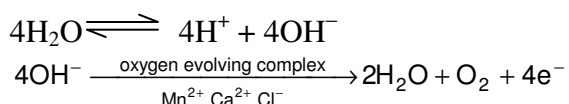


BIOLOGY

1. (4) Blood vessel lining is thin and hence is lined by squamous epithelium since the cells are flat and form a thin lining.
2. (1) Bt cotton acts as biopesticide, compost is dead decay organic matter. Pesticides & urea both are chemicals used to enhance crop production. In organic form pesticides & chemical fertilizer are not used.
3. (3) Antibody formation is a function of B- lymphocytes & T-helper lymphocytes assist them.
4. (2) Megaspore and female gametophyte not released in the environment but retained in sporophyte which later on modified into seed like structure.
5. (3) Frog can act as a secondary consumer as well as a tertiary consumer in a particular ecosystem.
6. (3) Mn^{2+} , Ca^{2+} , Cl^{-} is needed for photolysis of H_2O .

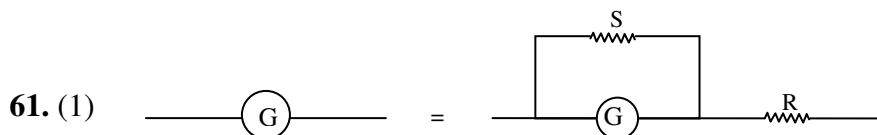


7. (3) Only one sperm is allowed to enter as after the entry there is depolarisation and formation of fertilisation membrane which prevent polyspermy.
8. (3) 70% of CO_2 travels in the blood plasma in *bicarbonate form*.
9. (1) Protons are transferred to outer chamber by various carrier like $FADH_2$ & $Co - Q$.
10. (2) DNA is a gametical material was proved by Harshy & Chase in the year 1952 with the help of bacteriophage.
11. (2) *Alstonia* has world, simple leaf with reticulate venation.
12. (3) QRS represents the complete cardiac cycle.
13. (4) Clavicle (Collar bone) and glenoid cavity are parts of pectoral girdle.
14. (2) In vegetative as well as in apomixis single parent is involved without involving fusion of gametes, so the progeny will be identical to the parents.
15. (4) The drug named cyclosporine A is obtained from the fungi *Trichoderma polyspora*. The drug possess immunosuppressive property which inhibit the activation of T-cell response to the transplant heart.
16. (3) In human beings females are homomorphic with two similar sex chromosomes (XX). Hence it would lead to the birth of normal female.
17. (2) Melatonin released by pineal gland is also called sleep hormone as it regulates the sleep-wake cycle.
18. (4) In water hyacinth *Eichornia* the vegetative suproduction take place by offsets not by runners. In grasses runner are present for vegetative reproduction.
19. (2) Food synthesized in leaves 1st transferred to companion cell as sucrose from where it is actively pumped into sieve tube elements.
20. (4) Endomembrane system of the plant are directly indirectly cut off E.R. which include vacuole, lysosomes & golgi complex not microbodies – peroxisomes glyoxysome etc.
21. (4) The bundle sheath possess thick wall devoid of intercellular spaces with large number chloroplast with agrannal thylakoids, peripheral reticulum & starch grain.
22. (2) Sweet potato & turnip modified root so they have same origin and same functions hence they are homologous. Ginger , potato & *Calocaica* are modified stem so they are analogous to sweet potato as they move different origin but similar function.
23. (2) In male frog, the ureters carry both urine and sperms.

