SOLUTIONS

Mentors Eduserv

All India Test Series 2018

Unit Test-5

NEET PATTERN

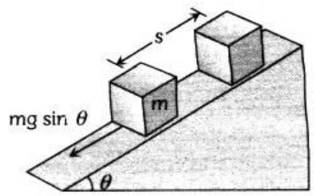
Test Date: 14-10-2017

Mentors Eduserv: Plot No.-136/137, Parus Lok Complex, Boring Road Crossing,
Patna-1, Ph. No. : 0612-3223680 / 81, 7781005550 / 51

PHYSICS

1. **(3)** $W = Fs\cos\theta \Rightarrow \cos\theta = \frac{W}{Fs} = \frac{25}{50} = \frac{1}{2} \Rightarrow \theta = 60^\circ$

2. **(2)**



$W = mg\sin\theta \times s$

$= 2 \times 10^3 \times \sin 15^\circ \times 10 \quad = 5.17$ kJ.

3. **(3)**

Opposing force in vertical pulling = mg

But opposing force on an inclined plane is $mg\sin\theta$, which is less than mg.

4. **(3)**

When the block moves vertically downward with acceleration $\frac{g}{4}$ then tension in the cord

$$T = M\left(g - \frac{g}{4}\right) = \frac{3}{4}Mg$$

Work done by the cord $\vec{F}\cdot\vec{S} = FS\cos\theta$

= Td cos 180°

$$= \left(-\frac{3}{4}Mg\right) \times d = -3Mg\frac{d}{4}.$$

5. **(3)**

When the ball is released from the top of tower then ratio of distances covered by the ball in first, second and third second

$h_I : h_{II} : h_{III} = 1 : 3 : 5 :$ [Because $h_n \propto$ (2n –1)]

$\therefore$ Ratio of work done $mgh_I : mgh_{II} : mgh_{III}$ = 1 : 3 : 5

6. **(2)**

$$W\int_0^{x_1} F\cdot dx = \int_0^{x_1} Cx\, dx = C\left[\frac{x^2}{2}\right]_0^{x_1} = \frac{1}{2}Cx_1^2$$

7. **(3)**

Work done on the wire to strain it will be stored as energy which is converted to heat. Therefore the temperature increases.

8. (4)

$$W\int_0^5 F dx = \int_0^5 (7-2x+3x^2)dx = [7x - x^2 + x^3]_0^5$$

= 35 – 25 + 125 = 135 J

9. (4)

$$S = \frac{t^3}{3} \quad \therefore dS = t^2 dt \;\Rightarrow a = \frac{d^2S}{dt^2} = \frac{d^2}{dt^2}\left[\frac{t^3}{3}\right] = 2t \text{ m/s}^2$$

Now work done by the force $W = \int_0^2 F \cdot dS = \int_0^2 ma \cdot dS$

$$\int_0^2 3 \times 2t \times t^2 dt = \int_0^2 6t^3 dt = \frac{3}{2}[t^4]_0^2 = 24 \text{ J}$$

10. (4)

$$U = \frac{a}{x^{12}} - \frac{b}{x^6}$$

$$F = -\frac{dU}{dx} = +12\frac{a}{x^{13}} - \frac{6b}{x^7} = 0 \Rightarrow x = \left(\frac{2a}{b}\right)^{1/6}$$

$$U(x=\infty) = 0$$

$$u_{equilibrium} = \frac{a}{\left(\frac{2a}{b}\right)} - \frac{b}{\left(\frac{2a}{b}\right)} = -\frac{b^2}{4a}$$

$$\therefore U(x=\infty) - U_{equilibrium} = 0 - \left(\frac{b^2}{4a}\right) = \frac{b^2}{4a}$$

11. (2)

For equlibrium

$$\frac{dU}{dr} = 0 \quad \Rightarrow \quad \frac{-2A}{r^3} + \frac{B}{r^2} = 0 \quad r = \frac{2A}{B}$$

For stable equilibrium

$\frac{d^2U}{dr^2}$ should be positive for the value of r.

