



NAME

NAME Institute

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BPKIHS Model Entrance Exam

2075

(Set-XXX)

Date: 2075/04/12

Hints and Solutions

NAME

Solutions for BPKIHS Model Entrance Exam set -XXX (2075-04-12)

Physics

1. c)
2. b) $\cos\theta = \frac{\vec{a} \cdot \vec{b}}{ab}$
 $= \frac{(\hat{i} + \hat{i}) \cdot \hat{j}}{\sqrt{2} \times 1}$
 $= \frac{1}{\sqrt{2}} = \cos \frac{\pi}{4}$
 $\theta = \frac{\pi}{4}$
3. a)
4. d) $\frac{v_1 - v_2}{v_2 - v_3} = \frac{at_1 - at_2}{at_2 - at_3} = (t_1 - t_2) : (t_2 - t_3)$
5. c) $\vec{V}_{BW} = \vec{V}_{BE} - \vec{V}_{WE} = (3\hat{i} + 4\hat{j}) - (-3\hat{i} - 4\hat{j}) = 6\hat{i} + 8\hat{j}$
6. a)
7. c) Pseudo force appears in opposite direction in accelerating frame.
8. d) Winner team resist to pull due to greater frictional force. Thus, normal reaction must be greater and so must be the force exerted on the ground.
9. d)
10. b) $h = e^2 h_0 = \left(\frac{1}{2}\right)^2 \times 7.2 = 1.8 \text{ m}$
11. c) gain in $E_K = Fd$
 $\Rightarrow \frac{1}{2}mv^2 = Fd$
 $v = \sqrt{\frac{2Fd}{m}}$
 $v \propto \frac{1}{\sqrt{m}}$
12. a) $R_{\text{inner wheel}} = \frac{mg}{2} \left(1 - \frac{v^2 h}{rga}\right)$
 $R_{\text{outer wheel}} = \frac{mg}{2} \left(1 + \frac{v^2 h}{rga}\right)$
13. a)
14. d) Work done = $\tau\theta = FR\theta$
15. b)
16. b) On inclination vertical height h of liquid remain same
 $l \cos \alpha = h \quad \cos \alpha < 1$
 $l > h$

17. c) Due to low density, clouds have very small terminal velocity so they fall slowly and appear to be floating.
18. c) Because of weightlessness, it will remain where left.
19. a) Thermometer with cylindrical bulb is more sensitive because surface area is more for cylindrical bulb. Hence rate of heat gain is fast.
20. a)
21. a) High humidity does not increase temperature but slows down evaporation. So as humidity increases, a man feels more hot.
22. b) By Wein's law for a black body
 $\lambda_m T = b$ constant
23. b) $d = 2r = \frac{2h}{\sqrt{\mu^2 - 1}}$
 $= \frac{2 \times 1}{\sqrt{\left(\frac{4}{3}\right)^2 - 1}} = \frac{6}{\sqrt{7}} \text{ m}$
24. c) $f = \frac{R}{2(\mu - 1)}$
 $f' = \frac{R}{\mu - 1}$
 $f' = 2f$
25. d) Parabolic mirror has paraboloid surface and both paraxial and marginal rays are focused at a single point thus reducing spherical aberration.
26. d) $I_B = (\sqrt{I_1} + \sqrt{I_2})^2$ $I_D = (\sqrt{I_1} - \sqrt{I_2})^2$
 When I_2 is halved, obviously dark fringes will be brighter and bright fringes will be darker.
27. b) Electrical energy density = $\frac{1}{2} \epsilon_0 E^2 \propto E^2$
28. d) $V_{\text{centre}} = \frac{\sigma R}{\epsilon_0} + \frac{\sigma r}{\epsilon_0}$
29. c) If charged spheres are connected by a conducting wire, there is flow of charge until both of them attain same potential.
 $V_1 = V_2$
 $\frac{Q_1}{4\pi\epsilon_0 R_1} = \frac{Q_2}{4\pi\epsilon_0 R_2}$
 $\sigma_1 R_1 = \sigma_2 R_2$
 $\frac{\sigma_1}{\sigma_2} = \frac{R_2}{R_1} = \frac{r}{R}$
30. a) P.d. across 50 cm length = potential gradient \times length