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24. (1) Rib muscles are under the voluntary control as well, but Diaphragm is totally involuntary, and cannot be altered.
25. (2) Rosie is first transgenic cow not buffalo produce milk which was human alpha lactalbumin enriched. Restriction endonuclease help in separation of desired gene from DNA molecule.
26. (1) The pathogen *Microsporium* belongs to kingdom fungi as *Rhizopus*.
27. (3) With the help of recombinant DNA technology the genetically modified organisms can be made.
28. (1) Ozone present in stratosphere acts as a shield absorbing ultraviolet radiation.
29. (2) Guttation is loss of water from leaf tip through hydathodes it is caused by root pressure.
30. (4) Biodiversity is the diversity or heterogeneity that exists not only at the species level but at all levels of biological organisation.
31. (1) Spindle fiber attached on the kinetochore.
32. (1) *Clostridium butyrium* is used to obtain butanoic acid not for lactic acid. *Lactobacillus lactis* is used to obtain lactic acid.
33. (4) mRNA has been used in producing transgenic plants resistant to nematodes.
34. (1) In humans, notochord is present during embryonic stages and is replaced by vertebral column in adults.
35. (3) Females who cannot form an ovum, but show suitable environment for implantation, need the GIFT technique.
36. (3) Common cold is not cured by antibiotics as antibiotics are used for bacteria. Common cold is caused by virus which is devoid of cellular content and hence the antibiotic remain ineffective.
37. (4) Pneumonia is a bacterial infection spread through droplet infection. While elephantism is spread by *Aedes* mosquito, malaria by female *Anopheles* and Typhoid by contaminated food & water.
38. (1) Since human RBCs are enucleated.
39. (1) Test cross is the cross between the F₁ hybrid to only its recessive parent.
40. (4) Logistic growth is expressed by $\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$ where K = carrying capacity, N = Population,
r = intrinsic rate of natural increase density at increase time t.
41. (3) A – Archigonophore
B – Female thallus
C – Gemma cups
D – Rhizoids
42. (3) LH surge usually occurs before ovulation which roughly occurs in the middle of the cycle.
43. (1) Human genomics project involve the entire sequencing of human genome which involve computer base analysis so bioinformatics developed during that time.
44. (1) There are 2 incisors, 1 canine, 2 premolars & 3 molars in the upper & lower halves of our jaws.
45. (1) The thigh muscles are voluntary as we can move our thigh according to our will.
46. (1) Cd has no known physiological role in plant.
47. (4) The sporophytes in liverwort less elaborate than mosses. *Pinus* is monoecious plant bear both the cone on same plant.
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48. (1) A B C D
F F T F
49. (2) C is octopus (Mollusc) and D is scorpion (Arthropod), both have Schizocoelom, a type of true coelom.
50. (3) The functional megaspore will produce embryosac. In most of the angiospermic families the embryo sac is 7-celled 8 nucleated produced by 1 meiotic & 3 mitotic division.
51. (4) Increase in mass from mass called intussusception.
52. (4) Open vascular bundle show secondary growth like gymnosperm & dicot.
53. (3) *Bacillus thuringiensis* contain crystal protein which is secreted by *cry* gene. It is inactive in plant but become activated in the midgut of insect & bind with epithelial cell to cause the pore.
54. (3) Trypsinogen is inactive and is released as such by pancreas, on reaching in duodenum it is activated by an intestinal enzyme (Enterokinase)
55. (3) Clitellum is glandular and secretes cocoon during breeding season.
56. (3) All seral succession will lead to moderate conditions called Mesic condition.
57. (4) Mechanical breakdown of detritus by Earthworm.
58. (4) Free central placentation – *Dianthus*
59. (4) B – Crista arise as a result of folding of inner mitochondrial membrane.
60. (2) Bears go into hibernation (winter sleep), broad base pyramid has more population in pre-reproductive phase hence show expanding population. Hot spots are areas with high species richness.

PHYSICS



According to question resistance 'R' 10 put in series.

$$G = \frac{GS}{G+S} + R$$

$$R = G - \frac{GS}{G+S} \Rightarrow R = \frac{G^2}{S+G}$$

62. (4) Using average distance speed

$$\text{Average speed} = \frac{\text{total distance}}{\text{total time}} = \frac{2S}{\frac{S}{V_1} + \frac{S}{V_2}}$$

$$= \frac{2V_1V_2}{V_1 + V_2}$$

63. (2) $\Delta T^\circ = \frac{1\mu\text{A} \times 10 \text{ ohm}}{40\mu\text{v} / ^\circ\text{C}} = 0.25^\circ\text{C}$

64. (3) Conservation of Linear momentum
Momentum initial = momentum final

$$m v \hat{i} + 3m (2v) \hat{j} = (m + 3m) \vec{v}$$

$$\frac{V}{4} \hat{i} + \frac{3}{2} v \hat{j} = \vec{v}$$

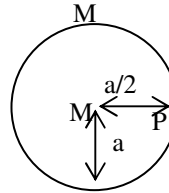
65. (1) $V = +15 \text{ cm}$
 $u = +10 \text{ cm}$
 Using lense formula $\frac{1}{f} = -\frac{1}{u} + \frac{1}{V}$
 $\therefore f = -30 \text{ cm.}$

66. (3) Using $h\nu = h\nu_0 + eV_0$
 $h(\nu - \nu_0) = eV_0$
 $V_0 = \frac{(\nu - \nu_0)h}{e}$
 $V_0 = \frac{(8.2 - 3.3) \times 10^{14} \times 6.62 \times 10^{-34}}{1.6 \times 10^{-19}}$
 $= 2V$

