MAJOR TEST # 01

ALLEN NEET-UG | **DATE : 22 - 03 - 2013**

SYLLABUS - 01

ANSWER KEY

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

HINT – SHEET

1. $[a]=\left[\frac{F}{\sqrt{x}}\right]=\left[\frac{MLT^{-2}}{L^{1/2}}\right]=ML^{1/2}T^{-2}$

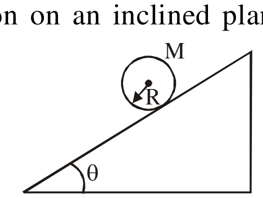
$[b]=\left[\frac{F}{t^2}\right]=\left[\frac{MLT^{-2}}{T^2}\right]=MLT^{-4}$

2. $L_0 = Mv_{cm} + I_{cm}\omega = M(\omega R) + \frac{MR^2}{2}\omega = \frac{3}{2}MR^2\omega$

3. Volume $V = \frac{4}{3}\pi r^3 \Rightarrow \frac{\Delta V}{V} = 3\frac{\Delta r}{r}$

6. For pure rolling motion on an inclined plane

$\mu_{min} = \frac{\tan\theta}{1+\frac{R^2}{K^2}}$



for cylinder $K^2 = \frac{R^2}{2}$

So $\mu_{min} = \frac{\tan\theta}{1+2} = \frac{1}{3}\tan\theta$

9. $\frac{\Delta K}{K} = \frac{\Delta m}{m}\% + 2\frac{\Delta v}{v}\%$

$= 2\% + 2 \times 3\% = 8\%$

11. As the two balls are falling freely under gravity, relative acceleration between them is zero. So relative speed between them remains same i.e. 40 m/s.

12. Required torque

$\tau = I\left(\frac{\Delta w}{\Delta t}\right) = (5\times10^{-3})\left(\frac{20\times2\pi}{10}\right)$

$= 2\pi \times 10^{-2}$ N-m.

13. θ_x, θ_y and θ_z must satisfy

$$\cos^2\theta_x + \cos^2\theta_y + \cos^2\theta_z = 1$$

If $\theta_x = 30°$ and $\theta_y = 45°$
then $\cos^2\theta_x + \cos^2\theta_y > 1$
Which is not possible

14. $\tau = I\alpha \Rightarrow TR = \left(\frac{MR^2}{2}\right)\alpha \Rightarrow \alpha = \frac{2T}{MR}$

15. Projection of a vector $\vec{A}$ along direction $\vec{B}$ is given by

$$= (\vec{A}\cdot\hat{B})\hat{B}$$

Therefore required projection

$$= \left[(2\hat{i}+3\hat{j})\cdot\left(\frac{\hat{i}+\hat{j}}{\sqrt{2}}\right)\right]\left[\frac{\hat{i}+\hat{j}}{\sqrt{2}}\right] = \frac{5}{2}(\hat{i}+\hat{j})$$

17. Acceleration $= \frac{V^2}{R} = \frac{(10)^2}{1000}$ m/s^2 towards centre of the circular path

18. They will meet at centre of mass

19. Distance travelled in 4th second $= \int_3^4 v\,dt$

$$= \int_3^4 (2t+3t^2)\,dt$$

$$= (t^2+t^3)_3^4$$

$= 16 + 64 - 9 - 27$
$= 44$ m

20. Work done $= \int \vec{F}.d\vec{r} = \int (x^2\hat{j}+y\hat{i})\cdot(dx\hat{i}+dy\hat{j})$

$$= \int_{(0,0)}^{(1,1)} (ydx + x^2dy)$$

$$= \int_0^1 xdx + x^2dx$$

$$= \left(\frac{x^2}{2}\right)_0^1 + \left(\frac{x^3}{3}\right)_0^1 = \frac{1}{2}+\frac{1}{3} = \frac{5}{6}\text{J}$$

21. $x = 2t \quad \Rightarrow t = \frac{x}{2}$

$$y = 6t + 4 = 6\left(\frac{x}{2}\right)+4$$

$\Rightarrow y = 3x + 4 \Rightarrow$ staright line

23. $|\text{Displacement}| = |\overline{OB} - \overline{OA}|$

$$= \sqrt{4^2+3^2-2\times4\times3\times\cos(75°-15°)}$$

$$= \sqrt{16+9-12} = \sqrt{13}$$

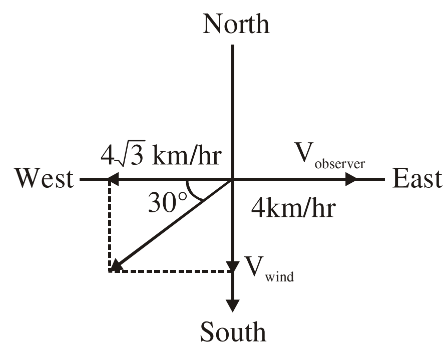
24. By using work-energy theorem

$$W_{gravity} + W_{air\ friction} = \frac{1}{2}m(v_2^2 - v_1^2)$$

$$\Rightarrow 5 \times 9.8 \times 20 + W_{air\ friction} = \frac{1}{2}\times5\times(10^2-0^2)$$