Here $\frac{d^2U}{dr^2} = \frac{6A}{r^4} - \frac{2B}{r^3}$ is +ve value for $r = \frac{2A}{B}$

12. (3)

$P = \sqrt{2mE} \therefore P \propto \sqrt{m}$ (if E = const.) $\therefore \frac{P_1}{P_2} = \sqrt{\frac{m_1}{m_2}}$

13. (1)

$E = \frac{P^2}{2m}$ if P = constant then $E \propto \frac{1}{m}$

14. (3)

$P = \sqrt{2mE}$. If E are same then $P \propto \sqrt{m}$

$\Rightarrow \frac{P_1}{P_2} = \sqrt{\frac{m_1}{m_2}} = \sqrt{\frac{1}{4}} = \frac{1}{2}$

15. (1)

Let intial kinetic energy, E_1 = E

Final kinetic energy, E_2 = E + 300% of E = 4E

As $P \propto \sqrt{E} \Rightarrow \frac{P_2}{P_1} = \sqrt{\frac{E_2}{E_1}} = \sqrt{\frac{4E}{E}} = 2 \Rightarrow P_2 = 2P_1$

$\Rightarrow$ $P_2 = P_1$ + 100% of P_1

i.e. Momentum will increase by 100%.

16. (4)

Condition for vertical looping $h = \frac{5}{2}r = 5\text{ cm} \therefore r = 2\text{ cm}$.

17. (4)

$P = \vec{F} \cdot \vec{v} = ma \times at = ma^2t$ [as u = 0]

$= m\left(\frac{v_1}{t_1}\right)^2 t = \frac{mv_1^2 t}{t_1^2}$ [As $a = v_1/t_1$]

18. (4)

$P = \frac{mgh}{t} \Rightarrow m = \frac{p \times t}{gh} = \frac{2 \times 10^3 \times 60}{10 \times 10} = 1200\text{ kg}$

As volume $= \frac{mass}{density} \Rightarrow v = \frac{1200\text{ kg}}{10^3\text{ kg/m}^3} = 1.2\text{m}^2$

Volume = 1.2 m^3 = 1.2 × 10^3 litre = 1200 litre

19. (1)

$P = \frac{\vec{F} \cdot \vec{s}}{t} = \frac{(2\hat{i} + 3\hat{j} + 4\hat{k}) \cdot (3\hat{i} + 4\hat{j} + 5\hat{k})}{4} = \frac{38}{4} = 9.5\text{ W}$

20. (1)

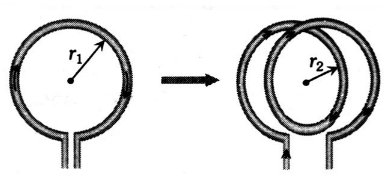
$P = \left(\frac{m}{t}\right)gh = 100 \times 10 \times 100 = 10^5$ W = 100 kW

21. (3)

Magnetic field at the centre of current carrying coil is given by

$$B = \frac{\mu_0}{4\pi} \cdot \frac{2\pi Ni}{r} \Rightarrow B \propto \frac{N}{r} \Rightarrow \frac{B_1}{B_2} = \frac{N_1}{N_2} \times \frac{r_2}{r_1}$$

The following fiugre shows how single turn coil changes to double turn coil.



$N_1 = 1$ $\quad$ $N_2 = 2$

$r_1 = r$ $\quad$ $r_2 = r/2$

$B_1 = B$ $\quad$ $B_2 = ?$

$$\Rightarrow \frac{B}{B_2} = \frac{1}{2} \times \frac{r/2}{r} = \frac{1}{4} \Rightarrow B_2 = 4B$$

Short trick : for such type of problems remember $B_2 = n^2 B_1$

22. (2)

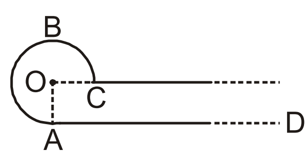
Because for inside the pipe i = 0

$$\therefore\ B = \frac{\mu_0 i}{2\pi r} = 0$$

23. (3)

For the circular part ABC, the angle subtended at the centre is $3\pi/2$.

Due to ABC, $B_1 = \frac{\mu_0}{4\pi} \cdot \frac{I}{r}\left(\frac{3\pi}{2}\right)$



Due to AD, A is at the end of the wire, therefore at O, $B_2 = \frac{\mu_0 I}{2\pi r} \times \frac{1}{2} = \frac{\mu_0 I}{4\pi r}$

$\therefore$ Total induction $= \frac{\mu_0 I}{4\pi r}\left(\frac{3\pi}{2} + 1\right)$

24. (3)

The magnetic inducjtion due to both semicircular parts will be in the same direction perpendicular to the paper inwards.

$$\therefore B = B_1 + B_2 = \frac{\mu_0 i}{4r_1} + \frac{\mu_0 i}{4r_2} = \frac{\mu_0 i}{4}\left(\frac{r_1 + r_2}{r_1 r_2}\right) \otimes$$

