

COMBINED TEST- 13

21 March 2020

SOLUTION

FOR

NEET PATTERN

NEET (TARGET BATCH)

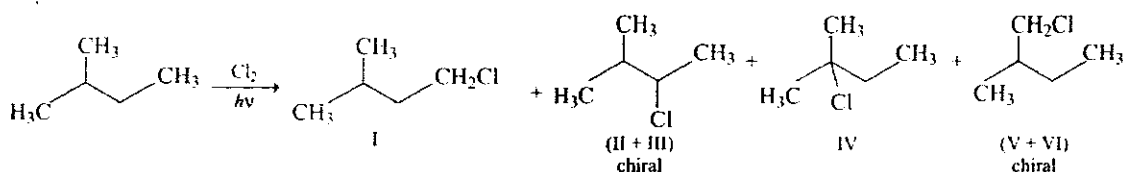


CATJEE
EDUCATION PVT. LTD.
BETTER EDUCATION THROUGH RESEARCH

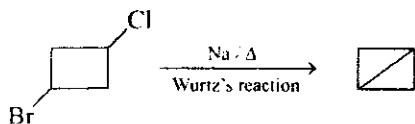
Name of Student:

SOLUTION: TARGET NEET BATCH

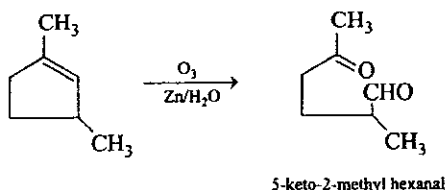
- 1.[b] Since, fractional distillation cannot separate enantiomers (II+III and V+VI), $M = 4$ and $N = 6$



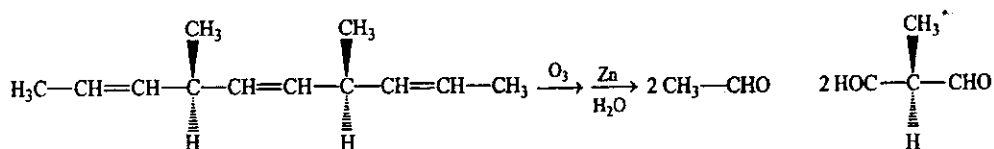
- 2.[d] 1-Bromo-3-chlorocyclobutane



- 3.[b]

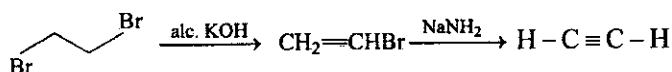


- 4.[a] Ozonolysis of the given triene occur as follows:

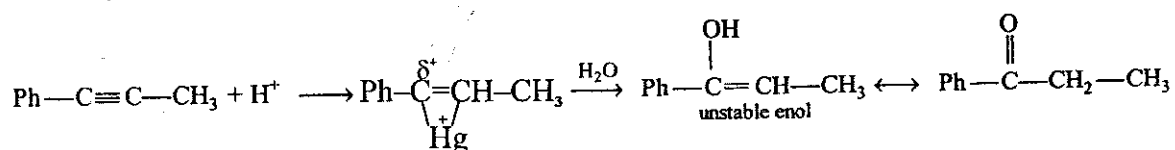


Since, none of the above is chiral, no optically active product is obtained.

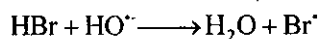
- 5.[b]



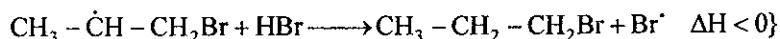
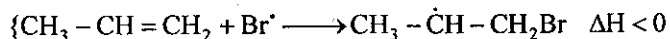
- 6.[a] Reaction proceeds through carbocation intermediate cyclic mercurinium ion.



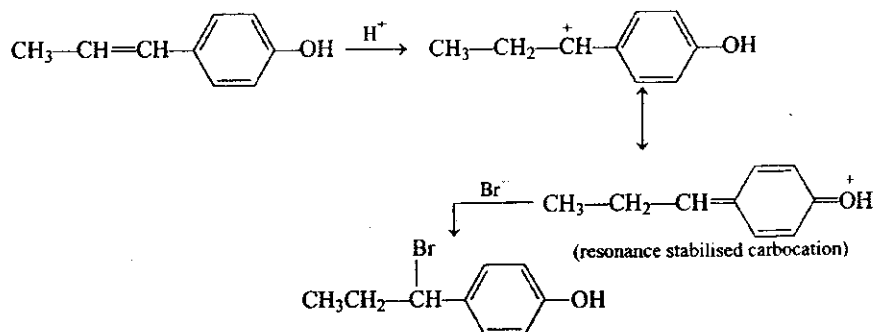
- 7.[c] In addition of HBr to an alkene, in the presence of peroxide, both the propagation steps are exothermic:



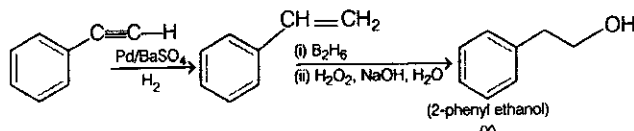
Propagation:



- 8.[c] Electrophilic addition on $\text{C}=\text{C}$ is governed by stability of carbocation:

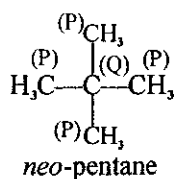


9.[c] The reaction condition indicates that starting compound is phenyl acetylene



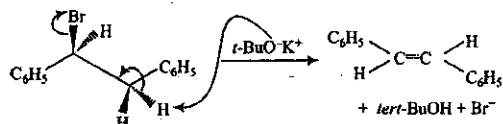
Hydroboration oxidation bring about anti-Markonikoff's hydration of alkene.

10.[c] Here, P=primary carbon atom, Q=Quaternary carbon atom

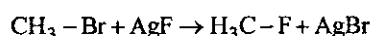


Thus, neo-pentane has four primary carbon atoms, 0-secondary, 0-tertiary and 1 quaternary carbon atom.

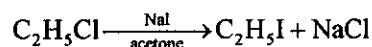
11.[b] An alkyl halide in presence of a bulkier base removes a proton from a carbon adjacent to the carbon bonded to the halogen. This reaction is called E2 (β -elimination reaction).



12.[d] The synthesis of alkyl fluorides is best accomplished by heating an alkyl chloride/bromide in presence of a metallic fluorides such as AgF, Hg₂F₂, CoF₂ or SbF₃. The reaction is termed as Swarts reaction.

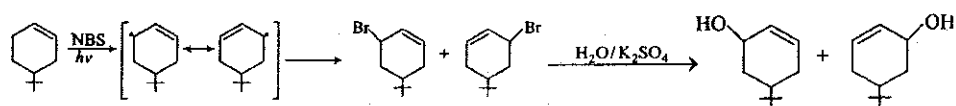


But, when action of NaI/acetone takes place on alkyl chloride of bromide, alkyl iodide forms. This reaction is called 'Finkelstein reaction'

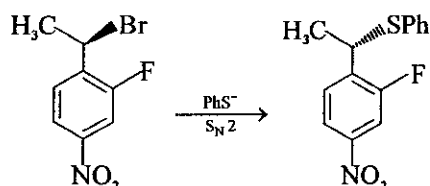


Free radical fluorination is highly explosive reaction, so not preferred for the preparation of fluoride.

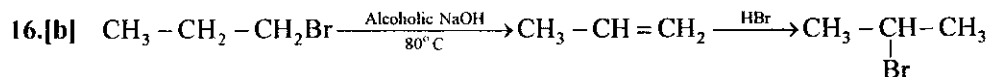
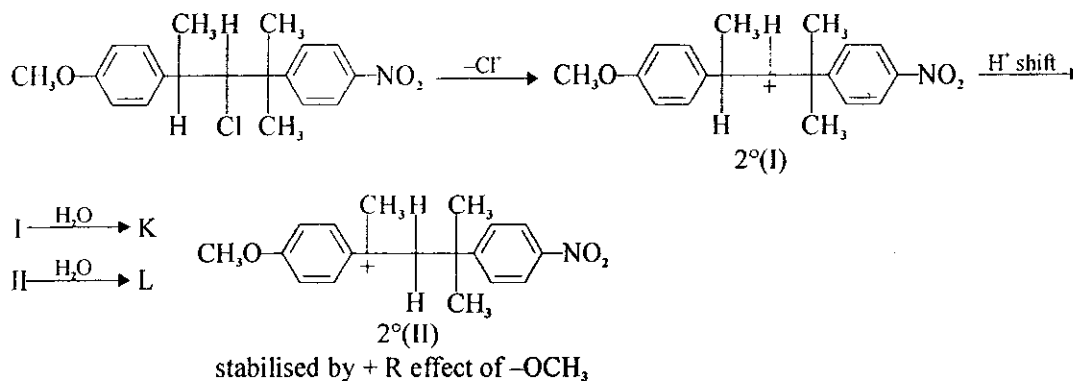
13.[a]



14.[a] Nucleophile PhS⁻ substitute the Br⁻ through S_N2 mechanism with inversion of configuration at α -C.