$$\Rightarrow W_{air\ friction} = 250 - 980 = -730 \text{ J}$$

25.



26. By using momentum conservation

$$\text{Final velocity} = \frac{mv\hat{i}+3m(2v\hat{j})}{4m}$$

$$= \frac{1}{4}v\hat{i} + \frac{3}{2}v\hat{j}$$

27. By using $v^2 = u^2 + 2aS$ we have stopping distance $S \propto v^2$

28. By using Impulse-momentum theorem

$$F\Delta t = m(v_2 - v_1)$$

$$\Rightarrow \Delta t = \frac{0.4[20-(-10)]}{100} = 0.12\text{s}$$

29. By using $s = ut + \frac{1}{2}at^2$ in vertical direction

$$-100 = 40(t) + \frac{1}{2}(-10)T^2$$

$\Rightarrow T^2 - 8T - 20 = 0 \Rightarrow T = 10s$

30. Masses of fragment are 2kg, 2kg and 1kg.
As total momentum of the system = 0
So velocity of lighter fragment

$$= \frac{\sqrt{(2\times15)^2 + (2\times15)^2}}{1}$$

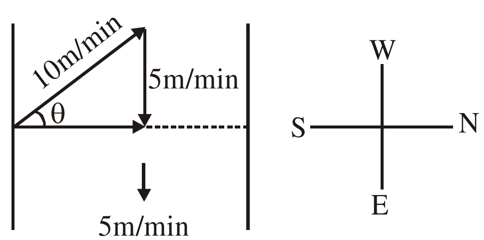
$= 30\sqrt{2}$ m/s

31. To increase range, elevation angle of cannon should be decreased.

32. As loss in PE = gain in KE
So $KE_c = mg\Delta h = 2 \times 10(14 - 7) = 140$ J

33. For C, H_{max} is maximum so vertical component of velocity will be maximum.
For A and C, range is same so they are projected at complementry angles.
For B, horizontal range is maximum, so its horizontal component of velocity will be maximum

34

35. 

$$\sin\theta = \frac{5}{10} \Rightarrow \theta = 30°$$

Therefore direction should be 30° W of N

36. Work required $= \frac{1}{2}kx_2^2 - \frac{1}{2}kx_1^2$

$$= \frac{1}{2}\times5\times10^3\left[(10\times10^{-2})^2 - (5\times10^{-2})^2\right]$$

= 18.75 J

37. No. of revolution/second $n = \frac{\omega}{2\pi} = \frac{88\times7}{2\times22} = 14$

38. By using work-energy theorem W = ΔKE

$$\frac{1}{2}mv^2 = 10\times25 \Rightarrow v = 10m/s$$

39. Here $v = \sqrt{rg\tan\theta} = \sqrt{10\times10\times\tan45°} = 10$ m/s

40. Here retardation = μg
Now by using v = u + at we have

$0 = 6 + (-10\mu)(10) \Rightarrow \mu = 0.06$

41. Centripetal acceleration

$$a_c = \frac{v^2}{R} = \frac{(60)^2}{1200} = 3m/s^2$$

Tangential acceleration $a_t = \frac{dv}{dt} = 4m/s^2$

The acceleration (or total acceleration) of the car $= \sqrt{a_c^2 + a_t^2} = 5m/s^2$

42. Here mg = μN, so mg = (0.2) (10) = 2N

43. $u\cos\theta = \frac{\sqrt{3}}{2}u \Rightarrow \cos\theta = \frac{\sqrt{3}}{2} \Rightarrow \theta = 30°$

