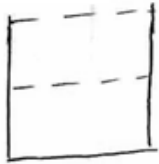


PACE IIT | MEDICAL | MHT-CET

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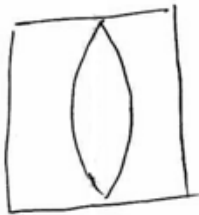
EDT - 20 - Physics (2017 Aspirants) (SOLUTION)

①



$$h = \frac{d}{\mu_1} + \frac{d}{\mu_2} = d \left(\frac{1}{\mu_1} + \frac{1}{\mu_2} \right)$$

②



$$\begin{aligned} \frac{1}{f} &= \left(\frac{\mu_2 - 1}{\mu_1} \right) \left(\frac{1}{R_1} - \frac{1}{R_2} \right) \\ &= \left(\frac{2}{3} - 1 \right) \left(\frac{1}{10} - \frac{1}{-10} \right) \\ &= -\frac{1}{3} \left(\frac{1}{5} \right) = -\frac{1}{15} \end{aligned}$$

③

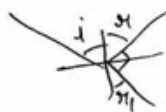
$$\begin{aligned} \delta_1 &= \delta_2 \\ (1.54 - 1)6^\circ &= (1.72 - 1)A \\ A &= \frac{3}{4} \times 6^\circ = 4^\circ 30' \end{aligned}$$

④

$$\frac{360}{n} - 1 = 6 - 1 = 5$$

⑤

$$\begin{aligned} \mu_1 \sin i &= \mu_2 \sin \theta_1 \\ 1 \cdot \sin 60 &= \mu_2 \sin 60 \\ \mu_2 &= \sqrt{3} \end{aligned}$$



$$\begin{aligned} \theta_1 + \theta_2 &= 90^\circ \\ \theta_1 &= 30^\circ \end{aligned}$$

⑥

$$\begin{aligned} \theta_1 + \theta_2 &= A \\ \theta_1 + 0 &= A \end{aligned}$$



$$\begin{aligned} \mu_1 \sin i &= \mu_2 \sin \theta_1 \\ 1 \sin i &= \mu \sin A \\ i &= \mu A \quad (\text{for small angles}) \end{aligned}$$

⑦

$$h_1 = \frac{x_1}{\mu}$$

$$h_2 = \frac{x_2}{\mu}$$



$$\begin{aligned} x_1 + x_2 &= \mu(h_1 + h_2) \\ &= 1.5(6 + 4) \\ &= 15 \text{ cm} \end{aligned}$$

⑧

Theory

⑨

$$\frac{h'}{\mu_1} = \frac{h}{\mu_2}$$

$$\frac{\mu_2}{\mu_1} \frac{dh'}{dt} = \frac{dh}{dt} = \frac{n_2 \cdot x}{n_1}$$

$$V = \pi r^2 h$$

$$\frac{dV}{dt} = \pi R^2 \cdot \frac{dh}{dt}$$

⑩

$$\frac{I_{\max} - I_{\min}}{I_{\max} + I_{\min}} = R$$

$$\frac{I_{\max}}{I_{\min}} = \frac{(\sqrt{I_1} + \sqrt{I_2})^2}{(\sqrt{I_1} - \sqrt{I_2})^2} = \frac{(1 + \sqrt{\beta})^2}{(1 - \sqrt{\beta})^2}$$

$$R = \frac{(1 + \sqrt{\beta})^2 - (1 - \sqrt{\beta})^2}{(1 + \sqrt{\beta})^2 + (1 - \sqrt{\beta})^2}$$

$$= \frac{(2)(2\sqrt{\beta})}{2(1 + \sqrt{\beta})} = \frac{2\sqrt{\beta}}{1 + \sqrt{\beta}}$$

$$\begin{aligned} \textcircled{12} \quad d \sin \theta &= n\lambda \quad \text{for minima} \\ d \sin \theta &= \lambda \quad \text{for } \underline{I} \text{ minima} \\ d \sin \theta &= \frac{3\lambda}{2} \quad \text{for } \underline{I} \text{ max.} \end{aligned}$$

$$\begin{aligned} \textcircled{13} \quad I_1 &= (\sqrt{I})^2 + (\sqrt{4I})^2 + 2\sqrt{I}(4I) \cos \theta \\ &= 5I + 4I \cos \theta \\ &= 5I + 4I \cos(120^\circ) \\ &= 3I // \end{aligned}$$

