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ALLEN CAREER INSTITUTE KOTA (RAJASTHAN)

CLASSROOM CONTACT PROGRAMME

(Academic Session : 2023 - 2025)

ENTHUSE & LEADER COURSE

PHASE : ALL

TARGET : Pre-Medical

Test Type :**MAJOR** Test Pattern :**NEET (UG)**

TEST DATE : 26-04-2024

HINT – SHEET

SUBJECT : PHYSICS

SECTION-A

2. Ans (3)

Radial acceleration, $a_r = \frac{v^2}{r}$

Tangential acceleration, $a_t = a$

$\therefore$ Resultant acceleration

$d = \sqrt{a_r^2 + a_t^2 + 2a_r a_t \cos\theta}$

But here $\theta = 90°$

$\therefore \cos\theta = \cos 90° = 0,$

and $d = \sqrt{a_r^2 + a_t^2} = \sqrt{\left(\frac{V^2}{r}\right)^2 + a^2}$

3. Ans (3)

Maximum extension $= \frac{2Mg}{K}$

$= \frac{2 \times 10 \times 10}{20} = 10m$

4. Ans (3)

$h = R(\cos\theta_1 - \cos\theta_2)$

$\frac{1}{2}mv^2 = mgh$

$\frac{mv^2}{R} = mg\cos\theta_2 \Rightarrow v = \sqrt{Rg\cos\theta_2}$

$\frac{1}{2}m\,Rg\cos\theta_2 = mgR(\cos\theta_1 - \cos\theta_2)$

$3\cos\theta_2 = 2\cos\theta_1$

5. Ans (2)

$a_{cm} = \left(\frac{m_2 - m_1}{m_2 + m_1}\right)^2 g$

$= \left(\frac{5-3}{5+3}\right)^2 g = \frac{g}{16}\ m/s^2$

6. Ans (4)

Centre of mass of circular disc of radius 4R = (0, 0)

Centre of mass of upper disc = (0, 3R)

Centre of mass of lower disc = (3R, 0)

Let M be mass of complete disc and then the mass of cut out disc are $\frac{M}{16}$

Hence, centre of mass of new structure is given by

$\vec{x} = \frac{m_1x_1 - m_2x_2 - m_3x_3}{m_1 - m_2 - m_3}$

$= \frac{M(0) - \frac{M}{16}(0) - \frac{M}{16}(3R)}{M - \frac{M}{16} - \frac{M}{16}} = \frac{-3R}{14}$

7. Ans (3)

$KE = KE_{CM} + \frac{1}{2}MV_{CM}^2$

KE in CM frame is least as $V_{CM} = 0$ in that frame]

8. Ans (1)

Let distance moved by wedge is 'x'

$m(R - x) - Mx = 0$

$\Rightarrow mR - mx - Mx = 0$

$\Rightarrow mR - x(M + m) = 0$

$\Rightarrow x = \frac{mR}{M + m}$

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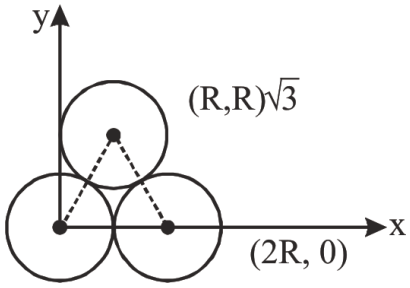
9. Ans (4)

$$x_{cm} = \frac{m \times 0 + m \times 2R + mR}{3m} = R$$

$$y_{cm} = \frac{m \times 0 + m \times 0 + mR\sqrt{3}}{3m} = \frac{R}{\sqrt{3}}$$



10. Ans (3)

$m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$

$(2m)10 + (m)0 = 2mv_1 + mv_2$

or $2v_1 + v_2 = 20$ .....(1)

$v_2 - v_1 = e\,(u_1 - u_2)$

$v_2 - v_1 = \frac{1}{2}\,(10 - 0)$

$v_2 - v_1 = 5$ .....(2)

Solving equation (1) and (2), we get

$v_1 = +5$ m/s and $v_2 = 10$ m/s

11. Ans (1)

Along y-axis : $v_2 \sin\theta = \frac{1}{2} v_1 \cos 60°$ ....(i)

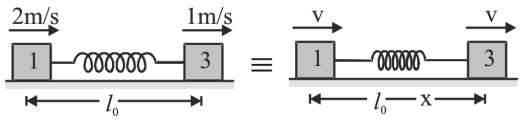
Along x-axis : $v_2 \cos\theta = v_1 \sin 60°$ ....(ii)

eq (i) ÷ eq (ii) $\tan\theta = \frac{1}{2\sqrt{3}}$ $\therefore \sin\theta = \frac{1}{\sqrt{13}}$

$$v_2 \times \frac{1}{\sqrt{13}} = \frac{1}{2} v_1 \times \frac{1}{2} \Rightarrow \frac{v_1}{v_2} = \frac{4}{\sqrt{13}}$$

12. Ans (2)

Due to spring force, velocity of 1 kg decreases and that of 3 kg increases. At the maximum compression, both the blocks move with same velocity.



