.6}{56} = 0.1 \text{ M} = [\text{OH}^-]$
36. a) The screening order is s>p>d>f.
37. b) Mixing of gases is spontaneous and proceeds with increase in entropy and decrease in free energy.
38. b) $\Delta n = 1 - \frac{3}{2} = -\frac{1}{2}$. Hence, $\Delta H < \Delta E$.
39. b) In hydrogen atom, energy of an electron is determined by n as well as l.

40. c) When l = 2, it means d-sub-shell, n = 5 means fifth energy level. So it is 5 d sub-shells.
41. c) MASO₄ since arsenate and metal both have three valency.
42. b) CH₃CH₂CH₂ - O - CH₃ & CH₃CH₂ - O - CH₂ - CH₃ are metamers.
43. d) CH₃Cl + CH₃CH₂Cl → CH₃ - CH₃ + CH₃ - CH₂ - CH₃ + CH₃CH₂CH₂ - CH₃.
44. d) According to Poppof's rule;



45. b) CHCl₃ oxidized to form a poisonous gas called phosgene and it can be prevented by adding 1% ethyl alcohol.



47. d)
48. d)
49. a) Chlorobenzene does not undergoes nucleophilic substitution reactions under ordinary conditions.
50. d) Miscible liquids with bp differing between 8-15°C are purified by fractional distillation.

Botany

51. a) Lichen is symbiotic relationship between fungi (mycobiont) and algae (phycobiont). Only fungal partner reproduce sexually by producing ascospores or basidiospores on their fruiting bodies.

- 52 c) Extra-cellular digestion (digestion outside cell) and osmotrophic mode of nutrition are common to fungi like yeast.
- 53 b) The presence of ciliated gametes indicates the aquatic origin of Bryophytes and Pteridophytes.
- 54 d) The rachis of several ferns like Dryopteris bears advance types of stellar system called dictyostele. It is horse show shape arrangement of protostelic element and called meristeles.
- 55 d) The pollen grains of Cycas and Pinus shed at 3-celled and 4-celled stage respectively. The number of prothelial cell determines the number of cells in pollen grains.
- 56 b) Many noded flat stem for functional activities of leaf is called phylloclade, e.g. Opuntia, Cactus.
- 57 b) Among 20 amino acids, glycine is the simplest amino acids containing 2 carbon molecules.
- 58 a) Capsular or schizocarpic fruits are common in members of family Malvaceae. The Solanaceae, Cruciferae and Compositae have Berry, capsular and achenial types of fruits respectively.
- 59 d) The parenchymatous tissue is characterised by thin living cell wall, non-lignified, oval or spherical with intercellular spaces.
- 60 d) The structural and functional unit of chloroplast are thylakoids and quantasomes respectively.
- 61 d) Hadrome or xylem is conducting tissues responsible for conduction of water and minerals.
- 62 c) Palade discovered Ribosome and it is also called as Palade particle.
- 63 a) Emil Heitz discovered dark and light (stainable with acetocarmine) parts of chromatin and called heterochromatin and euchromatin.
- 64 c) According to Chargaff rule, the molecular amount of Purine (adenine and guanine) is equivalent with Pyrimidine (thymine and cytosine), i.e. $A + G = T + C$.

- 65 d) The pollen entry through other than micropyle is called aporogamy. The entry of pollen tubes through micropyle, chalaza and integuments are porogamy, chlazogamy and misogamy respectively.
- 66 d) Aleurone layer is proteinous layer present in endosperm of maize.
- 67 b) The rust of coffee is caused by fungi (*Hemileia vastatrix*) while red rust of coffee is caused by algae (*Cephaleuros virscens*).
- 68 d) Myrmecophily is pollinating relationship between flowering plants and ants. It is beneficial for both symbiosis) ants food and shelter) and plants (pollination and security).
- 69 c) The somatic embryo produced during tissue culture is embryoids.
- 70 d) About 40 types of antibiotics can be produced from single species of *Sterptomyces griseus*.
- 71 b) Ascus bears diploid Ascus Mother Cell (AMC) which divides meiotically and produce 4 or 8 ascospores (n).
- 72 b) Ultimate source of energy for earth is sun light which is trapped by producer through photosynthesis.
- 73 c) A common bryophyte, Sphagnum is also called peat moss or bog moss.
- 74 c) Pyramid is graphical representation of different trophic levels. The pyramid of number is graphical representation of number of different trophic levels of an ecosystem or food chain.
- 75 d) The pollen tetrad contains 4 microspores aggregated into single group with the help of callose.

Zoology

76. a) Radial animals are usually sessile, free floating or weakly swimming. Eg: some sponges, hydra, jelly fish, sea-urchin.
77. a) Import involves passive sinking of food into body by nurturing of plasmalemma. Eg: ingestion of algae

78. d) Miracidium – infective for secondary host. Eg: snail
Metacercaria – infective for primary host. Eg: sheep
79. b) Fertilization in earthworms are cross, external fertilization in cocoons.
80. d) Corpora allata are neuro secretory and secrete juvenile hormone or neotinin.
81. a) In mollusca, blood with amoebocytes, respiratory pigment is copper containing haemocyanin dissolved in plasma.
82. c) Seven cervical vertebra a typical character of mammals.
83. b)
84. b)
85. d) Simple squamous epithelium – Alveoli, Bowman's capsule, blood vessel (endothelium) heart, visceral and peritoneal lining of coelom (mesothelium).
86. c) Neuromotor system controls ciliary beating in *Paramecium*.
87. b) The function of mehlis gland is unicellular and bilobed. The secretion of which lubricate the eggs passage moist.
88. d) Ventricle I and II are called as paracoels or lateral ventricles located in cerebral hemispheres.
89. d) Hinge joint – hinge joints are monaxial (uniaxial) because they are typically allow motion around a single axis. Eg: knee, elbow and inter phalangeal joints.
90. a) Prototherians are oviparous, their eggs contain a large amount of yolk.
91. b) Parathyroid increases the calcium level and decreases the phosphate level by stimulate the release of calcium from gut.
92. a) Utriculus and sacculus are considered to be sense organs of static equilibrium. The three semicircular canals maintain dynamic equilibrium.
93. a) The papillary muscles are associated with the atrio-ventricular valves that valves that they help open and close.

94. b) The mucosa of trachea is lined with a ciliated pseudostratified epithelium containing mucus secreting goblet cells and this help in pushing mucus out.
95. b) Collagen is a water non-soluble fibrous protein.
96. b) Prototherians are primitive mammals, egg lying mammals, oviparous mammals, reptile like mammals confined to Australian region. Young ones are fed on milk from mammary glands without nipples.
97. b) In secondary aquatic animals; eg: whales, forelimbs modified to form paddles for swimming.
Elastic lungs, enable them to store large volumes of oxygen during submergence.
98. c) Urostyle is the 10th vertebra as long as remaining vertebral column. Urostyle has a dorsal keel or crest or ridge.
99. d) Myocytes found in sponges.
100. b) WBCs accumulates at the site of wound by diapedesis. It is the squeezing of leucocytes out from the endothelium of capillaries to fight against foreign agents.

Result will be published on Sunday

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==== Best of Luck ====