- $= \frac{6}{300} \times 50 = 1 \text{ V}$
31. b) $P_P = P_1 + P_2 = 80 \text{ watt}$
32. b) $\theta_n = \frac{\theta_c + \theta_i}{2} = 270^\circ \text{C}$
33. c)
34. d) $\tau = BINA \sin\theta$ also $\tau = MB \sin\theta$
 $M = NIA$
35. d) $S = \frac{G}{n-1} = \frac{10}{10-1} = \frac{10}{9} \Omega$ in parallel
 θ θ
36. d) $W = \int_0^\theta \tau d\theta = \int_0^\theta MB \sin\theta d\theta = MB (1 - \cos\theta)$
37. a) The disc is held stationary in a plane perpendicular to field. So magnitude of field is equal at each point and hence induced emf is zero.
38. c) $E_{\text{rms}} = \frac{E_0}{\sqrt{2}}$
39. c)
40. b) $eV_s = hf - \phi = hf - hf_0$
 $f_{\text{uv}} > f_{\text{visible}}$
41. a) $\lambda = \sqrt{\frac{150}{v}} \text{ \AA}$
 $= \sqrt{\frac{150}{150}} \text{ \AA} = 1 \text{ \AA}$
42. a) $E_2 = \frac{-13.6}{n^2} = \frac{-13.6}{2^2} = -3.4 \text{ eV}$
43. c)
44. b) $\frac{M}{M_0} = \frac{I}{I_0} = \frac{1}{64} = \left(\frac{1}{2}\right)^6$
 $\Rightarrow \left(\frac{1}{2}\right)^n = \left(\frac{1}{2}\right)^6$ $n = 6$
 $t = n T_{1/2} = 6 \times 2 = 12 \text{ hrs.}$
45. b)
46. b)

47. b) In the fundamental mode of vibration of an open pipe, a node is formed at the middle of the pipe where displacement is minimum and pressure is maximum.
48. b) $\frac{V_{\text{oxygen}}}{V_{\text{hydrogen}}} = \sqrt{\frac{\rho_{\text{hydrogen}}}{\rho_{\text{oxygen}}}} = \sqrt{\frac{2}{32}} = \frac{1}{4}$
49. b) $T \propto l^2$
 $f = \frac{1}{2l} \sqrt{\frac{T}{m}}$
 $\% \Delta T = 2\% \Delta l \Rightarrow 10\% = 2\% \Delta l$
 $\% \Delta l = 5\%$
50. b) Musical interval = $\frac{320}{240} = \frac{4}{3} = 1.33$

Chemistry

51. b) Decrease in free energy (- ΔG) equals to useful work done by the system (- W non-exp).
52. c) It is governed by 2nd law of thermodynamics.
53. c) By using Henry's law.
54. b) Find kc for each reaction more k, more is the extent of reaction.
55. c) $\text{pOH} = 14 - 10 = 4$
 $\therefore [\text{OH}^-] = 1 \times 10^{-4} \text{ m}$
 $k_{\text{sp}} = [\text{Ba}^{2+}] [\text{OH}^-]^2$
 $\therefore [\text{Ba}^{2+}] = \frac{k_{\text{sp}}}{[\text{OH}^-]^2} = \frac{1 \times 10^{-9}}{(10^{-4})^2} = 10^{-1} \text{ molL}^{-1}$
56. c) Out of HI, H₂S, NH₃ and HF; NH₃ is weakest acid, so NH₂⁻ is strongest base so has greatest proton affinity.
57. a) As [salt] = [acid], pH = pka = 9.30
58. d) The vapour pressure of water is least because of strong intermolecular H-bonding in water molecules.
59. b) Liquefaction of gas takes place if the temperature is below critical temperature.
60. b) 10% solution of KOH is called lye.
61. a) $\text{CaCO}_3 + \text{SiO}_2 \rightarrow \text{CaSiO}_3 + \text{CO}_2$
 Flux impurity slag
62. a) Both are precipitated simultaneously because of being in same gp. Of qualitative analysis