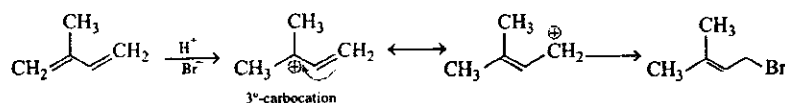


15.[a] Reaction proceed through carbocation intermediate

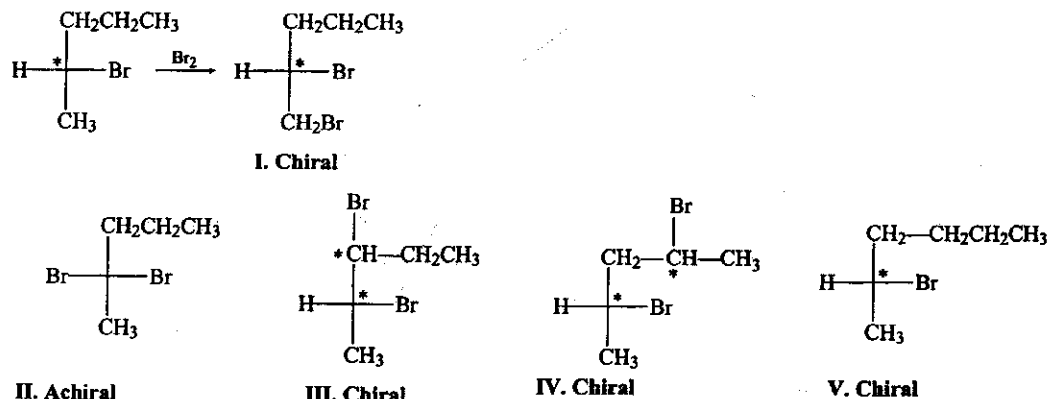


17.[d] $\text{S}_{\text{N}}2$ reaction at asymmetric carbon occur with inversion of configuration and a single stereoisomer is formed because the reactant and product are not enantiomer. Therefore the sign of optical rotation may or may not change.

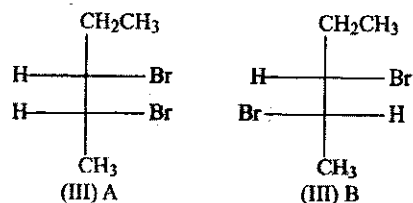
18.[d] Since, there is no mention of temperature, room temperature will be considered and thermodynamically controlled product would be the major product as:



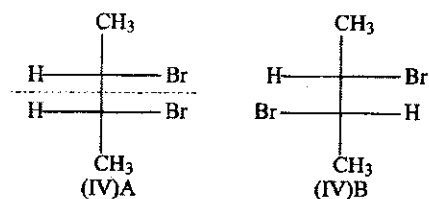
19.[a] Given compound undergoes free-radical bromination under given conditions, replacing H by Br. C^* is chiral carbon.



(III) has two chiral centres and can have two structures.



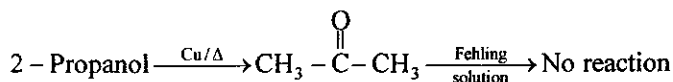
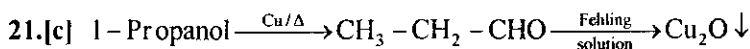
(IV) has also two chiral centres and can have two structures.



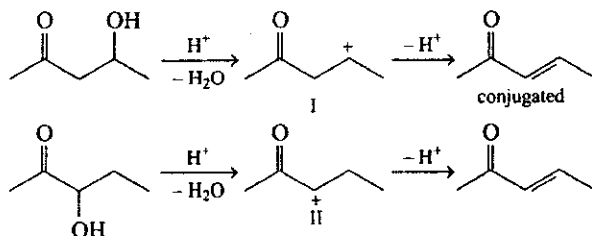
It has plane of symmetry thus, achiral.

Thus, chiral compounds are five. I, III A, III B, IV B and V.

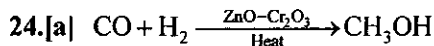
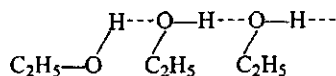
20.[b] The reaction of alcohol with Lucas reagent is mostly an S_N1 reaction and the rate of reaction is directly proportional to the stability of carbocation formed in the reaction. since, 3° R-OH forms 3° carbocation (most stable), hence it will react fastest.



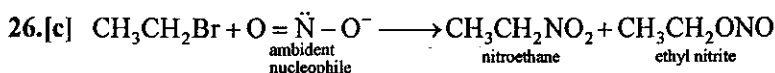
22.[a] Although both reactions are giving the same product, carbocation I is more stable than II



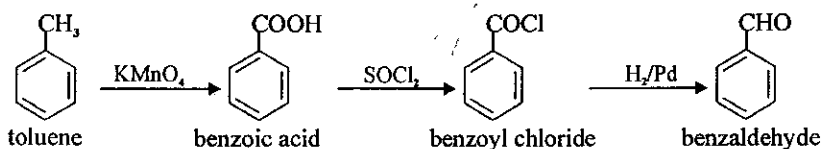
23.[a] Ethanol is capable in forming intermolecular H-bonds.



