the STOP to train minds

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NEET (UG)–2020
MOCK TEST - 09
Solution

ANSWER

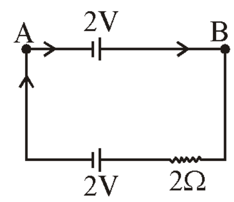
1. (1)	2. (2)	3. (3)	4. (2)	5. (2)
6. (4)	7. (3)	8. (1)	9. (1)	10. (4)
11. (3)	12. (4)	13. (1)	14. (1)	15. (3)
16. (1)	17. (2)	18. (2)	19. (4)	20. (2)
21. (4)	22. (1)	23. (1)	24. (1)	25. (2)
26. (3)	27. (1)	28. (1)	29. (2)	30. (2)
31. (4)	32. (1)	33. (1)	34. (2)	35. (2)
36. (4)	37. (1)	38. (4)	39. (1)	40. (1)
41. (2)	42. (1)	43. (1)	44. (4)	45. (2)
46. (2)	47. (3)	48. (1)	49. (2)	50. (1)
51. (4)	52. (1)	53. (4)	54. (1)	55. (1)
56. (4)	57. (1)	58. (2)	59. (2)	60. (1)
61. (2)	62. (4)	63. (1)	64. (3)	65. (2)
66. (3)	67. (1)	68. (2)	69. (2)	70. (2)
71. (1)	72. (1)	73. (4)	74. (2)	75. (3)
76. (2)	77. (3)	78. (2)	79. (2)	80. (2)
81. (2)	82. (2)	83. (2)	84. (2)	85. (1)
86. (3)	87. (2)	88. (3)	89. (4)	90. (1)
91. (2)	92. (1)	93. (2)	94. (3)	95. (2)
96. (2)	97. (1)	98. (2)	99. (2)	100. (2)
101. (2)	102. (4)	103. (3)	104. (1)	105. (3)
106. (4)	107. (1)	108. (3)	109. (2)	110. (2)
111. (1)	112. (3)	113. (3)	114. (3)	115. (2)
116. (2)	117. (4)	118. (3)	119. (4)	120. (4)
121. (3)	122. (1)	123. (3)	124. (4)	125. (3)
126. (1)	127. (1)	128. (3)	129. (3)	130. (2)
131. (4)	132. (2)	133. (2)	134. (3)	135. (1)
136. (2)	137. (4)	138. (2)	139. (1)	140. (2)
141. (1)	142. (1)	143. (2)	144. (1)	145. (4)
146. (3)	147. (3)	148. (3)	149. (3)	150. (2)
151. (1)	152. (3)	153. (3)	154. (3)	155. (2)
156. (2)	157. (2)	158. (2)	159. (3)	160. (3)
161. (4)	162. (4)	163. (2)	164. (4)	165. (4)
166. (1)	167. (2)	168. (4)	169. (4)	170. (1)
171. (1)	172. (1)	173. (1)	174. (4)	175. (2)
176. (2)	177. (2)	178. (2)	179. (1)	180. (2)

Explanation :

1. (1) Component of $\vec{A}$ on $\vec{B} = \frac{\vec{A}.\vec{B}}{|\vec{B}|} = \frac{2+3}{\sqrt{2}} = \frac{5}{\sqrt{2}}$

2. (2) Cicuit can be draw as

3. (3)



Total emf = 2 + 2 = 4V

So $I = \frac{4}{2} = 2A$

4. (2) Amplitude of electric field and magnetic field are related by the relation

$$\frac{E_0}{B_0} = c$$

Average energy density of the magnetic field is

$$u_B = \frac{1}{4}\frac{B_0^2}{\mu_0}$$

$$= \frac{1}{4}\frac{E_0^2}{\mu_0 c^2} \qquad \left(\because B_0 = \frac{E_0}{c}\right)$$

$$= \frac{1}{4}\varepsilon_0 E_0^2 \qquad \left(\because c = \frac{1}{\sqrt{\mu_0 \varepsilon_0}}\right)$$