63. b) $\text{HgO} \xrightarrow{\Delta} \text{Hg} + \frac{1}{2} \text{O}_2$
64. c) SO₂ is soluble in water
65. d) Pb⁺⁺ does not give borax bead test.
66. c) $\text{LiH} + \text{AlH}_3 \rightarrow \text{Li}[\text{AlH}_4]$; H⁻ of LiH acts as ligand.
67. a) Water gas + producer gas is semi water gas
68. b) $\text{Na}_2\text{Z} + \text{Ca}^{2+} \rightarrow \text{CaZ} + 2\text{Na}^+$
69. a) Alkaline solution of pyrogallol absorbs oxygen quickly.
70. b) In ZnS, S²⁻ ions form fcc or ccp lattice in which Zn²⁺ occupy alternate tetrahedral voids.
71. a) $t = \frac{2.303}{K} \log \frac{[A_0]}{[A]} = \frac{2.303}{10^{-5}} \log \frac{10}{5} = 360 \text{ s}$
72. d) A photochemical reaction involves photon of light for the interaction of chemical species.
73. a) It will be approximately 50 mL since no association or dissociation takes place.
74. a) More the number of particles in solution more is the osmotic pressure since it is a colligative property.
75. b) $\text{CaCO}_3 + 2\text{HCl} \longrightarrow \text{CaCl}_2 + \text{CO}_2 + \text{H}_2\text{O}$
 100g 73g 44g
 100 mL of 20% HCl solution = 20g HCl
 So, CaCO₃ is limiting reagent
 $\therefore 100\text{g of CaCO}_3 \text{ produces } 44\text{g CO}_2$
 $\therefore 20\text{g of CaCO}_3 \text{ produces } \frac{44}{100} \times 20 = 8.80 \text{ g of CO}_2$
76. b) No. of mole of carbon = $\frac{49.3}{12} = 4.1$
 No. of mole of hydrogen = $\frac{6.84}{1} = 6.84$
 No. of mole of oxygen = $\frac{43.86}{16} = 2.74$
 Ratio of C : H : O = 1.5 : 2.5 : 1 = 3 : 5 : 2
 \therefore empirical formula = C₃H₅O₂
 E.f. mass = 12 × 3 + 1 × 5 + 16 × 2 = 73
 Mol. mass = 2 × U.D = 2 × 73 = 146
 $\therefore n = \frac{\text{mol. mass}}{\text{E.f. mass}} = \frac{146}{73} = 2$
 \therefore molecular formula = (E.f.)n = (C₃H₅O₂) = C₆H₁₀O₄

77. d) Angular node is not present in s-orbital.
 78. d) Any orbital can accommodate maximum electrons with opposite spin.
 79. c) In graphite, central carbon atom is surrounded by 3 other carbon atoms, so it has sp^2 -hybridization.
 80. d) In sp - sp overlaps, both 's' and 'p' orbitals have 50% character when hybridized and thus provide most efficient overlap.

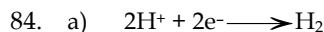
81. c) $x + 2 - 2 = 0 \therefore x = 0$.

82. b) Specific conductance decreases with dilution.

83. c) Since, for concentration cell,

$$E_{\text{cell}} = \frac{0.0591}{n} \log \frac{C_1}{C_2}$$

$E_{\text{cell}} > 0$ if $C_2 > C_1$ so that $\Delta G = -ve$.



$$2 \times 22400 \text{ cm}^3 \text{ at STP}$$

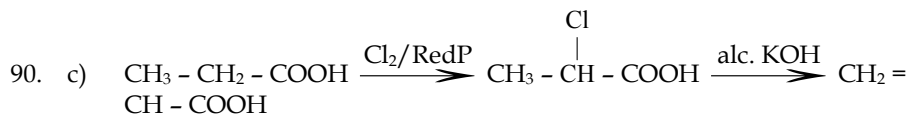
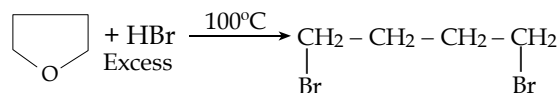
To liberate 22400 cm^3 at STP electricity required = $2 \times 96500 \text{ C}$

To liberate 112 cm^3 at STP electricity required

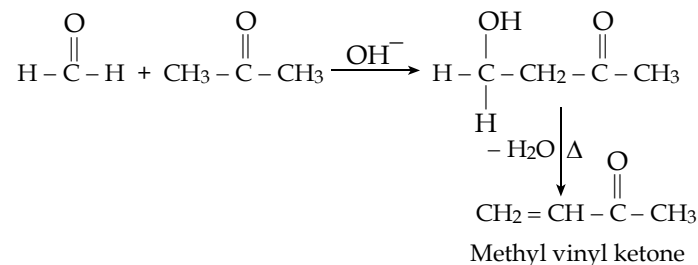
$$= \frac{2 \times 96500 \times 112}{22400} = 965 \text{ C}$$

85. a) Langmuir's adsorption is monomolecular.
 86. d) Symmetrical alkene gives same product in Markonikov's and Antimarkonikov's reaction.
 87. c) Amongst halogen, I^- being most nucleophilic bring about exchange of Cl by I.
 88. b) Weaker acid cannot displace stronger acid so NH_3 being weaker acid than ROH, the reaction does not occurs.