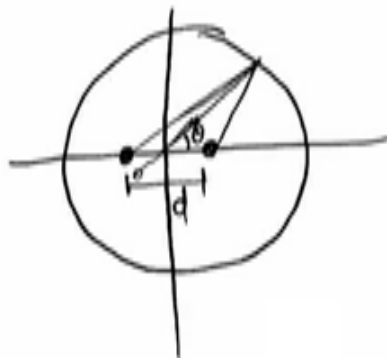
$$\begin{aligned} \textcircled{14} \quad d \sin \theta &= \lambda_1, \quad \& \quad d \sin \theta = \frac{7\lambda_2}{2} \\ & \text{(first minima)} \end{aligned}$$

$$\lambda_1 = 3.5\lambda_2$$

$$\begin{aligned} \frac{3\lambda_1}{2}, \frac{5\lambda_1}{2}, \frac{7\lambda_1}{2} \\ I_{\max}, II_{\max}, III_{\max} \\ \text{(secondary)} \end{aligned}$$

$$\begin{aligned} \textcircled{15} \quad d \sin \theta &= \lambda \\ d \times \frac{1}{2} &= \lambda \\ d &= 2\lambda = 10000 \text{ \AA} \\ &= 10 \times 10^{-5} \text{ cm} \end{aligned}$$

$$\begin{aligned} \textcircled{16} \quad d \cos \theta &= 4\lambda \\ \cos \theta &= \frac{4\lambda}{d} \end{aligned}$$



(17) Theory

(18) Theory

(19)

$$\frac{hc}{\lambda} = \phi + e(4.8)$$

$$\frac{hc}{2\lambda} = 3.2e$$

$$\frac{hc}{2\lambda} = \phi + e(1.6) \times 2$$

$$\frac{hc}{\lambda} = 6.4e$$

$$0 = \phi - e(1.6)$$

$$\phi = e(1.6)$$

$$\frac{hc}{\lambda_0} = \frac{hc}{4\lambda} \Rightarrow \lambda_0 = 4\lambda$$

(20) Theory

(21) $\sqrt{\frac{c}{\lambda_{K\alpha}}} = a(z-1)$

$$\sqrt{\frac{\lambda_{K\alpha 1}}{\lambda_{K\alpha 2}}} = \frac{z_2 - 1}{z_1 - 1} = \frac{28}{42} = \frac{2}{3}$$

$$\frac{\lambda_{K\alpha 1}}{\lambda_{K\alpha 2}} = \frac{4}{9}$$

(22)

$$12.1 = 13.6 \left(\frac{1}{n^2} - \frac{1}{\eta^2} \right)$$

$$\frac{12.1}{13.6} = 1.5$$

$$\eta^2 = \frac{13.6}{1.5} = 9$$

$$\eta = 3$$

$$\text{no. of lines} = \frac{3(3-1)}{2} = 3$$

(23)

$$\frac{dN}{dt} = \lambda N$$

~~1600~~ In 8 seconds

$$I \rightarrow \frac{I}{16} = \frac{I}{2^n}$$

$n = 4$ half lives

4 half lives = 8 sec

$$T_{1/2} = 2 \text{ sec.}$$

$$\text{at } t = 6 \text{ sec } (3 T_{1/2})$$

$$I = \frac{I}{8} = 200$$

(24)