$$= \frac{1}{4} \times 8.854 \times 10^{-12} \times (2)^2$$

$$\approx 8.86 \times 10^{-12} \text{ J m}^{-3}$$

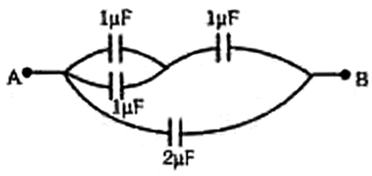
5. (2) $\beta = \frac{\lambda D}{d} \Rightarrow \beta \propto \frac{1}{d}$

6. (4) $P = 50\frac{N}{m^2}$

$$= 50 \times \frac{10^5}{(10^2)^2}\frac{\text{dyne}}{\text{cm}^2}$$

$$= 500\frac{\text{dyne}}{\text{cm}^2}$$

7. (3)



Redraw the ckt. $C_{AB} = \frac{8}{3}\mu F$

8. (1) Force on write Q due to write P is

$$F_P = 10^{-7} \times \frac{2 \times 30 \times 10}{0.1} \times 0.1 = 6 \times 10^{-5} N$$

(Towards left)

Force on wire Q due to wire R is

$$F_R = 10^{-7} \times \frac{2 \times 20 \times 10}{0.02} \times 0.1 = 20 \times 10^{-5} N$$

(Towards right)

Hence $F_{net} = F_R - F_P = 14 \times 1o^{-5}$ N

$= 1.4 \times 10^{-4}$ N

(Towards right)

9. (1) Revolutions per minute (N) = $\frac{3000}{\pi}$ rpm

so, frequency, $n = \frac{N}{60} = \frac{3000}{60 \times \pi} = \frac{50}{\pi} Hz$

and $\omega = 2\pi n = 2\pi \times \frac{50}{\pi} = 100$ rad/sec

$I = 400$ kg m^2

so rotational kinetic energy (K) is

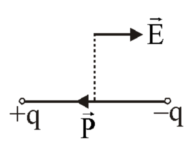
$$K = \frac{1}{2} I\omega^2 = \frac{1}{2} \times 400 \times (100)^2 = 2 \times 10^6 \text{ Joule}$$

10. (4) $\frac{I_{max}}{I_{min}} = \left(\frac{a_1 + a_2}{a_1 - a_2}\right) = \frac{36}{1}$

$\Rightarrow \frac{a_1 + a_2}{a_1 - a_2} = \frac{6}{1}$

$\Rightarrow \frac{a_1}{a_2} = \frac{7}{5}$

11. (3)



12. (4) $C = \frac{\epsilon_0 A}{d}; C_1 = \frac{\epsilon_0 A}{2d} = \frac{C}{2}$

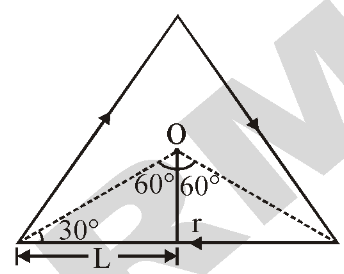
$$C_2 = \frac{5 \epsilon_0 A}{2d} = \frac{5}{2} C$$

$$C_{eq} = C_1 + C_2 = 3C$$

$$\frac{\Delta C}{C} = \frac{2C}{C} \times 100 = 200\%$$

13. (1) Magnetic field at O is

$$B = 3\left[\frac{\mu_0}{4\pi}\frac{i}{r}(\sin 60° + \sin 60°)\right]$$



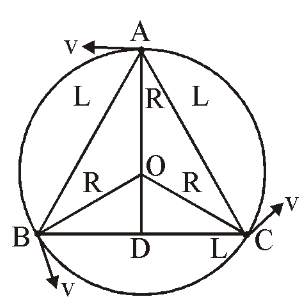
$\tan 30° = \frac{r}{L}$ $\Rightarrow r = \frac{L}{\sqrt{3}}$

$$= 3\left(\frac{\mu_0}{4\pi}\right)\left(\frac{i}{L}\right)\left(\frac{\sqrt{3}}{2}\right)(\sqrt{3}) \times 2$$

$$= \frac{9\mu_0 i}{4\pi L}$$

14. (1) $\vec{v} = \vec{\omega} \times \vec{r} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ -5 & 3 & 5 \\ 3 & 4 & 6 \end{vmatrix} = -2\hat{i} + 45\hat{j} - 29\hat{k}$

