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IOM Model Entrance Exam

2075

Morning Shift

(Set-XII A)

Date: 2075/04/19

Hints and Solutions

NAME

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

Physics

1. d)
2. d)
3. c)
4. d) $E_{\text{Krot}} = \frac{1}{2} I \omega^2 = \frac{1}{2} \times 2 \times 5^2 = 25 \text{ J}$
5. b) $\mu = \frac{\text{No. of parts}}{\text{No. of rough parts}}$
 $\tan \theta = \left(\frac{2}{1}\right) \tan \theta = 2 \tan \theta$
6. a) Escape velocity does not depend upon angle of projection.
7. b) $\mu = \frac{\sin\left(\frac{A + \delta_{\min}}{2}\right)}{\sin \frac{A}{2}} = \frac{\left(\frac{A + \pi - 2A}{2}\right)}{\sin \frac{A}{2}} = \frac{\cos \frac{A}{2}}{\sin \frac{A}{2}} = \cot\left(\frac{A}{2}\right)$
8. d) $\frac{1}{f_a} = (a_{\mu_g} - 1) \left(\frac{1}{R_1} + \frac{1}{R_2}\right)$
 $\frac{1}{f_w} = (w_{\mu_g} - 1) \left(\frac{1}{R_1} + \frac{1}{R_2}\right)$
 $w_{\mu_g} = \frac{a_{\mu_g}}{a_{\mu_w}} = \frac{1.2}{1.3} < 1$
9. b)
10. d) $e = 0.3 d = 0.3 \times 2R = 0.6R$
11. c) $\gamma_r = \alpha \quad \gamma_g = 3 \times \frac{\alpha}{3} \Rightarrow \frac{\gamma}{g} = \alpha$
 $\gamma_r = \gamma_g$ so level of liquid remains almost stationary
12. a)
13. d) $eV = \frac{hc}{\lambda_{\min}}$
 $\lambda_{\min} \propto \frac{1}{V}$
14. c) $E_{\text{K}_{\max}} = h(f - f_0)$
 $E_{\text{K}'_{\max}} = h(2f - f_0)$
 $= 2h(f - f_0) + hf_0 = 2 E_{\text{K}_{\max}} + hf_0$
15. c)
16. d)

17. c) The potential drop within the battery is due to internal resistance of battery and is directly proportion to the current drawn from the cell.
 18. b)
 19. b)
 20. c)

Chemistry

21. a) Meq. of conc. HCl = Meq. of dil. HCl

$$10 \times 10 = V \times \frac{1}{10} \therefore V = 1000\text{mL}$$

Thus, 990mL of water should be added to 10mL of conc. HCl to get Deci normal solution.

22. c) $\text{NO} + \text{O}_2 \rightarrow \text{NO}_2$. 46g of NO_2 is formed by 16g oxygen \therefore 10g of NO_2 is formed by $\frac{16 \times 10}{46} = 3.478\text{g}$ oxygen.

23. b) Blue per chromate is CrO_5 .

24. c) Eq. of Al $\frac{13.5}{27/3} = 1.5$

Thus, 1.5 Faraday is needed.

25. a) It is first order reaction.

26. d) It is calcinations

27. b) $\text{Zn} + 2\text{NaOH} \rightarrow \text{Na}_2\text{ZnO}_2 + \text{H}_2$

28. b) $\text{CaOCl}_2 + \text{CO}_2 \rightarrow \text{CaCO}_3 + \text{Cl}_2$

29. b) $\text{NH}_3 + \text{HCl} \rightarrow \text{NH}_4\text{Cl}$



30. a) $\text{HgO} \xrightarrow{\Delta} \text{Hg} + \frac{1}{2} \text{O}_2$

31. b) $2\text{CaO} + 2\text{Cl}_2 \rightarrow \text{CaCl}_2 + \text{Ca}(\text{ClO})_2$

32. b) When pressure is applied, the boiling point increases.

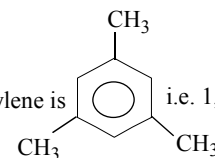
33. d) Phenolphthalein is not a suitable indicator for weak alkali titrations.

34. c) $\text{CH}_3\text{COOH} + \text{CH}_3\text{COO}^-$ acts as buffer.

35. b) $\text{NaHCO}_3 + \text{NaOH} \rightarrow \text{Na}_2\text{CO}_3 + \text{H}_2\text{O}$.