$$N = N_0 e^{-\lambda t}$$

$$\lambda = \frac{0.693}{20}$$

$$\frac{2N_0}{3} = N_0 e^{-\lambda t_1}$$

$$\frac{N_0}{3} = N_0 e^{-\lambda t_2}$$

$$2 = e^{-\lambda(t_1 - t_2)}$$

$$\ln 2 = -\lambda(t_2 - t_1) = -\frac{0.693}{20}(t_1 - t_2)$$

$$t_2 - t_1 = 20$$

(25)

$$\lambda_p = \frac{h}{mv} = \frac{h}{\sqrt{2mKE}} = \frac{h}{\sqrt{2meV}}$$

$$\lambda_\alpha = \frac{h}{\sqrt{2(4m)(2e)(8V)}}$$

$$= \frac{h}{8\sqrt{2meV}} = \frac{\lambda_0}{8}$$

$$(26) \quad \lambda = R_e \left(1 - \frac{1}{4}\right) = \frac{3}{4} R_e$$

$$\lambda_1 = R_e \left(1 - \frac{1}{9}\right) = \frac{8}{9} R_e$$

$$\frac{\lambda_1}{\lambda} = \frac{8 \times 4}{9 \times 3} = \frac{32}{27}$$

$$\lambda = \frac{32}{27} \lambda$$

$$(27) \quad 4 \times 7 - (2 \times 1.1) \times 2$$

$$(28) \quad 216 v_1 = 4 v_2$$

$$v_2 = 54 v_1$$

$$\frac{1}{2} \times 216 \cdot v_1^2 + \frac{1}{2} \times 4 v_2^2 = 5.5 \text{ MeV}$$

$$(29) \quad N = N_0 e^{-\lambda t}$$

$$(30) \quad \frac{hc}{\lambda} = \frac{hc}{\lambda_0} + eV_{\text{stop}}$$

$$(31) \quad \lambda = R_e \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right)$$

$$n_1 = 1$$

$$(32) \quad \frac{mV^2}{R} = \frac{Ze^2}{R^2}$$

$$mVR = \frac{nh}{2\pi}$$

$$(33) \quad N = N_0 e^{-\lambda t}$$
$$t = \frac{3}{\lambda}$$

(34) Theory

$$(35) \quad \frac{1}{2^n} = \frac{1}{15}$$

(36) Theory

$$(37) \quad \frac{j_c}{j_e} = \alpha$$

$$(38) \quad V = \int \vec{E} \cdot d\vec{r}$$

$$(39) \quad \frac{j_c}{j_B} = 0.9$$

(40) Theory

(41) Theory

(42) Theory

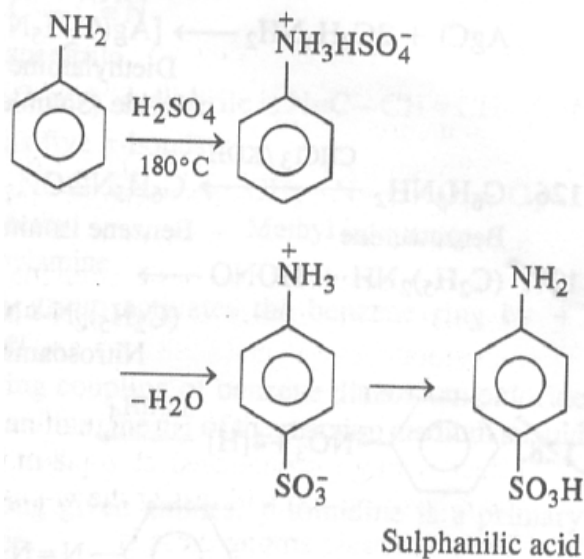
(43) Theory

(44) Theory

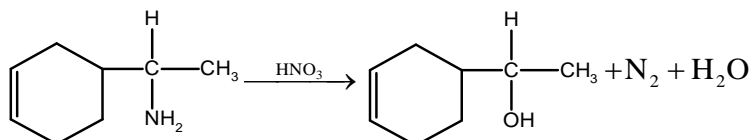
(45) Theory.