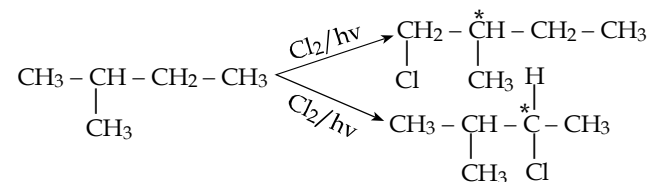
89. a)



91. a)



92. c) 1° amines gives alcohol along with the evolution of N_2 gas.
 93. b) Friedal Craft reactions is not possible in organic compounds containing m-directing group.
 94. b)
 95. c) Polystyrene is a chain growth (addition) polymer of styrene ($C_6H_5CH = CH_2$).
 96. d) sp hybridised carbon and its adjacent carbon are linear.
 97. c) - I group increases the stability of carbanion.
 98. c) For Lassigne's test of nitrogen compound must contains N in addition to carbon to form NaCN in sodium extract.
 99. d)
 100. b)



Botany

101. d) Pollination of snakes is called sepeontology.
 102. d) Cotton fibres are examples of surface fibres (sclerenchyma) produced from seed testa.
 103. d) *Atropa belladonna* is one of the important medicinal plant belonging to the family Solanaceae.
 104. b) Single megaspore mother cell can produce four megaspore; usually one megaspore survive.
 105. b) The man with Klinefelter syndrome shows masculine and feminine both characters with genotype XXY.
 106. d) The movement of lids of insectivorous plants is thigmonastic, i.e. movement due to touch.
 107. b) The cause of photorespiration or c2 cycle is

108. d) Codons and anticodons are found in mRNA and tRNA.
109. d) Cytokinin is the hormone of cell division in plant cells.
110. b) The concept or term ecosystem was proposed by Tansley while its better definition was given by E P Odum.
111. a) Facultative saprophytes are usual parasite but may become saprophytes.
112. c) Eutrophication refers to the decomposition in water body, i.e. low productivity.
113. c) Treatment of defective heredity through nutritional supports is euthenics.
114. d) Virus is non-living due to absence of energy restoring system.
115. b) In cell cycle G2 represents diploid phase due to replication prior to it. S phase replicates the genetic material.
116. d) Light reaction is responsible for the synthesis of assimilatory power like ATP and NADPH₂ required for fixation of CO₂ during dark phase.
117. b) Agranal chloroplast (chloroplast without grana) is common characters found in Kranz anatomy of C4 plants.
118. c) Stomata usually open during day time remain close throughout night time. In CAM plants (desert plants), the stomata may remain closed throughout day.
119. a) Chloroplast is only associated with eukaryotes, not found in bacteria, BGA, etc.
120. d) Mulching is essential for retention of water contents in soil.
121. b) The helotism is the term to denote the relationship between husband and wife as in alga and fungal partner in lichen.
122. d) Vascular arrangement with pith and core of one elements covered by another elements is siphonostele. Solenostele bears discontinuation in stellar system.
123. d) Smallest unit of DNA capable for expression of single character is cistron.
124. d) Generic materials of gemini virus is ssDNA as in coliphage ϕ x 174.
125. d) The phloem elements includes companion cells, sieve tubes, phloem parenchyma, phloem fibres.

Zoology

126. b) Penetrants – largest & most complex nematocyst

- Small glutinant – help the tentacles in fixing to an object when *Hydra* walks on its tentacles.
127. a) Lung fishes – connecting link between fish and amphibia.
128. b) Inner lining of stomach and intestine is formed of columnar epithelium. Cells of columnar epithelium are taller with basally located nucleus.
129. b) Heparin is a glycosaminoglycan with anticoagulant properties, occurring in vertebrate tissues, especially the lungs and blood vessels. It inhibits blood clotting.
130. a) Orinithine cycle (or urea cycle) is the series of biochemical reactions that converts ammonia, which is highly toxic and carbon dioxide to much less toxic urea during the excretion of metabolic nitrogen derived from the deamination of excess aminoacids. These reactions takes place in the liver of mammals.
131. a) Human cranium (or brain box) is formed by 8 bones and provides a bony protection for the brain. White collagen fibre prevents the mobility of skull (cranial) bones.
132. c) Choroid plexus is a membrane rich in blood vessels that lines the ventricles of the brain. It is an extension of the piameter and secretes cerebrospinal fluid into the ventricles. It also controls exchange of materials between the blood and cerebrospinal fluid.
133. c) Oral contraceptives is a preparation consisting of one or more synthetic female sex hormones, taken by women to prevent conception. Most oral contraceptives are combined pills consisting of an estrogen which blocks the normal process of ovulation.
134. a) Cerebellum is the largest part of the hindbrain, bulging back behind the pons and the medulla oblongata and overhung by the occipital lobes of the cerebrum. The cerebellum is essential for the maintenance of muscle tone, balance and the synchronization of activity in groups of muscles under voluntary control, converting muscular contraction into smooth coordinated movement.
135. c) Coelom is a fluid filled cavity that forms the main body cavity of vertebrate and most invertebrate animals. It is formed by the splitting of the mesoderm. Coelom enables the activities of body wall and alimentary canal to operate independent of each other as it separates the guts muscles from the body wall muscles. The coelomic fluid acts as a circulatory medium for the transport of food, waste material etc. It acts as shock absorber.