By the momentum conservation

$1 \times 2 + 3 \times 1 = (1 + 3)\,v \Rightarrow v = \frac{5}{4}$ m/s

By the energy conservation

$$\frac{1}{2} \times 1(2)^2 + \frac{1}{2} \times 3(1)^2 = \frac{1}{2}(1+3)v^2 + \frac{1}{2}kx^2$$

$$\frac{7}{2} = 2\left(\frac{5}{4}\right)^2 + \frac{75}{2}x^2$$

$$\frac{7}{2} = \frac{25}{8} + \frac{75}{2}x^2$$

$$\frac{3}{8} = \frac{75}{2}x^2$$

$$\frac{3 \times 2}{8 \times 75} = x^2$$

$$\Rightarrow x^2 = \frac{1}{100}$$

$$\Rightarrow x = \frac{1}{10}\text{ m}$$

$\Rightarrow x = 10$ cm

13. Ans (3)

$\because F_{ext} = 0 \quad \therefore \Delta X_{CM} = 0$

14. Ans (1)

$C_1 \Rightarrow \left(\frac{1}{2}, \frac{1}{2}\right)$, $C_2 \Rightarrow \left(\frac{3}{2}, \frac{1}{2}\right)$ and $C_3 \Rightarrow \left(\frac{1}{2}, \frac{3}{2}\right)$

$$x_{cm} = \frac{m_1x_1 + m_2x_2 + m_3x_3}{m_1 + m_2 + m_3}$$

$$= \frac{1\left(\frac{1}{2}\right) + 1\left(\frac{3}{2}\right) + 1\left(\frac{1}{2}\right)}{3} = \frac{5}{6}\text{m}$$

$$y_{cm} = \frac{m_1y_1 + m_2y_2 + m_3y_3}{m_1 + m_2 + m_3}$$

$$= \frac{1\left(\frac{1}{2}\right) + 1\left(\frac{1}{2}\right) + 1\left(\frac{3}{2}\right)}{3} = \frac{5}{6}\text{m}$$

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15. Ans (4)

As stress is shown on x-axis and strain on y-axis

So we can say that $Y = \cot\theta = \frac{1}{\tan\theta} = \frac{1}{\text{slope}}$

So elasticity of wire P is minimum and of wire R is maximum

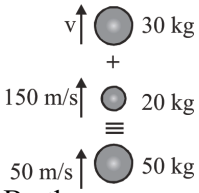
16. Ans (2)

Centre of mass may lie inside or outside of a body.

17. Ans (4)

Velocity of the body after 5 s ,

$v_0 = 100 - g \times 5 = 50$ m/s



By the conservation of momentum

$50 \times 50 = 20 \times 150 + 30\ V$

$v = -\frac{50}{3}$ m/s

18. Ans (4)

Mass of disc $\propto$ area

$\therefore \quad M_A = 4M_B$

$\therefore \frac{I_A}{I_B} = \frac{\frac{1}{2}M_AR_A^2}{\frac{1}{2}M_BR_B^2} = 4 \times 4 = 16.$

19. Ans (2)

$\frac{1}{2}MV^2\left(1+\frac{2}{5}\right) = \frac{1}{2}KX^2$

$X = \sqrt{\frac{7MV^2}{5K}}$

20. Ans (1)

$\tau = I\alpha$

21. Ans (3)

$\omega = \theta^2 + 2\theta$

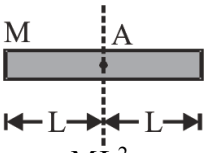
$\alpha = \omega\frac{d\omega}{d\theta}$

