AVIRAL CLASSES
CREATING SCHOLARS
JEE (ADVANCED), PMT & FOUNDATIONS

ULTIMATE TEST SERIES NEET -2020
TEST-06 SOLUTION

Test Date :17-03-2018

ANSWER KEY

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

HINT – SHEET

1. $\frac{mv^2}{r} = \frac{Gmm}{(2r)^2} \quad v^2 = \frac{Gm}{4r}$

$v = \frac{1}{2}\sqrt{\frac{Gm}{r}}$

2. $\frac{g_h}{g} = \frac{R^2}{(R+h)^2}$

$\frac{g/16}{g} = \frac{R^2}{(R+h)^2}$

$h = 3R$

3. $P = \rho\ell g$

$1.013 \times 10^5 = 1.29 \times \ell \times 9.81$

$\ell = 8$ km

4. $h = \frac{2T}{r\rho g} \Rightarrow r = \frac{2T}{h\rho g}$

$r = \frac{2\times73\times10^{-3}}{10\times10^{-2}\times10^3\times9.8} = 0.015$ cm

5. $\Delta P = \frac{F}{A} = \frac{mg}{A} = \frac{3\times10^4\times10}{120}$

$\Delta P = 2.5 \times 10^3$ Pa

$= 2.5$ kilopascal

6. To move the plate with a constant velocity, the necessary force will be equal to the viscosity force

F(say). Now $F = \eta A \frac{\Delta V_x}{\Delta z}$,

Here $\eta = 1.0$ kg/(m-s), A = 100 cm^2 = 10^{-2} m^2, $\Delta v_x = 7 \times 10^{-2}$ m/sec and $\Delta z = 1$ mm = 10^{-3} m

$$\therefore \; F = \frac{1.0\times10^{-2} \times (7\times10^{-2})}{10^{-3}} = 0.7 \text{ N}$$

7. $V = \omega\sqrt{A^2 - x^2}$

$$\frac{V_{max}}{3} = \frac{\omega A}{3} = \omega\sqrt{A^2-x^2}$$

$$\frac{A}{3} = \sqrt{A^2-x^2}$$

$$\frac{A^2}{9} = A^2 - x^2$$

$$x^2 = A^2 - \frac{A^2}{9} = \frac{8A^2}{9}$$

$$x = \frac{2\sqrt{2}A}{3}$$

8. $\frac{1}{K_{eq}} = \frac{1}{K_1} + \frac{1}{K_2}$

$$= \frac{1}{K} + \frac{1}{2K}$$

$$Keq = \frac{2K}{3}$$

$$n = \frac{1}{2\pi}\sqrt{\frac{2K/3}{M}} = \frac{1}{\pi}\sqrt{\frac{K}{6M}}$$

10. $n \propto \frac{1}{\ell}$ $\quad \frac{n_1}{n_2} = \frac{\ell_2}{\ell_1}$

$$\frac{N}{N+5} = \frac{20}{20.5}$$

20.5 N = 20 N + 5 × 20

0.5 N = 100

$$N = \frac{100}{0.5} = 200 \text{ Hz}$$

N + 5 ⇒ 200 + 5 = 205 Hz

12. $V = \sqrt{\frac{\gamma P}{\rho}}$ $\quad V \propto \frac{1}{\sqrt{\rho}}$ $\quad \frac{V_1}{V_2} = \sqrt{\frac{\rho_2}{\rho_1}} = \sqrt{\frac{1}{2}} = \frac{1}{\sqrt{2}}$

13. $\frac{\theta_1 - \theta_2}{t} = K\left[\frac{\theta_1+\theta_2}{2} - \theta_0\right]$

$$\frac{70-60}{10} = K\left[\frac{70+60}{2} - \theta_0\right] \text{.....(i)}$$

$$\frac{60-54}{10} = K\left[\frac{60+54}{2} - \theta_0\right] \text{....(ii)}$$

eq (i)/(ii)

$$\frac{10}{6} = \frac{65-\theta_0}{57-\theta_0}$$

solving it $\theta_0 = 45°C$

14. $V \propto \frac{1}{T^3}$

VT^3 = const.

$V^{1/3}$ T = const .....(i)

$V^{\gamma-1}$ T = const. ...(ii)

comparing equation (i) & (ii)

$\gamma - 1 = 1/3$

$\gamma = 4/3$

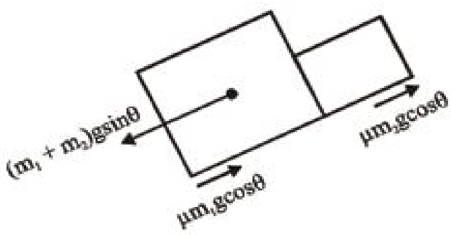
16. $\gamma_{mix} = \frac{(C_p)_{mix}}{(C_v)_{mix}} = \frac{n_1Cp_1 + n_2Cp_2}{n_1Cv_1 + n_2Cv_2}$

18. For motion, $mg - N = \frac{mv^2}{r}$ When reaction N becomes zero, contact breaks.

$$\therefore \; mg = \frac{mv^2}{r} \text{ or } v = \sqrt{rg} = 14 \text{ m/s}$$

23. $a = \frac{dV}{dt}$

28.