Acid salt base

36. c) temperature is a measure of intensity of energy, whereas, heat is a measure of quantity of energy.
 37. d) Use $PV=nRT$; find n for A and B separately. Now, again use $PV=nRT$ for mixing using $V=2\text{litre}$.
 38. d) P has 6 electrons in s-subshells as in d-subshell of Fe^{2+} .
 39. a) An application of P^{32} isotope.
 40. c) C_2H_4 involves sp^2 hybridization on carbon atoms.
 41. b) Among them Be has smallest size so, it has higher ionization energy.
 42. c) Metamerism is found in molecules having polyvalent functional group.



43. c) Mesitylene is  i.e. 1, 3, 5-trimethyl benzene

44. c) In RMgX , alkyl group has partial -ve charge so acts as nucleophile.

45. d) Each has lone pair of electron on oxygen atom.

46. d)

47. c) primary alcohols are oxidised to aldehyde and then to acid to decolourise KMnO_4 . Also ethylene oxidizes to formic acid

48. a) Bakelite is a cross linked condensation polymer of phenol & HCHO .

49. d) $\text{RMgX} \xrightarrow{\text{O}_2} \text{ROMgX} \xrightarrow{\text{HOH}} \text{ROH} + \text{Mg} \begin{cases} \text{OH} \\ \text{X} \end{cases}$

50. d) It is not possible in m-directing compounds & aniline. In aniline it undergoes acid base reactions

Botany

51. a) The fungal member of lichen is limited parasitic member which depends on algae for food materials.

52. d) F. E Fritsch (1945) classified algae in 11 classes based on photosynthetic pigments and reserved material.

53. c) Mesarch xylem elements (protoxylem lies in between metaxylem elements) is common character of leaf of angiosperms and stem or rhizomes of ferns like *Dryopteris*, *Pteridium*.

- 54 d) Bryophytes have dependent sporophyte, which gets food materials from mature gametophytic generation. Presence of amphibian habit, motile sperms and archegonia are common to bryophytes.
- 55 c) Sago palm is the common name given to Cycaspectinata.
- 56 c) Phylloclade is modified stem which bears nodes, internodes, spines and scaly leaves.
- 57 b) The plant which can produce fruits several time in life cycle after attaining maturity is called polycarpic plants, e. g. pear (*Pyrusmalus*) mango, papaya, etc. Bambusa, Agave and annual (*Pisum*) are monocarpic plants.
- 58 d) Large number of floral whorls are found in members of family Malvaceae.
- 59 c) Well developed aerenchyma with reduced mechanical tissues is common character of hydrophytes.
- 60 b) Chloroplast has quantasome as functional unit containing 280 pigments (with 230 chlorophyll and 50 carotenoids).
- 61 a) Under natural condition, the osmotic pressure is more than turgor pressure, i.e. $OP > TP$.
- 62 d) Christian de Duve first time discovered lysosome accidentally from rat liver cells.
- 63 d) Centrosome is pair particle of centrioles usually found in animal which are responsible for formation of spindle fibres during cell division.
- 64 c) According to Chargaff rule of molecular data of DNA, the molecular amount of Purine (A+G) is equivalent with Pyrimidine (G+C), i.e. $A + G = T + C$.
- 65 c) Pollen chamber, nucellus and filiform apparatus are associated with female reproductive structure while ubisch bodies are produced from tapetum in male reproductive structure.
- 66 a) Coconut (*Cocos*) has liquid and solid endosperms produced through free nuclear division.
- 67 d) Microspore of angiosperm produce two unequal cells: larger vegetative cell and smaller generative cell. At the time of pollination, pollen tube gets nucleus from vegetative cell and generative divides into two identical male gametes.

