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IOM Model Entrance Exam

2075

Day Shift

(Set-XI B)

Date: 2075/04/12

Hints and Solutions

NAME

Solutions for IOM Model Entrance Exam set -XI B (2075-04-12)

Physics

- a) Energy = $\frac{1}{2} LI^2$
[Inductance] = $\left[\frac{\text{energy}}{\text{current}^2} \right] = \left[\frac{ML^2T^{-2}}{A^2} \right] = [ML^2T^{-2}A^{-2}]$
- c) In 1st t/4 seconds = x
In 2nd t/4 seconds = 3x
In 3rd t/4 seconds = 5x
In last t/4 seconds = 7x = 1.4 m
Height of the building = x + 3x + 5x + 7x = 16x = 16 × 0.2 = 3.2m
- b) $d = \frac{u^2}{g}$
 $H_{\max} = \frac{u^2}{2g} = \frac{d}{2}$
- b) $F = \frac{dp}{dt} = \frac{2mu}{1/n} = 2 mnu$
- c) $y = r \cos \omega t$
 $\Rightarrow \frac{r}{2} = r \cos \frac{2\pi}{T} t$
 $\Rightarrow \frac{1}{2} = \cos \frac{2\pi}{T} t$
 $\cos \frac{\pi}{3} = \cos \frac{2\pi}{T} t$
 $\frac{2\pi}{T} t = \frac{\pi}{3} \quad t = \frac{T}{6}$
- b)
- d) $\beta = \frac{Q_2}{W} = \frac{Q_2}{Q_1 - Q_2} = \frac{T_2}{T_1 - T_2} = \frac{273}{27} = 10$
- a) Sphere has smallest surface area and hence it will cool slowest.
- d) $(V_{\max})_{\text{particle}} = \omega r = 2\pi f y_0$
 $V_{\text{wave}} = f\lambda$
 $(V_{\max})_{\text{particle}} = 4 V_{\text{wave}}$
 $2\pi f y_0 = 4f\lambda$
 $\lambda = \frac{\pi y_0}{2}$
- a) $l \propto \frac{1}{f}$

$$l_1 : l_2 : l_3 = \frac{1}{f_1} : \frac{1}{f_2} : \frac{1}{f_3} = \frac{1}{1} : \frac{1}{2} : \frac{1}{3} = 6 : 3 : 2$$

11. d)
12. b) Frequency is not changed by a transformer.
13. d) Initially $\tan\beta = \frac{V}{H}$
After rotation $H' = H \cos\theta$
 $\therefore \tan\beta' = \frac{V}{H \cos\theta}$
 $\therefore \frac{\tan\beta'}{\tan\beta} = \frac{H}{H \cos\theta} = \sec\theta$
14. a) In adjacent coils, current flows in same direction so that there is force of attraction shortening the spring.
15. c)
16. c) $\frac{I_1}{x} = \frac{I_2}{(1.2-x)^2}$
 $\Rightarrow \frac{1.2-x}{x} = \sqrt{\frac{I_2}{I_1}} = \sqrt{\frac{32}{8}} = 2$
17. b) $\sin\theta = \frac{n\lambda}{d} = \frac{1 \times 6000 \times 10^{-10}}{12 \times 10^{-7}} = \frac{1}{2} = \sin 30^\circ$
 $\theta = 30^\circ$
Angular width = $2\theta = 60^\circ$
18. b)
19. a)
20. b)

Chemistry

21. b) Due to high electron cloud density of oxygen, addition of further electron is difficult.
22. b)
23. a) Moles of KOH = $10(L) \times 0.1 = 1 \text{ mol}$
 $\text{KOH} + \text{HCl} \longrightarrow \text{KCl} + \text{H}_2\text{O}$
Pure HCl required for 1 mol of KOH = 36.5 g