25. (3)

$$B = \frac{\mu_0}{4\pi} \cdot \frac{2\pi N i}{r}$$

$$\Rightarrow 3.14 \times 10^{-3} = \frac{10^{-7} \times 2 \times 3.14 \times N \times 10}{(10 \times 10^{-2})} \Rightarrow N = 50$$

26. (2)

$$B = \frac{\mu_0}{4\pi}\frac{\theta i}{r} = \frac{\mu_0}{4\pi} \times \frac{\pi}{2} \times \frac{i}{R} = \frac{\mu_0 i}{8R}$$

27. (2)

$$B = \mu_0 n i = 4\pi \times 10^{-7} \times \frac{200}{10^{-2}} \times 2.5 = 6.28 \times 10^{-2} \text{ wb/m}^2$$

28. (4)

$$F = qvB = 1.6 \times 10^{-19} \times \left[\sqrt{\frac{2E}{m}}\right] 2.5$$

$$= 4 \times 10^{-19}\sqrt{\frac{2 \times 2 \times 1.6 \times 10^{-19} \times 10^{6}}{1.66 \times 10^{-27}}} = 7.6 \times 10^{-12} \text{ N}$$

29. (2)

$$F = qvB\sin\theta = 1.6 \times 10^{-19} \times 2.5 \times 2.5 \times 10^{7} \sin 30^{\circ}$$

$$F = 1.6 \times 10^{-19} \times 6.25 \times 10^{7} \times \frac{1}{2} = 5 \times 10^{-12} \text{ N}$$

30. (3)

$$r = \frac{mv}{qB} = \frac{6 \times 10^{7}}{1.7 \times 10^{11} \times 1.5 \times 10^{-2}} = 2.35 \text{ cm}$$

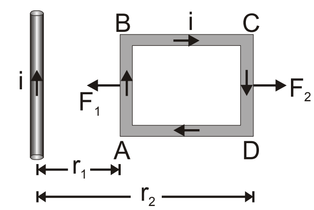
31. (1)

$$\mu = i.A = \frac{qv}{2\pi R}(\pi R^2) = \frac{qvR}{2}.$$

32. (3)

$\because r_1 < r_2$

So $F_1 > F_2$



$\Rightarrow F_{net} = (F_1 - F_2)$

towards the wire.

33. (3)

Net force on a current carrying closed loop is always zero if it is placed in a uniform magnetic field.

34. (2)

Force per unit length $= \frac{\mu_0}{4\pi} \cdot \frac{2i_1i_2}{r} = \frac{\mu_0}{2\pi} \cdot \frac{i^2}{b}$

35. (2)

$$i = \frac{C\theta}{NAB} \Rightarrow i \propto \theta$$

36. (2)

Force per unit length on two parallel current carrying conductors is given by $\frac{F}{\ell} = 10^{-7} \times 2\frac{i_1i_2}{a}$

$$\Rightarrow \frac{F}{\ell} = 10^{-7} \times 2 \times \frac{1 \times 1}{1} = 2 \times 10^{-7} \text{ N/m}$$

37. (4)

Since $\theta = 0°$ so $\tau = 0$ $[\because \tau = NiAB \sin\theta]$.

38. (2)

$$F = Bil = 2 \times 1.2 \times 0.5 = 1.2 \text{ N}$$

39. $\left(\frac{F}{\ell}\right) = \frac{\mu_0}{4\pi}\frac{2i_1i_2}{a} \Rightarrow \left(\frac{F}{\ell}\right) = \frac{\mu_0}{4\pi}\cdot\frac{2i^2}{d} = \frac{\mu_0 i^2}{2\pi d}$ [Attractive]

40. **(4)**

$$F = 10^{-7}\times\frac{2i^2}{a}\times\ell \Rightarrow 30\times10^{-7} = 10^{-7}\times\frac{2i^2}{0.15}\times9$$

$$\Rightarrow i = 0.5\ A$$

41. **(1)**

Magnetic field inside the conductor $B_{in} \propto r$ magnetic field outside the conductor $B_{out} \propto \frac{1}{r}$

[where r is the distance of observation point from axis]

42. **(3)**

$$\left|\vec{B}\right| = \frac{\mu_0}{4\pi}\cdot\frac{2\pi i}{r} \Rightarrow \left|\vec{B}\right| \propto \frac{1}{r}$$