- 68 b) Parasite and saprophytic organisms get food materials from dead and decaying organisms. They have no chlorophyll for the synthesis of food materials.
- 69 c) Polyethylene glycol (PEG) is main enzyme for protoplasmic fusion. In plant cells, cellulase and pectinase are also required for dissolution of cell wall.
- 70 c) Most of antibiotics are produced from several species of *Streptomyces* and *Bacillus*.
- 71 d) Scheilden and Schwann are well known for cell theory. It states that every cell should arise from pre-existing cell, i.e. cell divides to give new cells.
- 72 c) Sea ecosystem is the largest ecosystem or biome for production of molecular oxygen for other ecosystems.
- 73 b) Transfer of characters through sex chromosomes is called sex linked inheritance, e.g. Hypertrichosis, Myopia, haemophilia, colourblindness, etc. Sickle cell anaemia is somatic mutation due to replacement of one codon by another which forms RBC into sickle shape and lead to anaemia.
- 74 d) Commonly monocots are C4 plants with few exception like rice, wheat, barley and oats.
- 75 d) During respiration, complex organic compounds (carbohydrates, lipids, protein) are oxidised into simple molecules with the liberation of metabolic energy in the form of ATP. Requirement of oxygen and releasing carbon dioxide depends on types of respirations.

Zoology

76. b) Macula lutea or yellow spot is in the exact centre of the retina → cones are most densely concentrated in the central fovea, a small depression in the centre of macula lutea.
77. b) Thyroid initiates, regulates and plays a key role in the metamorphosis of frog's tadpole.
78. c) During phase of maturation, the primary spermatocyte undergoes meiosis I giving rise to two haploid (n) secondary spermatocyte. The secondary spermatocyte undergo meiosis II resulting in the formation of four spermattids.

79. b) Meroblastic cleavage:- 2-types Discoidal cleavage and superficial cleavage.
Holoblastic → cleavage furrow bisects the entire egg.
80. c) Second cervical is the axis, it has odontoid process.
81. c) CO is a poisonous gas. It combines with haemoglobin rapidly than oxygen to form carboxyhaemoglobin.
→ CO makes the most stable combination with haemoglobin of blood.
82. c) Phrenic artery supply to diaphragm. Diaphragm absent in frog.
83. a) Oviducts are independently developed mullarian duct.
84. c) Reflex -arc
- Sensory neuron

Stimulus → receptor → Spinal cord

↓ Motor neuron

Effector

↓

Action
85. c) Eg:- Climbing perch(*Anabas*)
86. a) Basophils are non-phagocytic with 2 - 3lobes of nucleus. They are also involved in allergic reaction.
87. c) Mammalian bone is characterised by the presence of Haversian system or osteon - Matrix between periosteum and endosteum is perforated by a series of fine canals called Haversian canal. → Haversian canals are interconnected by transverse canals known as Volkmann's canals.
88. c) Charles Darwin during his voyage around the world studied the fauna and flora of Galapagos Islands. → Galapagos Islands are called living laboratory of evolution.
89. a) New world monkey eg:- Spider monkey, old world monkey eg:- Rhesus monkey baboon.
Hominoids 4 types of Apes, Gibbon, Orangutan, Gorilla, Chimpanzee
90. c) Pre-patent period is the duration between the initial sporozoite infection or the first appearance of the parasites in blood, it is 8 days in *Plasmodium vivax*.

91. a) Body cavity of *Hydra* is called coelenteron. Coelenteron serves the double purpose of digestion and circulation.
92. c) Copulatory bursa found in male *Ancylostoma*.
93. d) *Pila* → protostome → Haemocoel
Ascaris → protostome → Pseudocoelom
Aphrodite (Annelida) → protostome → Schizocoelom
Asterias → Deuterostome → Enteroceleom
94. a) In cockroach, the blood circulation is maintained by 12 pairs of wing shaped involuntary alary muscles.
95. b) Body cavity of Annelids is a true coelom (Schizocoel), containing milky white alkaline coelomic fluids.
96. c) **In Birds:** Zygodactyly → the digits are distinct.
Pectoral muscles are attached to keel sternum in birds.
Presence of very short tail is the adaptive character of birds
97. b) Longest cells in human body - Neurons
There is no division for neurons after birth. Probably due to the absence of centrosome.
Least power of regeneration is found in neurons.
98. b) Sleeping sickness caused by *Trypanosoma*
Kala-azar → caused by *Leishmania*
Amoebic dysentery → by *Entamoeba*
99. c) Juxta glomerula cells of the kidney secrete as enzyme renin which converts a plasma protein called angiotensinogen in liver into angiotensin I, which is then converted in lung into a peptide angiotensin II. Angiotensin II stimulate the adrenal cortex to produce more aldosterone.
100. b) **Sesamoid bone:** The bone formed by Ossification of tendons, eg: **Patella**

Result will be published on Sunday

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