$$60\% \text{ HCl required} = \frac{100}{60} \times 36.5 = 60.8 \text{ g.}$$

24. a) In this reaction, H_3PO_4 exhibits basicity = 1.
25. c) H_2F_2 is a dimer of H-F formed through H-bonds (H - F H - F).
26. b) In BF_3 , hybrid state of B is sp^2 and is trigonal planar.
27. b) Iodine changes its O.N. from $0 \rightarrow +5$ (IO_3^-) and from $0 \rightarrow -1$ (I^-).
28. c) $\text{Cu}^{+2} + 2e \rightarrow \text{Cu}$
2.0 Faradays can deposit copper = 1 mol
2.5 Faradays can deposit copper = $\frac{2.5}{2} = 1.25 \text{ mol.}$
29. a) Fe does not form amalgam with mercury.
30. d) Al has more affinity for oxygen.
31. c) $\text{BaO}_2 + \text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{BaCO}_3 + \text{H}_2\text{O}_2$
32. a) Na_2CO_3 loses water on standing in air.
33. b) The purest variety of carbon is anthracite.
34. c) On rubbing liquor ammonia with I_2 , a dark brown ppt. of ammoniated nitrogen iodide, $\text{NH}_3 \cdot \text{NI}_3$, is obtained, which decomposes quickly on drying into $\text{NH}_4\text{I} + \text{I}_2 + \text{N}_2$.
 $8\text{NH}_3 \cdot \text{NI}_3 \rightarrow 5\text{N}_2 + 9\text{I}_2 + 6\text{NH}_4\text{I}$
35. a) The concentration of reactant does not change with time for zero order reaction (unit of K suggests zero order) since reactant is in excess.
36. d) $56 \text{ g N}_2 = 2 \text{ mol}$, $44 \text{ g of CO}_2 = 1 \text{ mol}$
Pressure for 3 moles = P
 \therefore Pressure for 2 moles (p_{N_2}) = $\frac{2P}{3}$
37. d) $K_p = \frac{(p_{\text{CO}})^2}{p_{\text{CO}_2}} = \frac{(4.0)^2}{2.0} = 8 \text{ atm.}$
38. c) $\text{pH} = 5.5$, $\text{pOH} = 14 - 5.5 = 8.5$ so, $[\text{OH}^-] = 10^{-\text{pOH}} = 10^{-8.5}$.
39. b) Here AlCl_3 accepts a lone pair from Cl^- for sharing, and hence acts as a Lewis acid.
40. d) Properties of the system which depend upon the quantity of matter contained in it is called extensive property. E.g. mass, volume, energy, heat, capacity, enthalpy entropy free energy, etc.

145. b) $\Delta n(g) = 1 - \frac{3}{2} = -0.5$. Hence $\Delta H < \Delta E$.
42. c) Electrophilic addition (Markovnikov's rule)
43. a) $\text{CH} \equiv \text{C} - \text{CH}_3 \xrightarrow[\text{Hg}^{2+} / \text{H}_2\text{SO}_4]{\text{H}_2\text{O}} \text{CH}_2 = \text{C}(\text{OH})\text{CH}_3 \rightleftharpoons \text{CH}_3\text{COCH}_3$
44. c) 3, 3 diethylpentane
45. c) $\text{CH}_3 - \text{Mg} - \text{X} + \text{CH}_3\text{OH} \rightarrow \text{CH}_4 + \text{Mg}(\text{OCH}_3)\text{X}$
46. d) Alcohol do not reacts with NaOH aldehydes containing α -hydrogen undergoes aldol condensation.
47. a) formic anhydride is not known
48. c) $\text{CH}_3\text{CN} \xrightarrow{\text{Na/C}_2\text{H}_5\text{OH}} \text{CH}_3\text{CH}_2\text{NH}_2 \xrightarrow{\text{HNO}_3} \text{CH}_3\text{CH}_2\text{OH} \xrightarrow{[\text{O}]} \text{CH}_3\text{CH}_2\text{COOH}$
49. b) $\text{C}_6\text{H}_5\text{NH}_2 \xrightarrow[\text{O}^- \text{C}]{\text{NaNO}_2 + \text{HCl}} \text{C}_6\text{H}_5\text{N}_2\text{Cl} \xrightarrow{\text{CuCl}_2 + \text{HCl}} \text{C}_6\text{H}_5\text{Cl}$
50. c) Insulin is a protein but inulin is a polysaccharide of fructose.

Botany

51. c) The indirect transfer of genetic materials from one strain bacteriophage to another strain through vector or bacteriophage (virus) is bacterial transduction.
52. a) Anton de Bary well known as father of modern Mycology or Mycology.
53. b) Androcytes or Androzoid mother cells lie in male gametophytic structure and haploid in nature. It divides mitotically and produce flagellated antherozoids.
54. b) The Bryophytes and Pteridophytes require water for fertilization, so are considered as amphibian of the plant kingdoms. In case, when both are given Bryophytes are considered as amphibian.
55. a) Common member of Gymnosperms consist of exclusive tracheid elements. Exceptionally some gymnosperms (Gnetales order) also bear vessels.
56. d) Phylloclads are modified aerial stem, arises from nodes of stem and bear modified leaves.