$\alpha = (\theta^2 + 2\theta)(2\theta + 2)$

$\because \quad \theta = 1$ rad

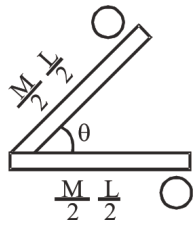
$\alpha = 3 \times 4 = 12$ rad/sec^2

22. Ans (3)



$I_A = \frac{ML^2}{12} = I_0$

Now rod is bent at A



M.I. of half rod (1) about A and $\perp^{ar}$ to the plane

$I_1 = \frac{1}{3}\frac{M}{2}\left(\frac{L}{2}\right)^2 = \frac{ML^2}{24} = I_2$

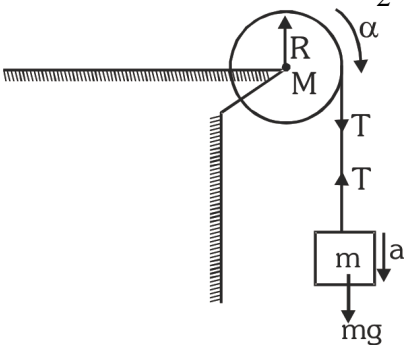
$I_A = I_1 + I_2 = \frac{ML^2}{12} = I_0$

M.I. will remain the same for any value of θ.

23. Ans (4)

For block : $mg - T = ma$ .....(i)

For disc (pulley) $TR = I\alpha = \frac{MR^2}{2}\alpha$



But $\alpha = \frac{a}{R}$ so $T = \frac{Ma}{2}$ ...(ii)

Therefore

$\frac{mg - T}{T} = \frac{2m}{M} \Rightarrow \frac{mg}{T} = \frac{2m}{M} + 1$

$\Rightarrow T = \frac{mg}{\left(\frac{2m}{M}+1\right)} = \frac{(1.2 \times 10)}{\left(\frac{2 \times 1.2}{2.4}+1\right)} = 6N$

24. Ans (1)

$a_1 = R\alpha - a_2$

$3 = 3\alpha - 6$

$9 = 3\alpha$

$\alpha = 3$ rad/s^2

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25. Ans (3)

$V_e = \sqrt{\frac{2GM}{R}} = \sqrt{\frac{8\pi G}{3}R^2\rho} = \sqrt{\frac{8\pi G\rho}{3}}R$

$\frac{\Delta v}{v} = \frac{\Delta R}{R} \Rightarrow \frac{\Delta v}{v}\% = -4\%$

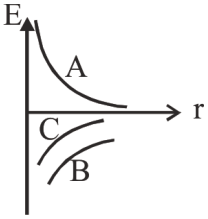
escape speed reduces by 4%.

26. Ans (2)

Kinetic energy of the satellite, $K = \frac{GMm}{2r}$

Potential energy of the satellite, $U = -\frac{GMm}{r}$

Total energy of the satellite, $E = -\frac{GMm}{2r}$



In figure,

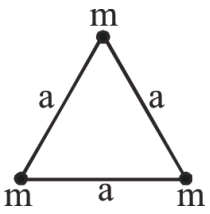
Variation of K with r is shown by curve A.

Variation of U with r is shown by curve B.

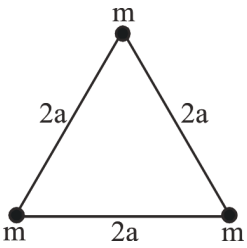
Variation of E with r is shown by curve C.

27. Ans (2)

$U_i = -\frac{3Gm^2}{a}$



$U_i = -\frac{3Gm^2}{2a}$



$W = U_f - U_i = \frac{-3Gm^2}{2a} + \frac{3Gm^2}{a} = \frac{3Gm^2}{2a}$

28. Ans (2)

$h \propto \frac{1}{g}$

$\frac{h_1}{h_2} = \frac{g_2}{g_1}$, $g_1 = 9g_2$

$\frac{2}{h_2} = \frac{g_2}{9g_2}$, $h_2 = 18m$

29. Ans (3)

NCERT-XI, Pg. # 193

Since escape speed $= \sqrt{\frac{2GM}{R+h}}$, it do not depend on mass of body.

30. Ans (4)

$T = 2\pi\sqrt{\ell/g} \Rightarrow g \propto \ell T^{-2}$

$\Rightarrow \frac{\Delta g}{g} = \frac{\Delta \ell}{\ell} + 2\frac{\Delta T}{T}$

$= 1 + 2(2) = 5\%$

31. Ans (3)

$F_1 = \frac{GMm}{4R^2}$, F_2 = force due to whole sphere – force due to the sphere forming the cavity