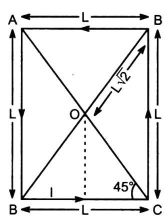
43. **(1)**

Every point on line AB will be equidistant from X and Y-axis. So magnetic field at every point on line AB due to wire 1 along X-axis is equal in magnitude but opposite in direction to the magnetic field due to wire along Y-axis. Hence B_{net} on AB = 0

44. **(4)**

45. **(3)**

Magnetic field at the centre due to either arm



$$B_1 = \frac{\mu_0}{4\pi}\times\frac{I}{(L/2)}[\sin45^\circ + \sin45^\circ] = \frac{\mu_0}{4\pi}\times\frac{2\sqrt{2}I}{L}$$

Field at centre due to the four arms of the square,

$B = 4B_1$

$$= 4\left(\frac{\mu_0}{4\pi}\times\frac{2\sqrt{2}I}{L}\right) = \frac{\mu_0}{\pi}\times\frac{2\sqrt{2}I}{L} \quad \text{i.e., } B \propto \frac{1}{L}$$

CHEMISTRY

46. **(2)**

47. **(1)**

Conformational

Isomer have

Least activation

Energy

48. **(2)**

Odd spiro shown optical in agiven condition and even show G.I.

49. **(2)**

No of meso from = $2\frac{n-1}{2} = 2\frac{3-1}{2}$

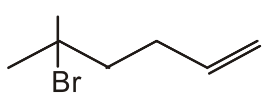
where n = chiral carbon = $2^1 = 2$

50. **(4)**

At double bon, substituted cycloalkene donot show G.I.

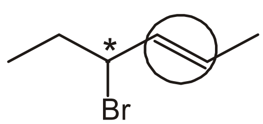
51. **(3)**

52. **(4)**



Streogenic centre = 0

∴ Steres isomer = 0

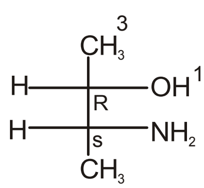


streogenic centre = 2

of stereoisomers = $2^n = 2^2 = 4$

53. **(3)** **54.** **(4)**

55. **(4)**

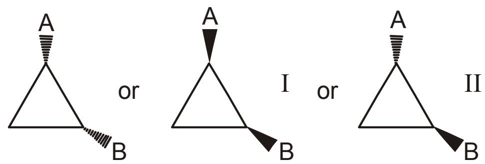


56. **(4)**

At each chiral centre on (1) as not either same or opposite configraction at each carbon on (ii) & (iii)

57. **(4)**

58. **(4)**



59. **(1)** **60.** **(2)**

61. **(2)**

$$C_{10}H_{18}(s) + 12O_2(g) \rightarrow 10CO_2(g) + 4H_2O(l)$$

$$\Delta n = 10 - 12 = -2$$

$$\Delta H = -1228.2 + (-2 \times 2 \times 10^{-3} \times 300)$$

Temperature is taken i.e., 27°C.

$$\Delta H = -1228.2 - 1.2 = -1229.4$$

62. **(1)**

For reversible isothermal expansion.

$$S = nR \ln \frac{V_2}{V_1} = 1 \times 8.314 \times \ln \frac{10}{1}$$

=19.143 = 19.15 J mol^{-1} K^{-1}

63. **(1)**

At equilibrium $\Delta G = 0$.

$$\Rightarrow \Delta G = \Delta H - T\Delta S = O \Rightarrow \Delta H = T\Delta S$$

$$\Rightarrow \frac{\Delta H}{\Delta S} = T = \frac{30}{0.066} = 454.54 \text{ K}$$

64. **(2)**

$$\frac{1}{2}x_2 + \frac{3}{2}y_2 \rightarrow xy_3$$

$$\Delta S = 50 - \left(\frac{3}{2} \times 40\right) - \frac{1}{2} \times 60 = -40 \text{ Jk}^{-1} = \qquad T = \frac{\Delta H}{\Delta S} = \frac{-30000}{-40} = 750 \text{ K}$$

65. (1)

$\text{Work} = -P\Delta V$

$= -1 \times 10^5 (1 \times 10^{-2} - 10^{-3}) = -900$ J.

66. (2)

67. (4)

Internal enrgy is a state function.

68. (2)

$\Delta U = nC_v\Delta T$ $\Delta T = 0 \Rightarrow \Delta U = 0$

69. (2)

70. (3)

$HC \equiv CH + H_2 \rightarrow C_2H_4$

$\Delta H = e_{C\equiv C} + e_{H-H} - e_{C=C} - 2e_{C-H}$

=198 + 103 + (–145)–2 (98)= –40 kcal.