15. (3) Consider the circle with centre at O, and having radius R. In it consider three bodies of masses M each moving with velocity v under the action of their gravitational attraction.



$$R = \frac{2}{3}AD = \frac{2}{3} \times L\sin 60^\circ = \frac{2L}{3} \times \frac{\sqrt{3}}{2}$$

$$= \frac{L}{\sqrt{3}} \text{ or } L = \sqrt{3}R$$

Centripetal force on any one mass M is

$$= \frac{2GM^2}{L^2}\cos\left(\frac{60^\circ}{2}\right)$$

$$\therefore \frac{Mv^2}{R} = \frac{2GM^2}{L^2} \times \frac{\sqrt{3}}{2}$$

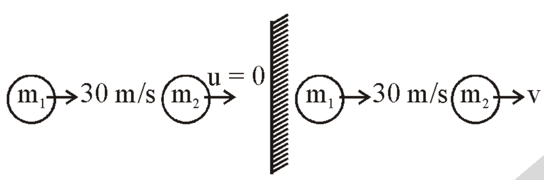
$$\text{or } \frac{GM^2}{\left(\sqrt{3}R\right)^2}\sqrt{3} = \frac{Mv^2}{R}$$

$$\therefore v = \sqrt{\frac{GM}{\sqrt{3}R}}$$

16. (1) $E = -\frac{dV}{dx} = (10x + 10) = -(10 + 10)$

$= -20\ Vm^{-1}$

18. (2)



Since $m_1 >> m_2$, thereforeheavy body (m_1) does not change its velocity after collision. By the definition of coefficient of restitution

$$e = \frac{v_2 - v_1}{u_1 - u_2} \Rightarrow 1 = \frac{v - 30}{30 - 0}$$

v = 60 m/s

19. (4) $\frac{\theta_1 - \theta_2}{t} = -K\left(\frac{\theta_1 + \theta_2}{2} - \theta_0\right)$

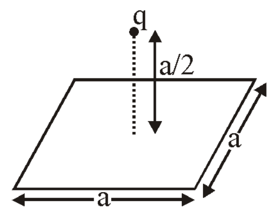
t = 2 min = 120 s

$$\frac{80 - 70}{120} = -K\left(\frac{80 + 70}{2} - 30\right) \quad ...(i)$$

$$\frac{60 - 50}{t} = -K\left(\frac{60 + 50}{2} - 30\right) \quad ...(ii)$$

(i)/(ii) ⇒ (t = 216 s)

21. (4)



23. (1) Let v_1 and v_2 be the velocities of the body just before and just after the collision.

$$KE_1 = \frac{1}{2}mv_1^2 = mgh_1 \quad ....(1)$$

$$KE_2 = \frac{1}{2}mv_2^2 = mgh_2 \quad ....(2)$$

from (1) & (2) $\Rightarrow \frac{v_1^2}{v_2^2} = \frac{h_1}{h_2} = \frac{10}{2.5} = 4$

$$\Rightarrow \frac{v_1}{v_2} = 2$$

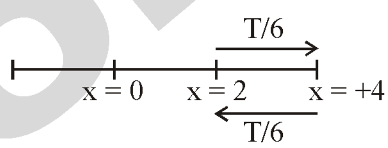
24. (1) Heat gain = Heat loose

$m_w s_w \Delta T = m_s L + m_w s_w(\Delta T)$

40 × 1 × (54.3 – 25) = 2 × L + 2 ×1 × (100 – 54.3)