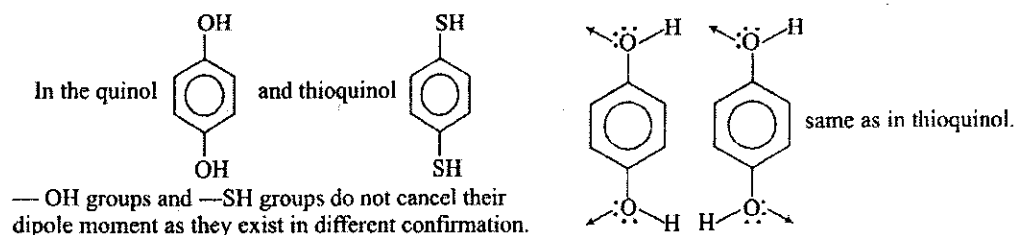
25.[a] Phenol does not react further with HI.



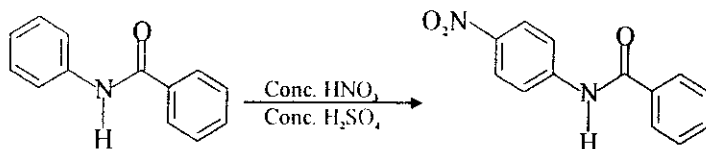
27.[d]



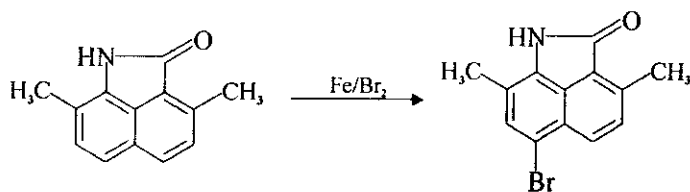
28.[d] Draw the structure of organic compounds indicating net dipole moment which includes lone pair and bond angle also.



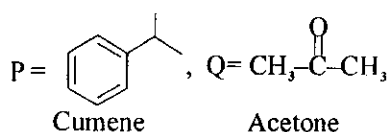
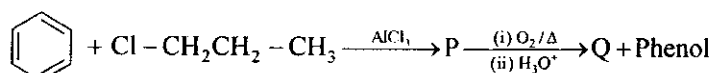
29.[b] Ring attached to nitrogen is activated while ring attached to C=O is deactivated. Also electrophilic substitution occur predominantly at *para* position of the activated ring due to immense steric hindrance at *ortho* position.



- 30.[b] Ring attached to nitrogen is activated by electron donating resonance effect while ring attached to carbonyl group is deactivated by electron withdrawing resonance effect:



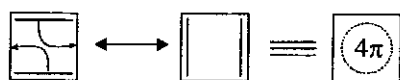
31.[c]



- 32.[c] Both chloro and nitro groups are deactivating in electrophilic aromatic substitution reaction. also nitro group is stronger deactivating group. Methyl group is activator in electrophilic aromatic substitution.

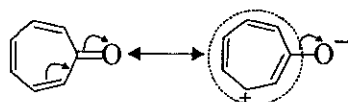
Hence, overall order of reactivity is: Nitrobenzene < Chlorobenzene < Benzene < Toluene

- 33.[b] According to Huckel rule, the compounds which have 4n(n=0, 1, 2, 3...) delocalised π-electrons in a close-loop are anti-aromatic and characteristically unstable. Compound B satisfy the criteria of anti-aromaticity as:



Compound (c) is aromatic.

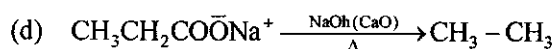
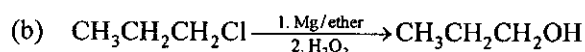
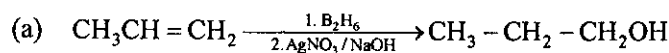
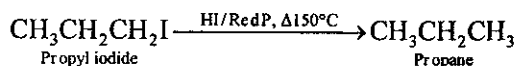
Compound (a) has 4π-electrons which are also delocalised but do not constitute close loop, hence non-aromatic. Compound (d) is aromatic, characteristically stable.



Tropyllium ion, aromatic

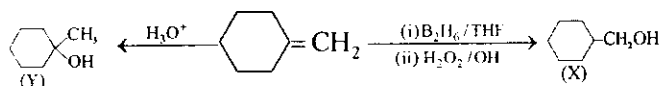
Order of stability Aromatic > Non-aromatic > Anti-aromatic.

- 34.[c] Alkyl halides undergo reduction with red phosphorus and hydrogen iodide and result in the formation of alkane.