71. (2)

72. (1)

$C_6H_5COOH + \frac{15}{2}O_2 \rightarrow 7CO_2 + 3H_2O(l)$

$\therefore \Delta H = 7(-393) + 3(-286) - (-408) = -3201\,kJ$

$\Delta H = \Delta U + \Delta nRT$

$\therefore \Delta U = -3199.75\,kJ$

73. (4)

74. (3)

The amount of heat evolved = 1000×37=37 kcal

Calorific value $= \frac{37}{5} = 7.4\ kcal/g$

75. (2)

$C_6H_{10}O_5 + O_2 \rightarrow 6CO_2 + 5H_2O$

No. of mole of $C_6H_{10}O_5 = \frac{1}{162}$

no. of moles of CO_2 and H_2O formed.

$$=\frac{6}{162} \text{ and } \frac{5}{162}$$

So, for that particular values.

$$-11.11-8.641-\Delta H_f(C_6H_{10}O_5)=-15$$

$$\Delta H_f=-4.75 \text{ kJ.}$$

76. **(4)**

77. **(1)**

It is due to more ionic character of Cs_2CO_3.

78. **(2)**

79. **(3)** **80.** **(2)**

81. **(3)** **82.** **(3)**

83. **(2)** **84.** **(4)**

85. **(1)**

Li metal imparts carmine red colour to flame due to emission spectrum.

86. **(1)** **87.** **(4)**

88. **(1)** **89.** **(3)**

90. **(3)**

BOTANY

91. **(4)** **92.** **(1)** **93.** **(2)**

94. **(4)** **95.** **(2)**

96. **(3)** **97.** **(1)** **98.** **(1)**

99. **(1)** **100.** **(4)**

101. **(4)**

102. **(1)**

Osmotic expansion of a cell is regulated by vacuole mainly.

103. **(1)**

104. **(1)**

Potassium ion pum theory.

105. **(2)**

Role of K^+ in stomatal opening is now universaly accepted.

106. (4)

107. (1)

Higher the concentration, higher the osmotic pressure of solution.

108. (4)

109. (1)

Amyloplast is starch storing leucoplast.

110. (1)

Root pressure is the main pressure for guttation.

111. (4) 112. (4)

113. (1)

Exosmosis causes plasmolysis.

114. (2)

Cell shape is mainly maintained by turgor pressure.

115. (3)

116. (1)

117. (2)

118. (3)

119. (1)

Transpiration decreases T.P. of a cell.

120. (2) 121. (1)

122. (1)

Hyadothode pore helps in guttation.

123. (2) 124. (3) 125. (4)

126. (2)

Active process is ATP dependent while passive process is ATP non dependent process.

127. (2)

128. (2)

129. (3) 130. (2) 131. (4)

132. (2)

133. (4)

Crop rotation and mixed croping both are done to increases nitrogenous content in soil.

134. (1) 135. (3)

ZOOLOGY

136. (1)

137. (3)

Amoeboid movement is brought about by pseudopodia, occurs in WBCs and macrophages.

138. (1)

139. (2)

Peristalsis is movement of gutwall by smooth muscles.

140. (4)

Only myosin protein present in H-zone, represented by ‘s’.

141. (Bonus)

142. (3)

143. (2)

144. (2)

145 (3)

During muscle contraction length of neither of any myofilament decreases. H-zone the part of myofibril decreases.

146. (3)

147. (3)

148. (1)

149. (3)

150. (1)

151. (4)

152. (1)

153. (1)

154. (2)

Z-line present between I-band/L-band in a myofibril.

155. (4)

156. (1)

157. (2)

158. (1)

159. (2)

160. (4)

SER content becomes low in red muscle fibres.

161. (2)

162. (1)

163. (2)

The joint between atlas and axis becomes rotational, called pivot joint.

164. (4)

Sphenoid is a cranial bone.

165. (1) 166. (2)

167. (2) 168. (4)

169. (3)

170. (1) 171. (4)

172. (2) 173. (1)

174. (2)

175. (2)

Intervertebral joint is an example of cartilagenous joint.

176. (3)

177. (1)

In menopausal women, fall of estrogen level causes osteoporosis.

178. (3)

Fibrous joints/sutures don't allow movement.

179. (1)

180. (1)