As range = P × maximum height

So $\frac{2u^2\sin\theta\cos\theta}{g} = P\left[\frac{u^2\sin^2\theta}{2g}\right]$

$$\Rightarrow P = \frac{4}{\tan\theta} = \frac{4}{1/\sqrt{3}} = 4\sqrt{3}$$

44. By impulse momentum theorem,
According to question in x-direction

$F_x\Delta t = m(0 - u_x)$

$\Rightarrow (-3)\Delta t = 5(0-6)$

$\Rightarrow \Delta t = 10$ s

45. $T_{BC} = (m_c)a = (2)(0.6) = 1.2$ N

46. $(P + \frac{a}{V_m^2})(V_m - b) = RT$

At high pressure $P(V_m - b) = RT$

$$\frac{PV_m}{RT} - \frac{Pb}{RT} = \frac{RT}{RT}$$

$Z = 1+\dfrac{pb}{RT}$

51. $C_6H_{6(g)} + \dfrac{15}{2} O_{2(g)} \longrightarrow 6CO_{2(g)} + 3H_2O_{(g)}$

$\Delta Hg = 9 - 8.5 = 0.5$

$\Delta H = \Delta U + \Delta n_g RT$

$\boxed{\Delta H = -x + 0.5RT}$

52. NCERT Page # 15/1.8

1 mole $K_4[Fe(CN)_6]$ contains 6 mole C-atoms $= 6 \times 12$ g C

$\therefore$ 0.05 mole $K_4[Fe(CN)_6]$ contains

$= \dfrac{6\times 12}{1} \times 0.05 = 3.6$ gC

54.

	N_2 +	$O_2 \rightleftharpoons$	2NO	
Initially	3	2	0	2x=1mole NO
At equilibrium	(3–x)	(2–x)	2x	x=0.5mole
moles	2.5	1.5	1	

Concentration – $\dfrac{2.5}{2}$ M $\dfrac{1.5}{2}$ M

$K_C = \dfrac{(1/2)^2}{(2.5/2)(1.5/2)} = 1/15$

56. NCERT Page # 220/7.13

$K_{sp} = s^2 \Rightarrow s = \sqrt{K_{sp}}$

58. $\Delta T_b = i.K_b.m$

Vant Hoff's factor (i) is maximum for Na_2SO_4

59. $\dfrac{1}{2}N_{2(g)} + \dfrac{3}{2}H_{2(g)} \longrightarrow NH_{3(g)}$; $\Delta H_f^{\circ} = -92.0$ kJ

$N_{2(g)} + 3H_{2(g)} \longrightarrow 2NH_{3(g)}$; $\Delta H_{rxn} = -92\times 2 = 184$ kJ

$2NH_{3(g)} \longrightarrow N_{2(g)} + 3H_{2(g)}$; $\Delta H_{rxn} = 92 \times 2 = 184$ kJ

60. NCERT Page # 18

	H_2SO_4 +	$Ca(OH)_2$ →	$CaSO_4$ +	$2H_2O$
Initially–	0.5mol	0.2 mol	0	0
After rexn	0.3 mol	0	0.2mol	0.4 mol

Here, $Ca(OH)_2$ is limiting reagent

Number of molecules of $CaSO_4 = 0.2 \times 6\times 10^{23}$

61. $C_{gr.}$ is more stable than O_{dia}.

62. NCERT Page # 203-204/7.8.2 and 7.8.4

$\Delta n = 0$, so no effect of pressure.

This reaction is exothermic in nature.

64. $K_b \propto$ Boiling point of solution.

66. NCERT Page # 212/7.11.3

For weak acid – $[H^+] = C \propto$

$\Rightarrow pH = -\log [H^+]$

68. NCERT Page # 15/1.8

69. $\overset{\ominus}{F}$ are present in THV so distance of THV from corner is $= \dfrac{a\sqrt{3}}{4}$

70. $\Delta T_f = i.k_f.m$ and $i = 1 + (n - D).\propto$

71. $\dfrac{r_{A^+}}{R_{B^-}} = 0.414$

$r_{A^+} = 100 \times 0.414 = 41.4$ PM

72. NCERT Page # 15/1.9

% by mass of element

$= \dfrac{\text{no. of atoms of element} \times \text{Atomic weight}}{\text{Minimum molecular weight}} \times 100$

$5.33 = \dfrac{1\times 14}{M_{\omega}} \times 100$

74. H_2SO_4 is a strong acid

$[H^+] = 4 \times 10^{-3} \Rightarrow pH = -\log(4 \times 10^{-3}) = 2.4$

75. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$

| | | | | |

1 + 1 + 3 + 1+ 3

76. NCERT Page # 195/eq.7.15

78. mass% $= \dfrac{\omega_{solute}}{\omega_{solute} + \omega_{solvent}} \times 100$

80. NCERT Page # 219

salts of WASB undergo anionic hydrolysis.