L = 540.3 cal/g

25. (2)



Minimum time taken by particle $= \frac{T}{6} + \frac{T}{6}$

$$= \frac{T}{3} = 0.4 \text{ s}$$

26. (3) $H_{max} = \frac{u^2 \sin^2\theta}{2g}$

According to problem

$$\frac{u_1^2 \sin^2 45^\circ}{2g} = \frac{u_2^2 \sin^2 60^\circ}{2g}$$

$$\Rightarrow \frac{u_1^2}{u_2^2} = \frac{\sin^2 60^\circ}{\sin^2 45^\circ}$$

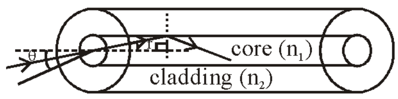
$$\Rightarrow \frac{u_1}{u_2} = \frac{\frac{\sqrt{3}}{2}}{\frac{1}{\sqrt{2}}} = \sqrt{\frac{3}{2}}$$

27. (1) The sixth coin is under the weight of four coins above it. Hence,

Reaction of the 6th coin on the 7th coin

= Force on the 6th coin due to 7th coin = 4mg

29. (2)



$1 \times \sin\theta = n_1 \times \sin r$

$\sin r = \dfrac{\sin\theta}{n_1}$ ... (i)

$i > \theta_c$

$90 - r > \theta_c$

$\sin(90 - r) > \sin\theta_c$

$\cos r > \dfrac{n_2}{n_1}$ ...(ii)

On squaring and then adding equ. (i) and eq. (ii), we get

$$\frac{\sin^2\theta}{n_1^2} + \frac{n_2^2}{n_1^2} \ge 1$$

$$\sin^2\theta + n_2^2 \ge n_1^2$$

$$\sin^2\theta \ge n_1^2 - n_2^2$$

$$\sin\theta \ge \sqrt{n_1^2 - n_2^2}$$

$$\theta \ge \sin^{-1}\sqrt{n_1^2 - n_2^2}$$

30. (2) $W = h\nu - \dfrac{1}{2}mv^2$

$h\nu$ = energy of incident photon

$= \dfrac{12400}{1240}\text{eV} = 10\ \text{ev}$

$\therefore$ W = 10 – 8 = 2 eV

So, λ_0 = Thershold wavelength

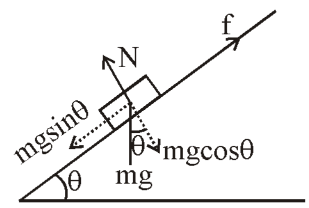
$= \dfrac{12400}{2\text{eV}}$ Å = 6200 Å

31. (4) $R = \dfrac{u^2 \sin 2\theta}{g} = \dfrac{2u_x v_y}{g}$

$\therefore$ Range horizontal initial velocity (u_x)

In path 4 range is maximum so football possess maximum horizontal velocity in this path.

32. (1) The various forces acting on the block are as shown in the figure.



From figure

$mg\sin\theta = f$ ....(i)

$mg\cos\theta = N$ ....(ii)

Divide (i) by (ii), we get

$$\tan\theta = \frac{f}{N} = \frac{\mu N}{N}$$

or, $q = \tan^{-1}(\mu)$

33. (1) $dq = I\,dt = I_0(1 - e^{-\nu T}) = \dfrac{E}{R}(1 - e^{-\nu T})$

$$q = \int_0^T \frac{E}{R}\left(1 - e^{\frac{-1}{T}}\right)dt = \frac{E}{R}\left[t + Te^{\frac{-t}{T}}\right]_0^T$$

$$= \frac{E}{R}\left[T + \frac{T}{e} - T\right] = \frac{E}{R}\frac{T}{e}$$

34. (2) f = 5 cm, D = 25 cm

$$MP = 1 + \frac{D}{f} = 1 + \frac{25}{5} = 6$$

35. (2) No of α particles $(n) \Rightarrow \dfrac{232 - 208}{4} = \dfrac{24}{4} = 6$