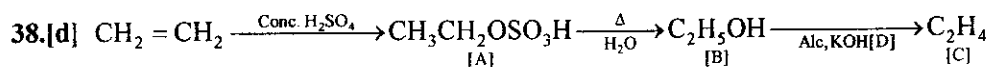
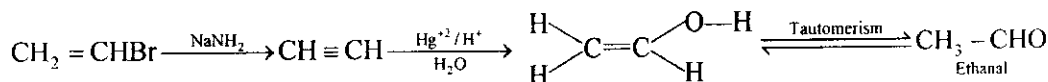


- 35.[d] LPG is chiefly a mixture of butane and iso-butane. Their molecular formula is C₄H₈. The gas is used for cooking purpose.

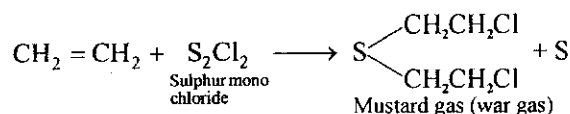
36.[c] Due to hydration, addition of H₂O takes place by Markownikoff's rule and by hydroboration-oxidation, addition of H₂O takes place by anti-Markownikoff's rule.



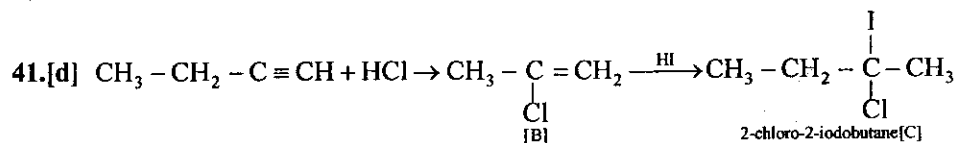
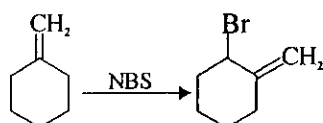
37.[b]



39.[b]

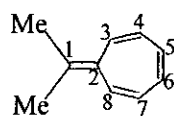


40.[a] NBS is a selective brominating reagent. Since, it normally brominates the ethylenic compounds in the allylic position. Thus, the reaction would be



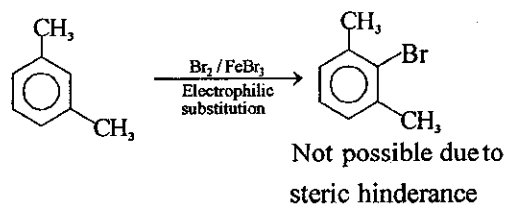
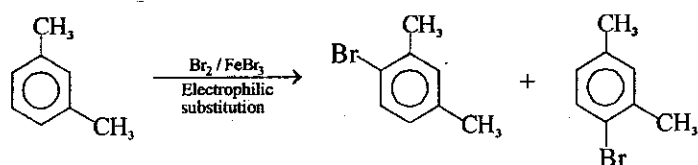
42.[a] Addition of a proton at C1 results in the formation of tropylium carbocation (an aromatic species with more stability due to delocalisation of π-electrons) thus, it is the most reactive site towards protonation.

Addition of proton at any other carbon atom, interrupt in the delocalisation of π-electrons by disturbing planarity of molecules and hence, makes it less stable. Thus, rest all are less reactivitiesites toward protonation.

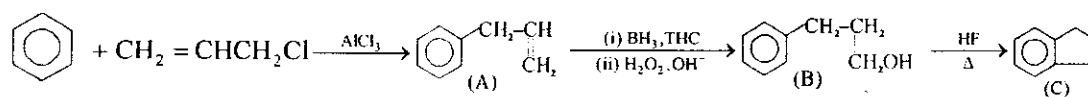


43.[c] -CH₃ (an alkyl group) is an *ortho* and *para* directing group, thus, 2 isomeric products are formed. Out of these 2 products. *ortho* one is a minor product while *para* product is a major one.

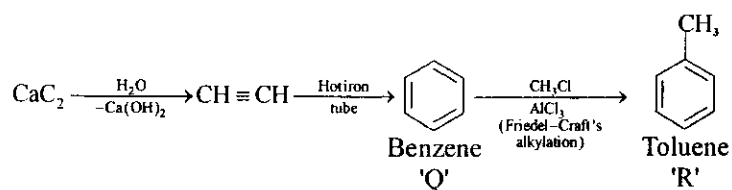
Thus, the complete reaction can be represented as:



44.[b]



45.[c]



Physics [Solution]

46. (D)