81. $\dfrac{R_{Al}}{R_{Cu}} = \dfrac{R_O(A_1)^{\frac{1}{3}}}{R_O(A_2)^{\frac{1}{3}}}$

$\dfrac{3.6}{R_{cu}} = \dfrac{(27)^{\frac{1}{3}}}{(64)^{\frac{1}{3}}}$

$$R_{Cu} = \frac{(4^3)^{\frac{1}{3}}}{(3^3)^{\frac{1}{3}}} \times 3.6$$

$$R_{Cu} = \frac{4}{3} \times 3.6$$

R_{Cu} = 4.8 fermi

82. eq(i) = $\frac{1}{2}$ × eq(ii) − $\frac{1}{2}$ × eq (iii)

$$K = \left(\frac{K_1}{K_2}\right)^{1/2}$$

83. NCERT Page # 215/7.11.5
$pK_a = pK_b = 14$
$\therefore pK_a = 14 - 9.3 = 4.7$
$K_a = 10^{-pKa} = 10^{-4.7} = 2 \times 10^{-5}$

84. Negative deviation solutions show decrease in volume and evolution of heat.

85. NCERT Page # 199/7.6.2

86. NCERT Page # 195/eq.7.15

87. NCERT Page # 18

88.

	$N_2O_4(g)$ $\rightleftharpoons$	$2NO_2(g)$
Initially –	450 m	0
At equilibrium	(450 – x)	2x

P_{total} = sum of partial pressure of all the gases
600 = 450 − x + 2x ⇒ x = 150 mm

89. NCERT Page # 195/eq.7.15

90. NCERT Page # 195/eq.7.15

91. NCERT : Pg. 4 (1.1).

93. NCERT : Pg. 5 (1.1).

95. NCERT : Pg. 5 (1.1).

97. NCERT : Pg. 5 (1.1).

99. NCERT : Pg. 5 (1.1).

101. NCERT : Pg. 5 (1.1).

103. NCERT : Pg. 7 (1.2).

105. NCERT : Pg. 7 (1.2).

107. NCERT : Pg. 7 (1.2).

109. NCERT : Pg. 8 (1.2).

111. NCERT : Pg. 9(1.3.1).

113. NCERT : Pg. 10 (1.3.7).

115. NCERT : Pg. 15.

117. NCERT : Pg. 18 (2.1).

119. NCERT : Pg. 19 (2.1).

121. NCERT : Pg. 19 (2.1.1).

123. NCERT : Pg. 19 (2.1.1).

127. NCERT : Pg. 19 (2.1.2).

128. NCERT Page # 126

129. NCERT : Pg. 19 (2.1.2).

130. NCERT Page # 139

131. NCERT : Pg. 19 (2.1.2).

132. NCERT Page # 136

133. NCERT : Pg. 18 (2.1).

134. NCERT Page # 136

135. NCERT : Pg. 19 (Figure 2.2).

136. NCERT XI, Page no. # 79, 80

137. NCERT : Pg. 20 (Figure 2.3).

139. NCERT : Pg. 20 (2.2.1).

144. NCERT XI, Page no. # 71

145. NCERT : Pg. 20 (2.2.1).

147. NCERT : Pg. 20 (2.2.1).

150. NCERT XI, Page no. # 96, 97

151. NCERT, Eng-Part-I, Pg # 3, 4, 9, 12

153. NCERT, Eng-Part-I, Pg # 22

155. NCERT, Eng-Part-I, Pg # 17

157. NCERT, Eng-Part-I, Pg # 21

159. NCERT, Eng-Part-I, Pg # 25

160. NCERT, Eng., Pg. No. # 112, Paragraph no.3
Hindi, Pg. No. # 112, Paragraph no.4

162. NCERT, Eng., Pg. No. # 109, Fig. 7.11
Hindi, Pg. No. # 109, Fig. 7.11

163. NCERT, Eng-Part-I, Pg # 47

165. NCERT, Eng-Part-I, Pg # 50, 51, 52

166. NCERT Page No. 279

167. NCERT, Eng-Part-I, Pg # 53

168. NCERT Page No. 101

169. NCERT, Eng-Part-I, Pg # 53, 54

170. NCERT Page No. 279

171. NCERT, Eng-Part-I, Pg # 55

172. NCERT Page No. 102

173. NCERT, Eng-Part-I, Pg # 54

174. NCERT Page No. 103

175. NCERT, Eng-Part-I, Pg # 50, 51

176. NCERT Page No. 103

177. NCERT, Eng-Part-I, Pg # 59

178. NCERT, Eng-Part-I, Pg # 56

179. NCERT, Eng-Part-I, Pg # 57, 58

180. NCERT, Eng-Part-I, Pg # 55, 56, 58, 60