67. (4) Energy of the n^{th} energy level
 $= -13.6 + 10 + 2.75$
 $= -0.85$
 Using
 $-0.85 = -\frac{13.6}{n^2} \Rightarrow n = 4$

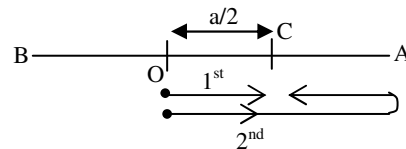
68. (4) $V_{\text{rms}} = \sqrt{\frac{V_0^2 \cdot \frac{T}{2}}{T}} = \frac{V_0}{\sqrt{2}}$

69. (4) Gravitational potential at P.
 $= \frac{GM}{a/2} + \frac{GM}{a}$
 $= \frac{3GM}{a}$



70. (4) Let AOB be the line along which particle describe S.H.M
 Let the particle cross at point C, where $OC = a/2$
 Time taken by one particle to reach C so that $OC = a/2$

$\therefore y = a \sin \omega t$
 $\frac{1}{2} = a \sin \omega t$
 $\sin \omega t = \frac{1}{2} = \sin \frac{\pi}{6}$
 $\therefore \omega t = \frac{\pi}{6} \Rightarrow t = \frac{\pi}{6\omega} = \frac{T}{12}$



Time taken by other particle to reach from OA and then A to C is

$$\left(\frac{T}{4} - \frac{T}{12}\right) + \frac{T}{4} = \frac{5T}{12}$$

\therefore Time difference $\Delta T = \frac{5T}{12} - \frac{T}{12} = \frac{4T}{12} = \frac{T}{3}$

\therefore phase difference $= \frac{T}{3} \times \frac{360}{T}$

$$= 120^\circ = \frac{2\pi}{3}$$

Short method :-

$$\begin{aligned} x &= A \sin \theta \\ \frac{A}{2} &= A \sin \theta \\ \therefore \theta &= 30^\circ \text{ and } 150^\circ \\ \text{Difference} &= 150^\circ - 30^\circ = 120^\circ = \frac{2\pi}{3} \end{aligned}$$

71. (2) Kirchoff Law

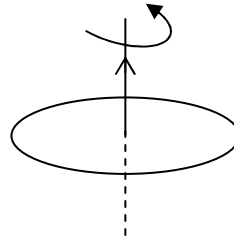
$$\begin{aligned} V_A + 1 + 2 - 2 &= V_B \\ \text{Given } V_A &= 0 \\ 0 + 1 - 2 - 2 &= V_B \\ \therefore V_B &= 1 \text{ volt} \end{aligned}$$

72. (2) Using $V^2 = u^2 + 2as$

$$\begin{aligned} \text{Put } a &= -g \\ &= -10 \times .5 = -5 \text{ms}^{-2} \\ u &= 2 \text{m/s} \\ \therefore V &= 0 \\ \therefore S &= .4 \text{ m} \end{aligned}$$

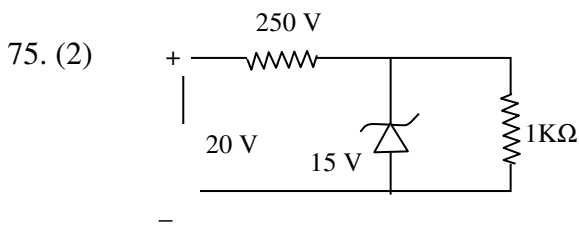
73. (1) Using $\frac{T^r}{\rho^{r-1}} = \text{Constant}$

$$P = 2 \left(\frac{1200}{300} \right)^{7/2} = 256 \text{ atm}$$



74. (3) At centre

$$B = \frac{\mu_0 I}{2R} = \frac{\mu_0 qf}{2R}$$



$$\frac{20 - 15}{250} - \frac{15}{1000} = 5 \text{mA}$$

76. (4) The energy value are $-13.6 \text{ eV}_1 - 3.4 \text{ eV}_1 - 1.51 \text{ eV}_1 - 0.85 \text{ eV}$ etc.