$= \frac{GMm}{4R^2} - \frac{GMm}{18R^2} \Rightarrow \frac{7GMm}{36R^2}$

$\therefore \frac{F_2}{F_1} = \frac{7}{9}$

32. Ans (1)

As orbital speed of a planet around Sun

$\boxed{V_0 \propto \frac{1}{\sqrt{r}}}$

So, $(V_0)_{Mercury} > (V_0)_{Earth} > (V_0)_{Mars}$

$\because r_{Mercury} < r_{Earth} < r_{Mars}$

33. Ans (3)

$P_{bottom} = P_0 + \rho gh \times \frac{A}{A}$

$= P_0 + \rho g\frac{(Ah)}{A} = P_0 + \frac{(\rho v)g}{A} = P_0 + \frac{mg}{A}$

as m is same $P_A = P_B = P_C$

34. Ans (2)

$\Delta\ell = \frac{FL}{AY}$

$\frac{\Delta\ell_s}{\Delta\ell_B} = \frac{F_s}{F_B} \times \frac{L_s}{L_B} \times \frac{A_B}{A_s} \times \frac{Y_B}{Y_s}$

$= \frac{3Mg}{2Mg} \times a \times \frac{1}{b^2} \times \frac{1}{c} = \frac{3a}{2b^2c}$

35. Ans (1)

If the initial length of the wire is ℓ_0 then

$M_1g = K(\ell_1 - \ell_0)$ & $(M_1 + M_2)g = K(\ell_2 - \ell_0)$

$\Rightarrow \frac{M_1 + M_2}{M_1} = \frac{\ell_2 - \ell_0}{\ell_1 - \ell_0} \Rightarrow \ell_0 = \frac{M_1}{M_2}(\ell_1 - \ell_2) + \ell_1$

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SECTION-B

36. Ans (4)

Density of water is maximum at 4°C, so water in capillary will rise minimum at 4°C.

37. Ans (2)

For streamline flow, Reynold's number $N_R = \frac{r\rho}{\eta}$ should be less. For less value of N_R, radius and density should be small and viscosity should be high.

38. Ans (1)

Per unit volume energy stored

$= \frac{1}{2} \times Y \times (\text{strain})^2$

$= \frac{1}{2} \times Y \times \left(\frac{1}{L}\right)^2$

Given, $\frac{1}{L} \times 100 = 1\%$

Thus per unit volume energy stored

$= \frac{1}{2} \times 2 \times 10^{10} \times \left(\frac{1}{100}\right)^2 = 10^6 Jm^{-3}$

39. Ans (4)

From the definition of bulk modulus

$\beta = \frac{\Delta P}{\Delta V / V}$

$\frac{-(1.65 - 1.01)10^5}{-10} \times 100 = 1.55 \times 10^5$

40. Ans (3)

A liquid surface comes at rest after stirring due to viscosity. Rest are examples of surface tension.

41. Ans (4)

When a tiny lead shot is gently dropped on the surface of a viscous liquid, the velocity of the lead shot increases with time until it finally attains a steady value known as terminal velocity.

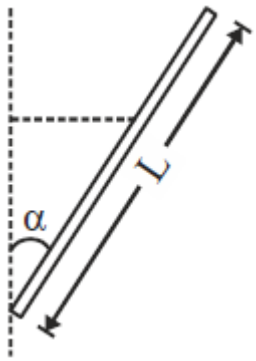
42. Ans (2)

Moment of forces about pivot should be equal to zero.

$12g(\ell) - mg(\ell/2) - 3g\left(\ell + \frac{\ell}{2}\right) = 0$

$\Rightarrow 12 - \frac{m}{2} - \frac{9}{2} = 0 \Rightarrow \frac{15}{2} = \frac{m}{2} \Rightarrow m = 15$ kg

43. Ans (2)



$I = \frac{ML^2}{3}\sin^2\alpha$

44. Ans (4)

The total kinetic energy, $K_N = K_R + K_T$

This equation is correct for anybody, which is rolling without slipping.

$K_R = K_T$, for the ring and hollow cylinder only.

It means $K_N = 2K_T$.

45. Ans (2)

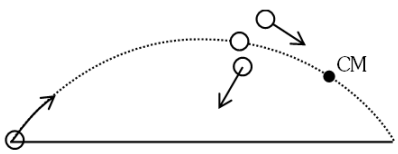
$I_P = m_1r_1^2 + m_2r_2^2 + m_3r_3^2 + m_4r_4^2$

$= 2 \times [5 \times (0.2)^2] + 2 \times [2 \times (0.4)^2]$

$= 0.4 + 0.64$

$= 1.04$ kg-m^2

46. Ans (4)



After explosion C.O.M. moving is the same path but particles moving in different direction.

47. Ans (3)

For elastic oblique collision between object of same mass, after collision they move perpendicular to each other.

