



NAME

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IOM Model Entrance Exam

2075

Morning Shift

(Set-XI A)

Date: 2075/04/12

Hints and Solutions

NAME

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

Physics

1. b) $\vec{P} \cdot \vec{Q} = 0$

$$\vec{P} \times \vec{R} = 0$$

$$\Rightarrow \vec{P} \perp \vec{Q}$$

$$\Rightarrow \vec{Q} \parallel \vec{R}$$

$$\text{Hence, } \vec{Q} \perp \vec{R}$$

2. a) $\frac{u^2}{g} = 0.2$

$$u = \sqrt{2} \text{ m/s}$$

$$u_x = u \cos \theta = \sqrt{2} \times \cos 45^\circ = 1 \text{ m/s}$$

3. b) $mv = \text{constant}$

$$\frac{4}{3} \pi r^3 \rho v = \text{constant}$$

$$vr^3 = \text{constant}$$

$$\frac{v_1}{v_2} = \left(\frac{r_2}{r_1}\right)^3 = \left(\frac{2}{1}\right)^3 = 8 : 1$$

4. d) $T' = 2\pi \sqrt{\frac{l}{g+a}}$

$$= 2\pi \sqrt{\frac{l}{g + \frac{g}{3}}}$$

$$= \frac{\sqrt{3}}{2} \times 2\pi \sqrt{\frac{l}{g}}$$

$$= \frac{\sqrt{3}}{2} \times T = \frac{\sqrt{3}}{2} \times 30$$

$$= 15 \frac{\sqrt{3}}{2} \text{ sec.}$$

5. c) $\tau = \frac{\pi \eta r^4 \theta}{2l}$

$$\theta \propto \frac{1}{r^4}$$

$$\therefore \frac{\theta_1}{\theta_2} = \frac{r_2^4}{r_1^4}$$

6. a) $T = 2\pi\sqrt{\frac{R}{g}}$

$$\omega = \sqrt{\frac{g}{R}}$$

$$V_{\text{centre}} = \omega R$$

$$= \sqrt{\frac{g}{R}} \times R = \sqrt{gR}$$

7. b) For over flow, $\gamma_a > 0$

$$\gamma_r - \gamma_g > 0 \Rightarrow \gamma - 3\alpha > 0$$

$$\therefore \gamma > 3\alpha$$

8. b)

9. a) $f_b = 284 - 280 = 4 \text{ Hz}$

$$T = \frac{1}{f_b} = \frac{1}{4} = 0.25 \text{ sec}$$

10. a) Vessel being filled with water behaves as closed organ pipe. As more and more water is filled l decreases and hence $f = \frac{v}{4l}$ increases.

11. d) $f \propto \frac{1}{\mu}$ and $\mu \propto \frac{1}{\lambda^2}$

$$f \propto \lambda^2$$

12. d)

13. b)

14. a)

15. b) $E = Bvl = 2 \times 10^{-4} \times 100 \times 50 = 1 \text{ v}$

16. c) $B_a = 2B_e$

$$\therefore \frac{B_a}{B_e} = 2$$

17. b) $I_s = I_p$

$$\frac{2E}{3 + 2r} = \frac{E}{3 + \frac{r}{2}}$$

$$r = 3\Omega$$

18. c)

19. c) $\lambda_{\text{max}} = 2d = 2 \times 15 = 30 \text{ \AA}$

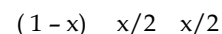
20. a) Boron rods absorb excess neutrons

Chemistry

21. a) For first order rxn,

Amount left after n - half lives = $(\frac{1}{2})^n \times$ initial amount

$$= (\frac{1}{2})^2 = \frac{1}{4} \left(n = \frac{t}{t_{1/2}} \right)$$



$$\therefore K_c = \frac{x^2}{4(1-x)^2}$$

$$\text{Also, } x = \frac{1}{2}$$

$$\text{Then, } K_c = \frac{1/4}{4(1-1/2)^2} = 0.25$$

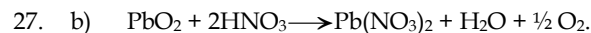
23. d) If strong base is present in a solution, then pH is calculated from its concentration,

$$\therefore [\text{OH}^-] = 10^{-1} \text{ or } \text{pOH} = 1; \text{pH} = 13.$$

24. a) In the metallurgy of zinc, reduction of roasted ore (ZnO) gives impure zinc (in fire-clay retort) called spelter.

25. a) Cu has E°_{OP} lesser than H.

26. a) The basic character of oxides increases down the gp.



28. b) Notice that electron affinity of Cl is more than F.