No of β particles : $z - 2n(\alpha) + n'\beta = 82$

$90 - 2(6) + n'(\beta) = 82$

$n'(\beta) = 82 - 78 = 4$

36. (4) $P = \dfrac{V^2}{R}$ so, $R = \dfrac{V^2}{P}$

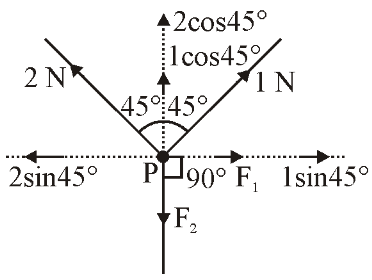
$$\therefore\ R_1 = \frac{V^2}{100}\ \&\ R_2 = R_3 = \frac{V^2}{60}$$

Now, $P_1 = \dfrac{(250)^2}{(R_1 + R_2)^2} \cdot R_1$ and

$P_2 = \dfrac{(250)^2}{(R_1 + R_2)} \cdot R_2$ and $P_3 = \dfrac{(250)^2}{R_3}$

$P_1 : P_2 : P_3 = 15 : 25 : 64 \Rightarrow P_1 < P_2 < P_3$

37. (1)



Applying equilibrium conditions

$\Sigma F_x = 0$

$\Rightarrow$ F_1 + 1sin45° – 2sin45° = 0

or F_1 = 2sin45° – 1sin45°

$$= \frac{2}{\sqrt{2}} - \frac{1}{\sqrt{2}} = \frac{2-1}{\sqrt{2}} = \frac{1}{\sqrt{2}} N$$

and $\Sigma F_y = 0$

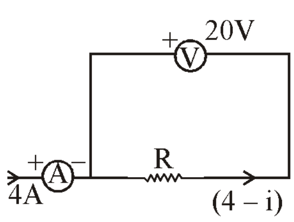
$\Rightarrow$ 1cos45° + 2sin45° – F_2 = 0

$$F_2 = \frac{2}{\sqrt{2}} + \frac{1}{\sqrt{2}} = \frac{2+1}{\sqrt{2}} = \frac{3}{\sqrt{2}} N$$

38. (4) B, v and I should be mutually perpendicular.

40. (1) Velocity of a wave is independent of others.

41. (2)



(4 – i) R = 20

$$R = \frac{20}{(4-i)}$$

for min. value of i (R > 5)

43. (1) In Position-1

$$\tan\frac{\pi}{6} = \frac{\omega L}{R} = \frac{(1000)\left(\sqrt{3}\times 10^{-3}\right)}{R}$$

$$\text{or, } \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{R}$$

$\therefore$ R = 3Ω

In position-2

$$\tan\phi = \frac{X_C}{R} = \frac{\left(\frac{1}{\omega C}\right)}{R}$$

$$= \frac{\dfrac{1}{\left(1000\times\dfrac{1000}{3}\times 10^{-6}\right)}}{3} = 1$$

$$\therefore \phi = \frac{\pi}{4}$$

44. (4) Velocity u of the body when it enters the liquid is given by

$$mgh = \frac{1}{2}mu^2 \text{ or } u = \sqrt{2gh}$$

Let volume of the body = V

mass of the body = Vd

weight of the body = Vdg

Mass of liquid displaced = VD

Weight of liquid displaced = VDg

Net upward force = VDg – Vdg

= Vg(D – d)

$$\text{Retardation} = \frac{\text{net weight}}{\text{mass}}$$

$$= \frac{V(D-d)g}{Vd} = \left(\frac{D-d}{d}\right)g$$

$$\text{Acceleration } a = -\left(\frac{D-d}{d}\right)g$$

Final velocity, v in the liquid when the body is instantaneously at rest is zero. Let the time taken be t.