For destructive interference,

$$\cos \phi = \min = -1$$

$$\text{i.e., } \phi = \pm\pi, \pm 3\pi, \pm 5\pi$$

$$\text{or } \phi = \pm(2n+1)\pi$$

with $n = 0, 1, 2, 3, \dots$

$$\text{or } \Delta x = \pm \frac{(2n+1)\lambda}{2}$$

47. (C)

in interference,

$$I_{\max} = (\sqrt{I_1} + \sqrt{I_2})^2$$

$$\text{while } I_{\min} = (\sqrt{I_1} - \sqrt{I_2})^2$$

$$\text{So, } \frac{I_{\max}}{I_{\min}} = \frac{(\sqrt{I_1} + \sqrt{I_2})^2}{(\sqrt{I_1} - \sqrt{I_2})^2}$$

$$= \frac{(A_1 + A_2)^2}{(A_1 - A_2)^2}$$

$$\therefore \text{Given } \frac{A_1}{A_2} = \frac{3}{5}$$

$$\therefore \frac{I_{\max}}{I_{\min}} = \frac{(3+5)^2}{(3-5)^2} = \frac{16}{1}$$

48. (B)

$$I = I_1 + I_2 + 2\sqrt{I_1 I_2} \cos \phi$$

$$= I + 4I + 2\sqrt{I \times 4I} \times \cos \frac{2\pi}{3}$$

$$= 5I + 4I \times \left(-\frac{1}{2}\right) = 5I - 2I = 3I$$

49. (A)

$$I = I_1 + I_2 = I + 4I = 5I$$

50. (B)

For dark fringe at P,

$$S_1P - S_2P = \frac{5\lambda}{2}$$

$$= 5 \times \frac{6000}{2} = 15000 \text{ \AA} = 1.5 \text{ micron}$$

51. (D)

For minima, path difference should be an odd multiple of half wavelength.

$$\text{or } \Delta = (2n-1)\frac{\lambda}{2}$$

$$\text{For third minima, } n = 3, \Delta = (2 \times 3 - 1)\frac{\lambda}{2} = \frac{5\lambda}{2}$$

52. (D)

Distance of n^{th} bright fringe from the center,

$$y_n = \frac{nD\lambda}{d}$$

$$\text{So, } y_3 = \frac{3 \times 6000 \times 10^{-10} \times 2.5}{0.5 \times 10^{-3}}$$

$$= 9 \times 10^{-3} \text{ m} = 9 \text{ mm}$$

53. (D)

We have,

$$n_1 \lambda_1 = n_2 \lambda_2$$

Number of fringes,

$$n_2 = \frac{n_1 \lambda_1}{\lambda_2} = \frac{60 \times 5461 \times 10^{-9}}{5890 \times 10^{-9}} = 55 \text{ fringes}$$

54. (C)

Since intensity at centre is given by:

$$I_{\text{res}} = 4I \cos^2 \left(\frac{\theta}{2} \right)$$

$$I_0 = 4I \Rightarrow I = \frac{I_0}{4}$$

55. (A)

For constructive interference in case of film,

$$2\mu t = \left(n - \frac{1}{2}\right)\lambda \quad (n=1, 2, 3, \dots)$$

For minimum thickness t , $n=1$ or $2\mu F = \lambda/2$

The minimum thickness of a soap bubble,

$$t = \frac{\lambda}{4\mu} = \frac{500}{4 \times 1.2} = 104.17 \approx 104 \text{ nm}$$

56. (D)

In single slit, for n^{th} secondary maxima; path difference

$$a \sin \theta = (2n+1)\frac{\lambda}{2}$$

For first secondary maximum, $n=1$

$$\therefore a \sin \theta = \frac{3\lambda}{2}$$

57. (A)

For n^{th} dark fringe, in single slit

$$a \sin \theta = n\lambda$$

For second dark fringe, $a \sin \theta = 2\lambda$

$$\text{So, } 24 \times 10^{-5} \times 10^{-2} \times \sin 30^\circ = 2\lambda$$

$$\therefore \lambda = 6 \times 10^{-7} \text{ m} = 6000 \text{ \AA}$$

58. (B)

Angular fringe width,

$$\theta = \frac{\lambda}{d} = \frac{6328 \times 10^{-10}}{0.2 \times 10^{-3}} = 3.164 \times 10^{-3} \text{ rad} = 0.1812^\circ$$

59. (D)

By using $\mu = \tan \theta_p$

$$\Rightarrow \mu = \tan 60^\circ = \sqrt{3}$$

$$\text{Also } C = \sin^{-1} \left(\frac{1}{\mu} \right) \Rightarrow C = \sin^{-1} \left(\frac{1}{\sqrt{3}} \right)$$

60. (C)

From Brewster's law, $\mu = \tan$

$$i_p \Rightarrow \frac{c}{v} = \tan 60^\circ = \sqrt{3}$$

$$\Rightarrow v = \frac{c}{\sqrt{3}} = \frac{3 \times 10^8}{\sqrt{3}} = \sqrt{3} \times 10^8 \text{ ms}^{-1}$$

61. (D)

The amplitude will be $A \cos 60^\circ = A/2$

62. (B)

Where phase difference is 0, intensity is maximum.

where, $\phi = \frac{\pi}{2}$ or $\frac{\phi}{2} = \frac{\pi}{4}$,

the intensity will be $I = I_{\max} \cos^2 \frac{\phi}{2} = \frac{I_{\max}}{2}$

63. (C)