EDT - 20 - Chemistry (2017 Aspirants)
(SOLUTION)

46. (3) Carbylamine is a reaction of 1° amine to give isocyanide
 47. (3) $R-CH_2OH \xrightarrow{PBr_3} RCH_2Br \xrightarrow{alc.KCN} RCH_2CN \xrightarrow{H_2/Pt} RCH_2CH_2NH_2$
 48. (3)

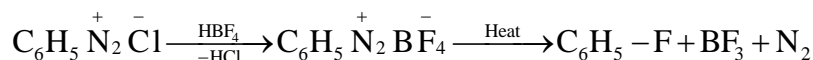


49. (1)



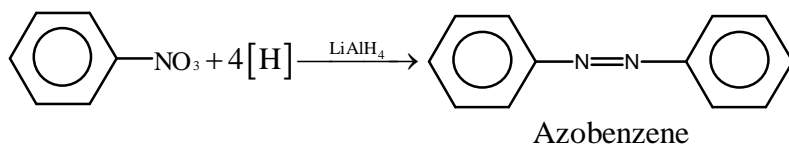
Compound X is optically active as such it must have chiral carbon atom. Further it must be a primary amine since it releases N_2 gas on reaction with nitrous acid.

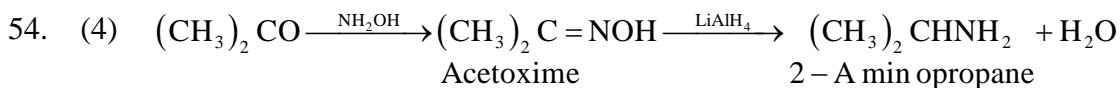
50. (2) In the reaction (2) p-hydroxy azobenzene is formed.
 51. (2) The diazonium salt is first reacted with fluoroboric acid (HBF_4) and the benzene diazonium tetra fluoroborate formed is heated to give to fluorobenzene. The reaction is called Balz-Schiemann reaction.



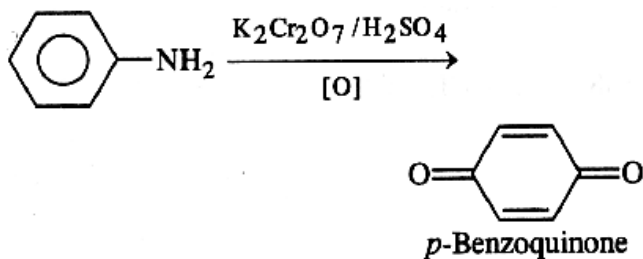
52. (1) $(C_2H_5)_2NH + HONO \rightarrow (C_2H_5)_2N-NO + H_2O$
 Nitrosoamine

53. (3)





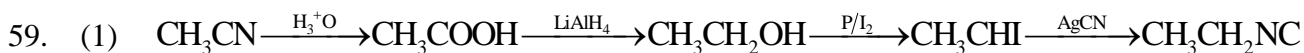
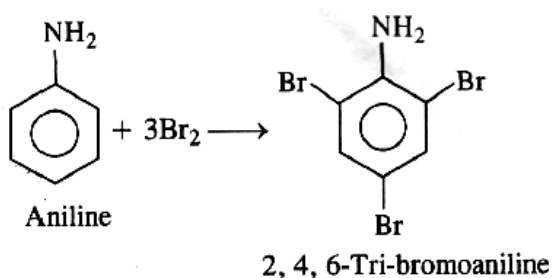
55. (3)



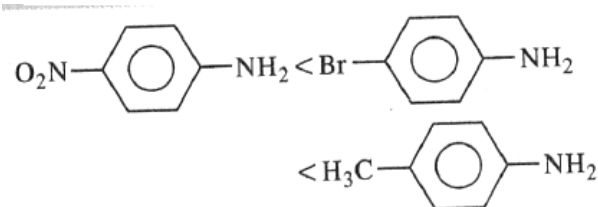
56. (2) Among given amines, *p*-toluidine is a primary amine.