Now v = u + at

$$0 = \sqrt{2gh} - \left(\frac{D-d}{d}\right)gt, \left(\frac{D-d}{d}\right)gt = \sqrt{2gh}$$

$$\therefore t = \left[\frac{d}{D-d}\right]\sqrt{\frac{2h}{g}}$$

45. (2) Here, speed of sound, v = 340 ms^{-1}

Length of pipe, L = 17 cm = 17 × 10^{-2} m

In a closed pipe (open at one end), the frequency of its nth harmonic is

$v_n = \frac{nv}{4L}$ where n = 1, 3, 5, 7, ...

Let nth harmonic of closed pipe resonates with 1.5 kHz source.

$\therefore\ v_n = 1.5 \times 10^3$ Hz

$\therefore\ 1.5 \times 10^3 = \frac{nv}{4L}$

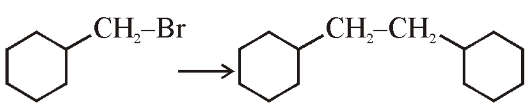
$n = \frac{1.5 \times 10^3 \times 4 \times 17 \times 10^{-2}}{340}$

n = 3

46. (2) Birch reduction

47. (3) $\overset{(1)}{CH_2} = \overset{(2)}{CH} - \overset{(3)}{CH_2} - \underset{OCH_3}{\overset{(4)}{CH}} - \underset{NO_2}{\overset{(5)}{CH_2}}$

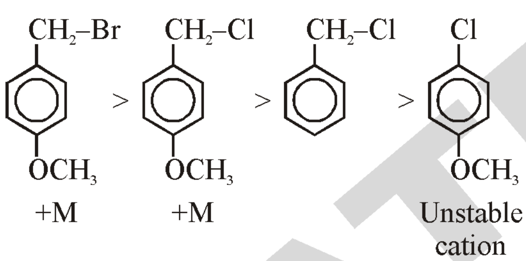
51. (4)



56. (4) $C_2H_5 - O - CH_3 \xrightarrow[SN^2]{HI} C_2H_2OH + CH_3I$

57. (1) Ref./NCERT/XII/Part-II/408

61. (2)



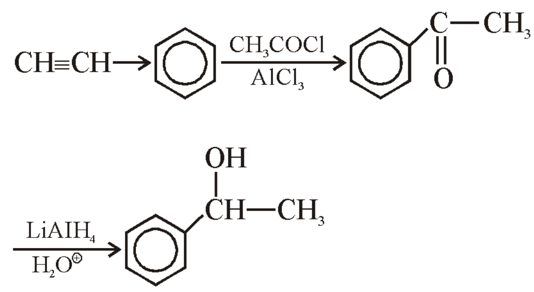
& Better Leaving group

62. (4) Ref./NCERT/XII/Part-II/413

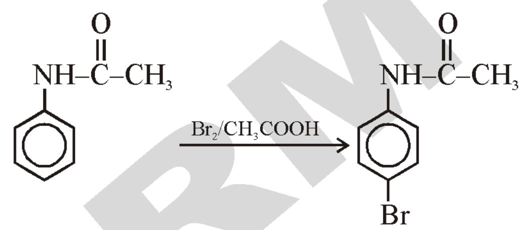
71. (1) $CH_2 - \underset{\underset{O}{\|}}{C} - NH_2 \xrightarrow{reduction} CH_3 - CH_2 - NH_2$

76. (2) $HCHO, CH_3 - CHO, CH_3 - CH_2 - \underset{\underset{O}{\|}}{C} - CH_2$

81. (2)



86. (3)



126. (1) Either oligomycin or DCCD blocks the H^+ leaf in membrane dipleted to F_1 thus oligomycin and DCCD inhibit the enteracting with F_0.
(DCCD = N_1N dicyclohexyl carbodiimide)

136. (4) In a fully turgid cell, difusion pressure dificit = zero as, turgor pressure = osmotic pressure

156. (2) (Chadwick and Burg proposed the effect of ethylene for positive geotrophic movement of plant)

176. (2) PS–I reaction centre is P_{700}.