We have,

$$\beta = \frac{\lambda D}{d}$$

\therefore The arrangement is placed in a liquid of refractive index n

$$\therefore \lambda' = \frac{\lambda}{n}$$

Therefore fringe width

$$\beta' = \frac{\lambda D}{dn}$$

or $\beta' = \frac{\beta}{n}$

64. (C)

Intensity, $I = 4I_0 \cos^2 \frac{\phi}{2}$

$\therefore I = I_0 \quad \therefore \phi = \frac{2\pi}{3}$

65. (C)

Distance of 5th bright fringe from central fringe,

$$x_{5D} = \frac{5\lambda D}{d}$$

Distance of 3rd dark fringe from central fringe,

$$x_{3D} = \frac{(2 \times 3 - 1) \times D}{2d} = \frac{5\lambda D}{2d}$$

Required distance,

$$x_{5D} - x_{3D} = \left(5 - \frac{5}{2}\right) \frac{\lambda D}{2} = \frac{5}{2} \times \frac{5 \times 10^{-7} \times 1}{1 \times 10^{-3}} = 1.25 \text{ m}$$

66. (A)

Change in path difference at the central point will

be: $(\mu - 1)t = 0.5 \times 4 \times 10^{-6} \text{ m}$

Equating $(\mu - 1)t = n\lambda$, we get $n = 4$

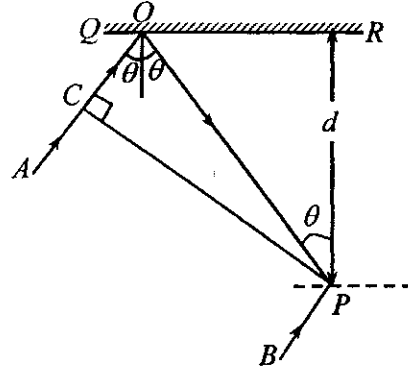
67. (A)

Path difference at the central point should satisfy the condition for 1st maxima i.e.

$$(\mu - 1)t = \lambda \Rightarrow 0.5t = \lambda \Rightarrow t = 2\lambda$$

68. (B)

Path difference between the two rays is given by



$$\Delta = CO + PO$$

$$\therefore PR = d,$$

So, $PO = d \sec \theta$

and $CO = PO \cos 2\theta = d \sec \theta \cos 2\theta$

So, $\Delta = (d \sec \theta + d \sec \theta \cos 2\theta)$

Phase difference between two rays is $\phi = \pi$ (as one ray is reflected one and another is direct).

Now, for constructive interference, path difference should be odd multiples of half wavelength.

i.e., $\Delta = \lambda/2, 3\lambda/2, \dots$

$$\text{So, } d \sec \theta + d \sec \theta \cos 2\theta = \frac{\lambda}{2}$$

$$\text{or } d \sec \theta (1 + \cos 2\theta) = \frac{\lambda}{2}$$

$$\text{or } d \sec \theta (2 \cos^2 \theta) = \frac{\lambda}{2}$$

$$\therefore \cos \theta = \lambda/4d$$

69. (A)

In conductors, the conduction band contains electrons even at 0 K

70. (A)

Aluminium is trivalent impurity which is used to obtain p - type semiconductor.

71. (B)

Doping doesn't disturb the neutrality.

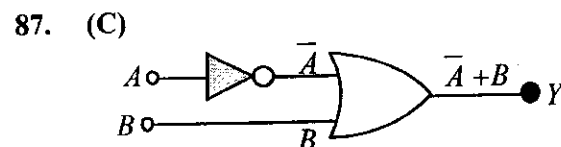
72. (B) In reverse biasing, barrier potential and width of the depletion layer increases.
73. (D) In a bipolar junction transistor, emitter is heavily doped, base is lightly doped and collector is moderately doped.
74. (B) A $n-p-n$ transistor conducts when collector is positive and emitter is negative with respect to the base.
75. (A) The alternating current gain β is given by
- $$\beta = \left(\frac{\Delta I_C}{\Delta I_B} \right)_{V_{CE}}$$
76. (A)
- $$\beta = \left(\frac{\Delta I_C}{\Delta I_B} \right)_{V_{CE}} = \frac{8.2}{(8.3 - 8.2)} = 82$$
77. (B) Current gain, $\beta = \frac{\Delta I_C}{\Delta I_B} \Rightarrow \Delta I_B = \frac{1 \times 10^{-3}}{100}$
 $= 10^{-5} \text{ A} = 0.01 \text{ mA}$
 By using $\Delta i_E = \Delta i_B + \Delta i_C$; $\Delta i_E = 0.01 + 1 = 1.01 \text{ mA}$
78. (C) If inputs are A and B , then output for NAND gate is $Y = \overline{AB}$.
 If $A=B=1$, $Y = \overline{1 \cdot 1} = \overline{1} = 0$
79. (D) The given truth table is for NAND gate.
80. (B) The boolean expression for NOR gate is $\overline{Y} = \overline{A+B}$
 i.e., if $A=B=0$ (low) $\Rightarrow Y = \overline{0+0} = \overline{0} = 1$ (High)
81. (C) Hence, output $Y = \overline{\overline{A+B}}$
 According to De-morgan's theorem
 $Y = \overline{\overline{A+B}} = \overline{\overline{A} \cdot \overline{B}} = A+B$
 This is the output equation of AND gate.
82. (D) A solid with completely filled valence band is an insulator, if the energy gap between the valence band and the empty conduction band is larger than that is about 5 eV.
83. (A)
84. (A) The given figure represents AND with NOT