136. b) *Leishmania donovani* – Leishmaniasis
Trypanosoma species – sleeping sickness or kalazar
Amoeba proteus – Amoebiasis
Plasmodium – Malaria
137. a) Silk is obtained from *Bombyx mori*. The silk is a continuous filament fibre consisting of fibroin protein secreted from two salivary glands in the head of each larvae and a gum called sericin, which cements the two filaments together. The process of obtaining silk thread from cocoon is known as post cocoon processing which includes stifling and reeling.
138. c) Natatorial adaptations are adaptations for aquatic life.
139. b) An insecticide is a pesticide used against insects in all development forms. They include ovocides and larvacides used against the eggs and larvae of insects. Insecticides are widely used in agriculture, household and even in medicine. Active ingredients of many household insecticides include permethrin and tetramethrin which act on the nervous system of insects and arachnids.
140. d) Arrector pili is a small muscle in the dermis of the skin that is attached to the base of a hair follicle. Contraction of the arrector pili is response to cold or fear, pulls the hair into a vertical position, thus trapping an insulating layer of air around the body and causing goose flesh in humans.
141. a) Mouth becomes watery when we look on the delicious food is due to olfactory response. Olfactory responses or olfaction is the sense of smell or the process of detecting smells. This is achieved by receptors in olfactory organs (such as nose) that are sensitive to air or water borne chemicals. Stimulation of those receptors results in the transmission of information to the brain via the olfactory nerve.
142. a) Number of appendages distinguishes an insect from a crustaceans.
143. b) Bowman's gland are found in nose below the olfactory epithelium. They secrete watery discharge to keep olfactory epithelium moist.
144. b) In holothuria lower bronches of respiratory trees form cuvierian organs which produce a sticky substance. When the animal is attacked or irritated, the cuvierian organ are thrown out and enemy is entangled in sticky thread.

145. d) Functional residual capacity is the volume of gas that remains in the lungs after the exhalation of a spontaneous or mechanically assisted breath. Infants with surfactant deficiency have a lower FRC.
146. b) Conn's syndrome is overproduction of the mineralocorticoid hormone aldosterone by the adrenal glands. Conn's syndrome is important because it is a potentially curable cause of high blood pressure (hypertension).
147. c)
148. d) *Metridium* is a solitary marine sea anemones. In sea anemone, the body has biradial symmetry. Body is clearly divisible into three region-oral disc, pedal disc and column. In *Metridium*, medusa stage is totally absent. Thus, life cycle of *Metridium* is simple and does not show an alternation of generation.
149. c) Adaptive radiation (divergent evolution) is the evolution from one species of animals or plants of a number of different forms. As the original population increases in sizes it spreads out from its centre of origin to exploit new habitats and food sources. In time this results in a number of populations each adapted to its particular habitat; eventually these populations will differ from each other sufficiently to become new species. A good example of this process is the evolution of the Australian marsupials into species adapted as carnivores, herbivores burrowers, fliers, etc. On a smaller scale, the adaptive radiation of the Galapagos finches provided Darwin with crucial evidence for his theory of evolution.
150. c)

English, Health & GK

151.a	152.c	153.b	154.b	155.c	156.c	157.d	158.a	159.d	160.a
161.c	162.c	163.b	164.a	165.d	166.a	167.a	168.c	169.a	170.d
171.c	172.b	173.c	174.b	175.b	176.a	177.b	178.d	179.a	180.b
181.d	182.a	183.a	184.d	185.a	186.c	187.d	188.c	189.a	190.a
191.c	192.a	193.b	194.a	195.c	196.c	197.b	198.b	199.d	200.b

Result will be published on Sunday

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==== Best of Luck ====