29. c) It is a use of this reagent.

30. c) K_{sp} of AgCl = $1.2 \times 10^{-10} = [\text{Ag}^+][\text{Cl}^-]$

$$= [S] [S + 0.1]$$

$$\therefore K_{\text{sp}} = s \times 0.1 = 1.2 \times 10^{-10}$$

$$\therefore S = 1.2 \times 10^{-9} \text{ M}$$

31. a) Standard heat enthalpy is heat enthalpy in standard state, i.e. 1 atm and 25°C.

32. c) The unpaired electron of chlorine is in 3p-subshell.

33. b) NO, NO₂ and O₂ are paramagnetic & hence have unpaired electrons.

34. c) NO₂⁺ have linear shape, NO₂ and NO₂⁻ have bent shaped. NO₂ has one unpaired electron & NO₂⁻ has a lone pair of electron.

35. d) There are 14 Bravais lattices.
36. d) Anions are always larger in size than their parent atom. Also size of iso-electronics decreases with increase in atomic number.
37. c) $g \text{ atom of I} = \frac{25.4}{127} = 0.2$
 $g \text{ atom of oxygen} = \frac{8}{16} = 0.5$
 \therefore Ratio of g atoms I:O = 2:5
38. b) $N = \frac{4 \times 1000}{40 \times 100} = 1.0$
39. d) $3\text{BaCl}_2 + 2\text{Na}_3\text{PO}_4 \rightarrow \text{Ba}_3(\text{PO}_4)_2 + 6\text{NaCl}$
40. a) $\text{S}^{4+} \rightarrow \text{S}^{6+} + 2e$
 $10e + 2\text{I}^{5+} \rightarrow \text{I}_2^\circ$
41. c) 1 g atom of Al = 3 eq. of Al = 1 Faraday charge
 3 mole electrons = 3 N electron
42. d) Since Cis-2-butene and trans-2-butene are not optically active, give same product on hydrogenation. i.e. n-butane and same product on ozonolysis i.e. CH_3CHO . But addition of Br_2 to these two isomers gives different products. Whereas cis-2-butene gives (\pm) mixture of 2, 3-dibromobutane, trans-2-butene gives Meso-2, 3-dibromobutane.
43. b) $\text{CHCl}_3 + \frac{1}{2}\text{O}_2 \xrightarrow{h\nu} \text{C}(\text{OH})\text{Cl}_3 \xrightarrow{(-\text{HCl})} \text{Phosgene}(\text{COCl}_2)$
44. c) Picric acid containing three electron-withdrawing - NO_2 groups is most acidic.
45. a) With HNO_2 , phenol gives p-Nitrosophenol as the major product. During this reaction, nitrosonium ion (NO^+) is the electrophile.
46. d) Lucas test is $\text{S}_{\text{N}}1$ reaction which depends on stability of carbocation more stable the carbocation formed, more readily turbidity will obtain.
47. a) Aromatic aldehydes are less reactive than aliphatic aldehydes and hence reduce only Tollen's reagent.
48. a) $\text{C}_6\text{H}_5\text{COCl} + 2\text{NH}_3 \longrightarrow \text{C}_6\text{H}_5\text{CONH}_2(\text{Benzamide}) + \text{NH}_4\text{Cl}$
49. b) $\text{RCOOH} + \text{CH}_2\text{N}_2 \longrightarrow \text{RCOOCH}_3(\text{Methyl ester}) + \text{N}_2$
50. b) Starch $\xrightarrow{\text{hydrolysis}}$ α -glycose
 Cellulose $\xrightarrow{\text{hydrolysis}}$ β -glycose
 Glycogen $\xrightarrow{\text{hydrolysis}}$ α -glycose
 Inulin $\xrightarrow{\text{hydrolysis}}$ fructose