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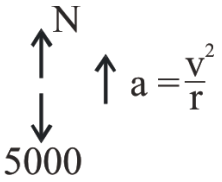
48. Ans (3)

$$x_{cm} = \frac{\int_0^1 x\lambda_0 x^2 dx}{\int_0^1 \lambda_0 x^2 dx} = \frac{3L}{4}$$

49. Ans (3)



$N - 5000 = 500 \times \frac{400}{10}$

$\Rightarrow N = 25000$

$\Rightarrow N = 25K$

50. Ans (1)

$a = \frac{v^2}{r} = \frac{2}{r^3}$

$v = \frac{\sqrt{2}}{r}$

$P = mv = \frac{\sqrt{2}m}{r}$

SUBJECT : BOTANY

SECTION-A

101. Ans (2)

105. Ans (3)

NCERT Pg # 264

106. Ans (4)

NCERT Pg. No. 229, 243

107. Ans (4)

NCERT (XIIth) Pg. # 236, 244

[b,c,d are correct]

108. Ans (1)

NCERT (XIth) Eng. med. Pg. # 10

110. Ans (1)

NCERT – 2.6/27

114. Ans (1)

Yeast is unicellular fungi

NCERT Pg # 24

118. Ans (2)

NCERT-XI Pg. # 134 IInd para- IInd line

121. Ans (4)

NCERT page no.67

123. Ans (2)

Ncert page 33.

124. Ans (4)

NCERT XI Pg. # 8

125. Ans (3)

NCERT-XIth, page no.07

126. Ans (2)

NCERT-XIth, page no.29

SECTION-B

138. Ans (2)

NCERT Pg. # 26

139. Ans (2)

Module No.1, Pg.#171

140. Ans (4)

Module No.1, Pg.#178

147. Ans (1)

NCERT (XIth) Pg. # 90, fig.-6.5(b)

SUBJECT : ZOOLOGY

SECTION-A

151. Ans (3)

NCERT pg no. 102

152. Ans (4)

NCERT pg no. 118

153. Ans (2)

NCERT pg no. 111

155. Ans (4)

Ncert XI pg 102 (old edition)

156. Ans (2)

NCERT pg no. 48

157. Ans (2)

NCERT pg no. 333

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158. **Ans (2)**
NCERT pg no. 119

159. **Ans (3)**
NCERT PAGE NO.331

160. **Ans (4)**
Statement (C) is wrong because enzymes are not made up of lipids
NCERT pg no. 154

161. **Ans (3)**
NCERT–XI, Para–4, pg no. 298
Para - (7)(H) Pg. # 298

162. **Ans (2)**
NCERT pg no. 334

163. **Ans (2)**
NCERT pg no. 270, 271

164. **Ans (1)**
NCERT pg no. 55

165. **Ans (4)**
NCERT pg no. 204

167. **Ans (3)**
NCERT pg no. 321

168. **Ans (1)**
NCERT pg no.56

169. **Ans (2)**
NCERT pg no. 332

170. **Ans (2)**
NCERT Pg # 316, 21.2

171. **Ans (2)**
NCERT pg no. 279, 280

172. **Ans (4)**
NCERT pg no. 293

173. **Ans (2)**
NCERT pg no. 308

174. **Ans (1)**
NCERT (XI) Pg. # 146 (Ist & Last para)

175. **Ans (2)**
NCERT-XII, Pg. # 47, 48

176. **Ans (1)**
NCERT Pageno.150,151,152

177. **Ans (1)**
NCERT Pg. # (E)- 129, (H)-142

178. **Ans (1)**
Pg. No. 187 XII-NCERT

179. **Ans (1)**
NCERT-XI Pg. # 297

180. **Ans (3)**
NCERT Page No.310

181. **Ans (3)**
NCERT XIth, Page 143

182. **Ans (4)**
NCERT pg no. 130

183. **Ans (3)**
NCERT XII, Page # 49,51

184. **Ans (1)**
Ncert XI, pg no 283, 286- 288

185. **Ans (1)**
NCERT Pg. # 268

SECTION-B

186. **Ans (4)**
NCERT Pg. # 127, para 7.4

187. **Ans (2)**
NCERT Pg. No. # 147 [E]
NCERT Pg. No. # 158 [H]

188. **Ans (1)**
NCERT pg no. 140

189. **Ans (1)**
NCERT pg no. 53

190. **Ans (2)**
NCERT-XII Page No. 59

191. **Ans (3)**
NCERT pg no. 183

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192. **Ans (4)**
NCERT pg no. 196

193. **Ans (4)**
NCERT pg no. 49

195. **Ans (4)**
NCERT pg no. 211

197. **Ans (3)**
NCERT pg no. 58

198. **Ans (1)**
NCERT pg no. 208

199. **Ans (2)**
NCERT pg no. 138, 140

200. **Ans (4)**
NCERT pg no. 54