\therefore the difference of these level will give answer

77. (4) For forward biasing P should be at high and N at low potential

78. (4) Using $N = N_0 e^{-\lambda t}$

Given at $t = 0$ N_0 of P = $4 N_0$

And No. of Q = N_0

$$\begin{aligned} \therefore 4 N_0 e^{-2\lambda t} &= N_0 e^{-\lambda t} \\ 4 &= e^{+\lambda t} \end{aligned}$$

$$2 \ln 2 = \frac{\ln 2t}{2}$$

$$\therefore t = 4 \text{ min.}$$

The No. of nuclei of R present

$$\therefore R = \left(4 N_0 - \frac{N_0}{4}\right) + \left(N_0 - \frac{N_0}{4}\right) = \frac{9N_0}{2}$$

79. (2) In a doped semiconductor

$$n_e n_h = n_i^2$$

$$n_e = \frac{n_i^2}{n_h} = \frac{(1.5 \times 10^{16})^2}{4.5 \times 10^{22}} = 5 \times 10^9 \text{ m}^{-3}$$

80. (4) For dispersion without deviation.

$$\begin{aligned} \delta_1 &= \delta_2 \\ (\mu_1 - 1) A_1 &= (\mu_2 - 1) A_2 \\ (1.5 - 1) 15^\circ &= (1.75 - 1) A \\ \therefore A &= 10^\circ \end{aligned}$$

81. (3)

$$\begin{aligned} f &\propto \sqrt{T} \\ \frac{\Delta f}{f} &= \frac{1}{2} \frac{\Delta T}{T} \\ \text{Given beat} &= 6 \\ \therefore \Delta f &= 6 \\ \frac{6}{600} &= \frac{1}{2} \frac{\Delta T}{T} \\ \frac{1}{50} &= \frac{\Delta T}{T} \\ \therefore \frac{\Delta T}{T} &= .02 \end{aligned}$$

82. (1) angular momentum

$$\begin{aligned} &= \text{Constant} \\ mvr &= \text{Constant} \\ mvr &= mv'r/2 \\ \therefore V' &= 2V \end{aligned}$$

$$\therefore \text{Kinetic energy} = \frac{1}{2} m (2V)^2 = 4 \text{ K.E}$$

$$83. (2) \text{ using } E = -\frac{\delta v}{\delta x} = -8x$$

$$\text{Put } x = 1$$

$$\therefore E = -8 \text{ v/m}$$

$$84. (1) W_{DE} = Q [V_E - V_D]$$

$$\text{As } V_E = V_D$$

$$\therefore W_{DE} = 0$$

85. (3) Escape velocity is the velocity with which body must be projected so that it does not return back to earth.

$$86. (3) \text{ P.E} = -MB \cos \theta$$

$$\text{Given } M = .4 \text{ JT}^{-1}$$

$$B = .16 \text{ T}$$

$$\theta = 0^\circ$$

$$P.E = -0.064 \text{ J}$$

87. (2) Parallel current wire will attract while in opp. Direct repel, however same direction wire are close to each other.

$$88. (4) \tan \phi + \tan \phi = \tan \theta$$

$$\tan \phi = \frac{\tan \theta}{2}$$

$$\tan \phi = \frac{\tan 45^\circ}{2}$$

$$89. (3) I = \frac{V}{Z} = \frac{V}{\sqrt{R^2 + XL^2}} = \frac{200}{\sqrt{(30)^2 + (20 \times 2)^2}} = 4 \text{ A}$$

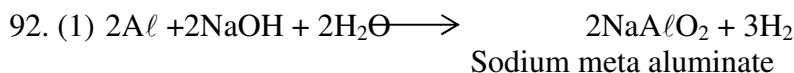
$$90. (4) n_2 = n_1 \left[\frac{M_1}{M_2} \right]^a \left[\frac{L_1}{L_2} \right]^b$$

$$= 4 \left[\frac{\text{g}}{100 \text{ g}} \right]^1 \left[\frac{\text{cm}}{10 \text{ cm}} \right]^{-3}$$

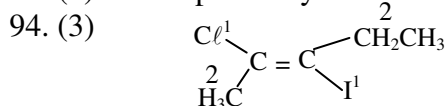
$$= 40.$$

CHEMISTRY

91. (4) (1) Plaster of Paris = $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$
 (2) Epsomite = $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$
 (3) Kieserite = $\text{MgSO}_4 \cdot \text{H}_2\text{O}$
 (4) Gypsum = $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$



93. (1) Self explanatory

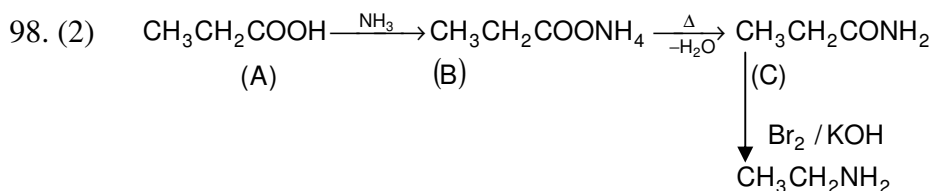


Trans - 2 - chloro - 3 - iodo - 2 - pentene.