Botany

51. a) Direct transfer of genetic materials from male stain bacteria (exogenote) to female strain (endogenote) through sex pili is bacterial conjugation.
52. d) Rhizopus is bread mould which bears columella for septation between sporangiospore and sporangium.
53. d) Crustose lichen is very primitive lichen which has complex organization of mycobiont and phycobionts.
54. d) Columella is sterile tissues found in capsule for supporting and nutrition of spore mother cells.
55. d) The wing of pollen grain of Pinus is extension of exine and made from sporopollenin.
56. d) Small bulb is also called bulblet and found in garlic.
57. a) Members of family Graminae or poaceae bear indistinct testa and pericarp in a fruit and called caryopsis.
58. c) Aloe vera is medicinally important plant, which belong to family Liliaceae.
59. d) Bicollateral vascular bundles bear two phloem (outer and inner), two cambia (outer and inner) and single central xylem.
60. b) The source of O_2 in glucose molecule during photosynthesis is CO_2 (assimilation of CO_2 into glucose is photosynthesis).
61. a) Imbibition is movement of solvent or liquid material from wetter (higher solvent) to drier (lower solvent) region due to affinity between imbibate and imbibant.
62. a) Microbodies are related with photosynthesis.
63. b) Sex chromosomes are alternately called allosomes.
64. b) According to Griffith experiment, DNA is genetic material in bacteria and virus.
65. b) Due to triple fusion between male gamete (n) and secondary cell (2n), PEN is produced which lead to the formation of triploid endosperm in angiosperms.
66. c) Microsporangia have large number of microspore mother cells which undergo sporic meiosis and produced haploid several microspores.
67. b) Pollen tube is extension of intine of pollen which is made from cellulose and pectin.

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68. b) Savannah is characterized by warm climate with predominant grassland and scattered trees community.
69. d) Green manure are leguminous or non-leguminous plant which can increase soil fertility.
70. d) For joining of two strands of DNA ligase enzyme is required.
71. a) Movement of minerals or solutes through selectively permeable membrane is diffusion.
72. c) Ecological niche is ecological role of a species (single population) and its habitat.
73. c) Growth first or G1 phase is responsible for making decision of cell division. The cell unable to enter S phase will escape from cell cycle remain in G0 phase.
74. c) The formation of ATP in quantasome by taking light energy during light reaction of photosynthesis is photophosphorylation.
75. b) Lateral roots and secondary roots arise from pericycle (stellar region), so endogenous in origin.

Zoology

76. d) Motile elongate zygote is called Ookinete, occurs in the stomach of mosquito.
77. a) spongocoel is lined by choanocytes cells.
78. c) Ventral vessel, blood flows from anterior to posterior side, mainly distributing vessel, valves absent.
79. b) Three chambers in cochlea are mainly scala vestibuli, scala-media and scala tympani. Helicotrema permits continuity between scala vestibuli and scala tympani.
80. c) Haemochorial → Placenta is found in man and has only three barriers. All the uterine components disappear and the maternal blood is reparted from the fetal blood only by fetal chorion, connective tissue and endothelium of fetal capillaries..
81. d) Each compound eye of cockroach of about visual units called ommatidia.
82. d) Isoenzyme: enzymes having similar properties but different molecular weight are called isoenzyme.
Lactic dehydrogenase take part in catalysis of pyruvic acid to lactic acid is an example of isoenzyme.
83. c) Sinanthropus is the peking man, other three are apes.
84. c) Atlas, first cervical ring like vertebra. Neural spine absent or reduced or poorly developed. Transverse process well-developed.

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85. d) The inner visceral layer of Bowman's capsule consist of podocytes, special less flattened cells.
86. c) Olecranon process is found in the elbow joint as a part of ulna.
87. b) The first pair of spinal nerve in frog is hypoglossal. The last pair of cranial nerves of mammals has the same name
88. a) Exothalamic goitre | Grave's disease due to hyper-activity of thyroid gland characterised by swelling of whole neck region, metabolic rate is high, eye - protruding out.
89. a) Potamodromous: eg. Common carps and trout fishes.
90. c) Uropygial /preen gland:
The preen gland, on the dorsal side of a bird' s tail, secreting oil with which bird makes it's feathers water proof.
91. d) The body of molluscan is covered by a skin fold mantle with shell glands which secrete calcareous spicules, shell plates or shell.
92. b) Vitelline glands - provide nutrition to the eggs. Vitelline glands - lubrication of egg passage
93. c) Endostyle of protochordate, eg:- cephalochordata is an organ associated to feeding. It, in vertebrates, is modified into thyroid gland
94. c) Trigeminal (v) is mixed nerve.
95. c) Allopatric speciation, species inhabiting the different graphical areas are allopatric.
96. a) Diaphragm separates the thoracic and abdominal cavity
97. c) Epiboly: involves stretching and spreading movement of the ectoderm, forming cells (micromeres) to surround the embryo on all sides except at one end where an apperture called blast pore is formed.
98. c) Cryptorchidism is the failure of one or both of the testicles to descend into the scrotum..
99. a) Estrogens are produced by the theca interna cells of graffian follicle's that regulated growth and development of female accessory reproductive organs, secondary sexual characters and sexual behaviour.
100. b) Clitellum helps in the formation of cocoons. Cocoons is the place where fertilization take place. Spermatheca used to store sperms.

Result will be published on Sunday

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