57. (2) $-\text{NH}_2$ group activates the ring $\text{C}_6\text{H}_5\text{NH}_2$ is most reactive towards electrophilic substitution of the ring.

58. (1)



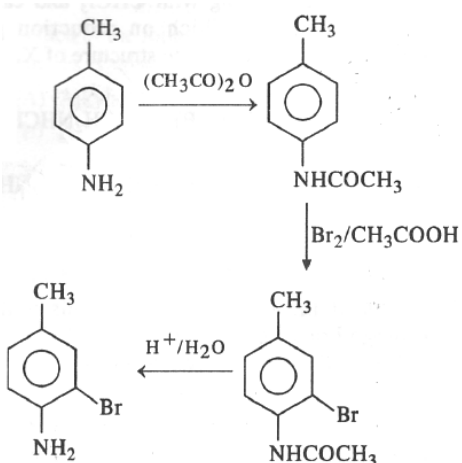
60. (1)



$-\text{NO}_2$ is electron withdrawing, $-\text{CH}_3$ is electron releasing (+ I effect), $-\text{Br}$ group has $-I$ effect but $+R$ effect.

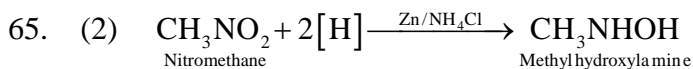
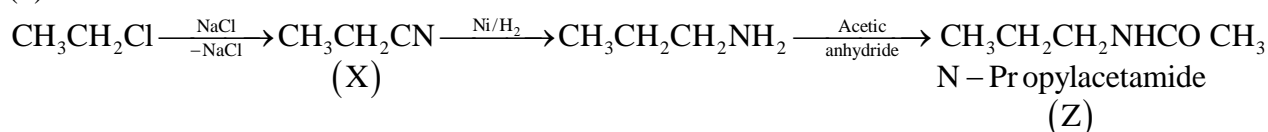


62. (2)



63. (2) Benzene diazonium salts are prepared in aqueous solution and LiAlH_4 reacts violently with water. Hence it cannot be used to reduce benzene diazonium salts to benzene. H_3PO_2 (option B) Is correct answer.

64. (1)



66. (4)

67. (2) Diazonium salts of benzylamine is not stable, it decomposes in situ, to form benzyl alcohol.

68. (1) Sulphonamides of 1° amines have an acidic H on the N atom and hence are soluble in NaOH .

69. (3) Ampicillin is a synthetic antibiotic.

70. (1) Chloramphenicol is a broad spectrum antibiotic.

71. (3) Analgin is a common analgesic.

72. (3) Luminal is a sedative.

73. (1) Aspirin is an antipyretic drug.

74. (4) Phenol can act both as an antiseptic (0.2%) as well as a disinfectant (1%)

75. (1) Quinine is effective in curing malaria.

76. (2) L.S.D is an example of psychedelic agent.

77. (3) Magnesium hydroxide, $\text{Mg}(\text{OH})_2$ is a common antacid.

78. (3) Chloromycetin is effective for typhoid.

79. (2) Chloroxylenol is one of the antiseptics present in Dettol.

80. (2) Benzoic acid is used as a preservative for coloured fruit juices. For colourless ones, sodium metabisulphite can also be used.

81. (2) Aspartamine is an artificial sweetener.

82. (1) Salol is an intestinal antiseptic medicine.

83. (3) Iodine is a powerful antiseptic. It is used in the form of its 2-3 per cent solution in mixture of alcohol and water.

84. (2)

85. (3) A few more popular tranquillizers are valium and serotonin

86. (2)

87. (4)

88. (2) Broad-spectrum antibiotics are medicines effective against a large number of harmful micro organism e.g., tetracycline, chloramphenicol etc

89. (4)

90. (3)