85. (A) In the given circuit, diode is in reverse biasing, so it acts as open circuit. Hence, potential difference between A and B is 6 V.

86. (D) There is a phase difference of 180 in case of CE amplifier.

Also, $A_v = \frac{V_o}{V_i} \therefore V_o = 4V$

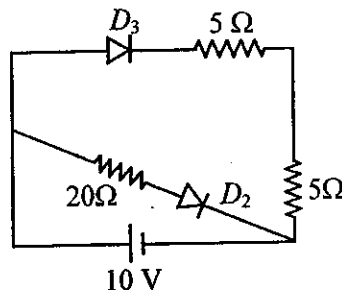
Hence, $V_o = (4V) \sin(\omega t - \pi/2)$



88. (C) If $V_A > V_B$, then both the junction diodes are forward biased and the given circuit diagram becomes a balanced Wheatstone bridge. The equivalent resistance in this case becomes 4Ω .

If $V_A < V_B$, then the diodes are reverse biased. In that case 4Ω , 5Ω and 4Ω are in series.

89. (C) In the given circuit, diode D_1 is reverse biased, so it will not conduct. Diodes D_2 and D_3 are forward biased, so they will conduct. The corresponding equivalent circuit is shown in the figure.



The equivalent resistance of the circuit is

$$R_{eq} = \frac{(5+5) \times 20}{(5+5) + 20} = \frac{10 \times 20}{10 + 20} = \frac{200}{30} = \frac{20}{3} \Omega$$

Current through the battery, $I = \frac{10V}{\frac{20}{3} \Omega} = 1.5 \text{ A}$

90. (A) The diode is in reverse biasing, so no current flows through it.

SOLUTION

91. (D)
92. (A)
93. (A)
94. (D)
95. (D)
96. (A)
97. (B)
98. (C)
99. (D)
100. (B)
101. (C)
102. (D)
103. (D)
104. (B)
105. (A)
106. (C)
107. (C)
108. (D)
109. (B)
110. (B)
111. (B)
112. (C)
113. (B)
114. (B)
115. (D)
116. (A)
117. (A)
118. (C)
119. (D)
120. (B)
121. (A)
122. (C)
123. (A)
124. (D)

125. (C)

126. (C)

Blue baby syndrome is also called infant methemoglobinemia. In this case skin of baby turned blue due to very less amount of haemoglobin. One of the common cause is intake of contaminated water with nitrates. Inside body nitrate is converted into nitrite which combined with haemoglobin and form methemoglobin. Now haemoglobin is not able to carry oxygen.

127. (D)

128. (A)

129. (C)

130. (A)

Chloride shift is also called Hamburger phenomenon or lineas phenomenon. In this process there is exchange of bicarbonates and chloride across membrane of RBCs. Oxygenation of blood in the lungs remove CO_2 from haemoglobin this is called Haldane effects.

131. (D)

132. (A)

133. (D)

134. (B)

135. (C)

136. (B)

137. (C)

Cardiac output = stroke volume \times total number of heart beats per minute

$6\text{L} = 60\text{mL} \times \text{Total number of heartbeats per minute}$

Total number of heartbeats = $\frac{6000\text{mL}}{60} = 100$

beats per minute

138. (A)
139. (C)
140. (A)
141. (B)
142. (B)
143. (C)
144. (C)
145. (A)
146. (D)
147. (D)
148. (D)
149. (C)
150. (A)
151. (C)
152. (D)
153. (A)
154. (A)
155. (A)
156. (D)
157. (B)
158. (B)
159. (D)
160. (C)

161. (C)
162. (A)
The bone which is form by the ossification of tendon is called sesamoid bone. Example: Patella
163. (B)
164. (B)
165. (C)
166. (B)
167. (D)
168. (C)
169. (B)
170. (B)
171. (A)
172. (B)
173. (C)
174. (C)
175. (B)
176. (D)
177. (A)
178. (B)
179. (A)
180. (B)