95. (3) SnO_2 is amphoteric in nature

96. (3) Electron withdrawing groups makes the attack of nucleophile easy.

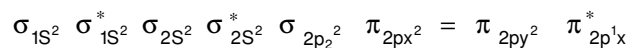
$$97. (3) \text{Apply } \frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$



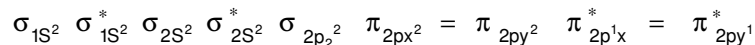
99. (4) (1) $\frac{1}{2}A \rightarrow B \quad \Delta H = + 150 \text{ kJ/mol}$
 (2) $3B \rightarrow 2C + D \quad \Delta H = - 125 \text{ kJ/mol}$
 (3) $E + A \rightarrow 2D \quad \Delta H = + 350 \text{ kJ/mol}$
 Apply 2 (1) + (2) - (3) to get the required equation.
100. (2) Apply $\Delta T_f = i k_f m$
 $T_f = - 0.24^\circ\text{C}$
101. (1) $\text{CaO(s)} + \text{SiO}_2(\text{s}) \rightarrow \text{CaSiO}_3(\text{s})$
 slag
102. (1) Apply
 $k_{sp}(\text{AgCl}) = [\text{Ag}^+][\text{Cl}^-]$
 $k_{sp}(\text{PbCl}_2) = [\text{Pb}^{2+}][\text{Cl}^-]^2$
103. (2) Neutral structure are more stable then the structure carrying charges.
104. (3) For zero order reaction
 Rate of reaction = k
 Units are $\text{mol L}^{-1} \text{s}^{-1}$
105. (1) Since reduction potential for $\text{I}_2/2\text{I}^-$ is less, hence I^- will be oxidized to I_2 .
106. (2) Apply $\pi = \frac{w \times R \times T}{M \times V(\text{in L})}$
107. (4) $2\text{N}_2\text{O}_5 \rightarrow 4\text{NO}_2 + \text{O}_2$
 $-\frac{1}{2} \frac{d(\text{N}_2\text{O}_5)}{dt} = +\frac{1}{4} \frac{d(\text{NO}_2)}{dt} = +\frac{1}{1} \frac{d(\text{O}_2)}{dt}$
 $\frac{1}{2} k [\text{N}_2\text{O}_5] = \frac{1}{4} k' [\text{N}_2\text{O}_5] = k'' [\text{N}_2\text{O}_5]$
 $\Rightarrow k' = 2k, \quad k'' = \frac{k}{2}$
108. (1) It will take 5 half lifes to fall conc. from 1.28 mg/L to 0.04 mg/L
 So time required is = 5×138
 $= 690\text{s}$
109. (4) $[\text{Cr}(\text{NH}_3)_6]^{3+}$, it contain maximum number of unpaired electrons.
110. (1) radius of tetrahedral void = $0.414 \times$ radius of anion
 radius of anion = $\frac{100}{0.414} = 241.5 \text{ pm}$.
111. (3) Factual.
112. (4) In (1), (2) & (3) basic character decreases due to resonance.
113. (1) H_2 contains largest number of moles and molecules among the following.
114. (2)
 Benzaldehyde \rightarrow Benzoin condensation
 Phthalic anhydride \rightarrow Phenolphthalein
 Phehyl benzoate \rightarrow Fries rearrangement
 Methyl salicylate \rightarrow Oil of wintergreen.
115. (3) $\text{Na} \rightarrow \text{Na}^+ + \text{e}^- \quad \text{IE}_1 = 5.1 \text{ eV}$
 $\text{Na}^+ + \text{e}^- \rightarrow \text{Na} \quad \text{electron gain enthalpy} = - 5.1 \text{ eV}$.
116. (3) In (1), (2) & (4) oxidation state of V, Fe and Cr is zero but in (3) oxidation state of Mn is +1, due to positive charge on Mn, C-O bond becomes strong.
117. (2) Order of reactivity of carbonyl compounds is

Aliphatic aldehydes > Aromatic aldehydes > Aliphatic ketones > Aromatic ketones.

118. (1) electronic configuration of O_2^+



Electronic configuration of O_2



Both contain unpaired electrons and hence paramagnetic.

119. (1) As we move away from nucleus, the difference in energy of energy levels decreases, hence transition from $n = 6$ to $n = 5$ is least energetic.

120. (1) Both (1) and (2) are primary halides. Also strong nucleophiles favours SN^2 .