57. c) *Ephedra* and other gymnosperms never bear fruits (due to absence of ovary) but bear seeds.
58. d) *Withamnia somniferum* is medicinally important plant, which belong to family Solanaceae.
59. c) Stomata are regulated pores responsible for gaseous exchange during transpiration, respiration and photosynthesis. They are commonly found in leaves, young stems, fruits, etc. but not found in roots.
60. c) Ribulose biphosphate carboxylase (Rubisco) is most common protein (enzyme) found in chloroplast (around 17%) required for photosynthesis. Cellulose is most common carbohydrate.
61. c) The cohesive force is due to weaker hydrogen bonding.
62. c) Transosome is the only organelle found in ovarian follicle with triple membrane.
63. d) Giant chromosome or polytene chromosomes are found in salivary glands of *Drosophila*.
64. c) Plasma membrane never consists of genetic material.
65. b) Syngamy or fertilization is fusion of two male and female compatible gametes.
66. d) Rice, wheat, maize, and other plant having edible part of seeds are useless to produce seedless.
67. d) Mulberry, jackfruit, pineapple are composite or multiple fruits develop from inflorescence while strawberry is produced from apocarpous ovary.
68. c) Sunlight driven biogeochemical cycle is water cycle or hydrological cycle.
69. c) Guha and Maheswori was the first persons who are able to develop haploid plants through pollen culture.
70. c) Exonuclease is responsible for sticking freeends of polynucleotides.
71. c) Movement of kerosene or swelling of rubber when placed in kerosene is common example of imbibition.
72. b) Eutrophication is the decomposition of organic compound in water body or ponds.
73. b) Tubulin and other structural proteins are synthesized during G2 phase of cell cycle.
74. d) Origin of root hair is epidermal, so always superficial or exogenous.

75. d) The process of formation of ATP at the site of reaction is substrate level phosphorylation in glycolysis.

Zoology

76. a) The papillary muscles are associated with the atrio-ventricular valves that valves that they help open and close.
77. c) Class: Cephalopoda □ eg. squid locomotion is by expelling water in jet through siphon (jet-propulsion)
78. d) **Lateral oesophageal hearts**- connect - dorsal and supra-oesophageal to ventral blood vessel.
79. b) Class **anthozoa** - E.g. Adamsia (*Sea anemone*), coral- only **polyp**
80. a) Zymogen granules are present in secretory organelles like golgi bodies which aid in secretion of various hormones
81. c) Eocene :- began about 5.49 crore years ago. Birds and mammals continued spreading and evolving along divergent lines. Amongst eutherians, ancient types of camels, horses (Eohippus), pigs, rats, monkeys, whales and seals appeared.
82. d) the renal portal unite with sciatic and while running along the outer border of kidney of its side it receives blood form lumbar region by a dorso-lumbar vein
83. b) **Teleology** - Explanation of phenomenon in terms of needs of organisms, **Ichthyology - fishes**
84. b) Ectoderm - adrenal medulla, Mesoderm- adrenal cortex
85. b) *Euspongia* - Commonly called bath sponge, *Sycon* - Crown, Urn sponge, *Euplectella* - Venous flower basket, *Spongilla* - fresh water sponge
86. b) **Cerebellum** - involuntary muscular coordination, maintenance posture, orientation and equilibrium of the body.
87. a) prototherians are oviparous, their eggs contain a large amount of yolk..
88. b) **Histamine** - one of the principal mediators of the inflammatory response is histamine, a chemical released by a variety of cells in response to tissue injury.
89. a) Humerus- proximally it bears a large head, greater tuberosity and lesser tuberosity.

90. a) **In rabbit** -thoracic ribs - 12-13 pairs **False ribs** - 8 and 9th pair (2 pairs), **Floating ribs**: 10, 11 and 12th pairs (3 pairs), **True ribs**: 1st to 7th pair. .
91. a) *Hippocampus* (sea horse) shows parental care. On the belly of male is a brood pouch for incubating eggs.
92. c) **Paedogenesis** - giving new one by pre-adult stage. **Neoteny** - deficiency of thyroxin in tadpole, it does not metamorphoses and remain tadpole throughout the life, the phenomenon is called neoteny.
93. b) Potadromous: Migration of pisces limited only within fresh water for spawning. eg. Carps and Trouts
94. b) **Mullerian duct** - in the embryo becomes the oviduct (fallopian tube) in the adult female.
95. d) **Cyanocobalamine** (Vitamin B₁₂) - it promotes DNA synthesis, maturation of RBCs and myelin formation.
96. a)
97. b) Totipotent cell of sponges is called interstitial cell.
98. d) Stimulation of Parasympathetic nervous system (Vagus supply) decrease the rate of heart beat by secreting acetylcholine.
99. c) Ciliary body contains a smooth muscle called ciliary muscles in the eye. Ciliary muscles alters the shape of lens for near or far vision. The mechanism is called accomodation.
100. d) Echinoid have jaw suspension called Aristotle's lantern (i.e. chewing apparatus).

Result will be published on Sunday

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Best of Luck