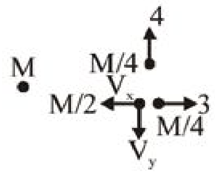
∴ Net force = $(m_1 + m_2)\, a_{net}$

∴ $(m_1 + m_2)g\sin\theta - (\mu m_1 g\cos\theta + \mu m_2 g\cos\theta)$
$= (m_1 + m_2)\, a_{net}$

$$\therefore \; a_{net} = g\left(\sin\theta - \frac{(\mu m_1 + \mu m_2)\cos\theta}{m_1 + m_2}\right)$$

Here, m_1 = 4kg, m_2 = 2kg, θ = 30°; μ = 0.3;

31.



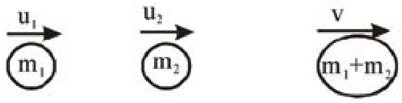
P → of system conserve. (No external force)

$\frac{M}{2}.V_x = \frac{M}{4}.3 \rightarrow V_X = 1.5$ m/sec.

$\frac{M}{2}.V_y = \frac{M}{4}.4 \rightarrow V_y = 2$ m/sec.

V of $\frac{M}{2}$ mass = $\sqrt{V_x^2 + V_y^2} = 2.5$ m/sec.

32.



In perfectly inelastic collision both bodies will more with same velocity

$m_1u_1 + m_2u_2 = (m_1+m_2)v$

final KE has some value because of velocity

Option (2) is wrong

34. For two particles to collide, the direction of the relative velocity of one with respect to other should be directed towards the relative position of the other particle

i.e. $\frac{\vec{r}_1 - \vec{r}_2}{|\vec{r}_1 - \vec{r}_2|} \rightarrow$ direction of relative position of 1 w.r.t. 2.

& $\frac{\vec{v}_2 - \vec{v}_1}{|\vec{v}_2 - \vec{v}_1|} \rightarrow$ direction of velocity of 2 w.r.t. 1

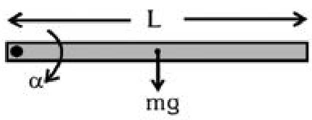
so for collision of A & B

$$\frac{\vec{r}_1 - \vec{r}_2}{|\vec{r}_1 - \vec{r}_2|} = \frac{\vec{v}_2 - \vec{v}_1}{|\vec{v}_2 - \vec{v}_1|}$$

35. As Range = $\frac{u^2 \sin 2\theta}{g}$ so $g \propto u^2$

Therefore $g_{planet} = \left(\frac{3}{5}\right)^2 (9.8 \text{ m/s}^2) = 3.5 \text{ m/s}^2$

36.



$$\tau = I\alpha \Rightarrow mg\left(\frac{L}{2}\right) = \left(\frac{m\ell^2}{3}\right)\alpha \Rightarrow \alpha = \frac{3g}{2L}$$

37. Coefficient of static friction,

$$\mu_s = \tan 30° = \frac{1}{\sqrt{3}} = 0.6$$

$a = g\sin30° - \mu_K g \cos30°$

$S = ut + \frac{1}{2}at^2$

$$\Rightarrow 4 = \frac{1}{2}\left[\frac{g}{2} - \frac{\mu_k g\sqrt{3}}{2}\right] \times 16 \Rightarrow \mu_k = 0.5$$

38. $d_f = \frac{d_i}{(1 + \gamma\Delta T)}$

fractional change

$= \frac{d_i - d_f}{d_i} = 1 - \frac{d_f}{d_i}$

$= 1 - (1 + \gamma\Delta T)^{-1}$

$= 1 - (1 - \gamma\Delta T)$

$\because (1+x)^n \approx 1 + nx$

$= \gamma\Delta T$

$= 5 \times 10^{-4} \times 40$

$= 0.020$

39. By conservation of linear momentum

$$4m\vec{v}_c = mv\hat{i} + 3m(2v\hat{j}) \Rightarrow \vec{v}_c = \frac{v}{4}\hat{i} + \frac{3}{2}v\hat{j}$$

40. $P_{avg} = \frac{W}{\Delta t} = \frac{\frac{1}{2}MV^2 - 0}{T} = \frac{1}{2}\frac{MV^2}{T}$

41. In isochoric process volume remains constant.

42. Generated power

$$= \left(\frac{mgh}{t}\right) \times \frac{90}{100} = (15 \times 60 \times 10) \times \frac{90}{100} = 8.1 \text{ kW}$$

43. Heat lost = Heat gained

$mLv + ms_w\Delta\theta = m_W s_W \Delta\theta$

$\Rightarrow m \times 540 + m \times 1 \times (100 - 80)$

$= 20 \times 1 \times (80 - 10)$

$\Rightarrow m = 2.5$ g

Total mass of water = (20 + 2.5)g = 22.5g

44. $\Delta U = \frac{f}{2}\ \mu R\ (\Delta T) = \frac{f}{2}\ (\mu RT_2 - \mu RT_1)$

$$\Delta U = \frac{f}{2}\ (P_2V_2 - P_1V_1) = \frac{5}{2}(4 \times 5 - 8 \times 2) \times 10^3$$

$$\Delta U = \frac{5}{2}\ (20 - 16) \times 10^3 = 10 \text{ kJ}$$

45. Isothermall process

$P_1V_1 = P_2V_2$

$P \times V = P_2\ (4V)$

$P_2 = P/4$

For adiabatic process

$$\frac{P}{4}\ (4V)^{\gamma} = P_f\ (16V)^{\gamma}$$

$$P_f = \frac{P}{4}\left(\frac{1}{4}\right)^{3/2} = \frac{P}{4}\times\frac{1}{8} = \frac{P}{32}$$

76. $E_n = -\frac{13.6z^2}{n^2} = -3.4\ ;\ n=2$

$$\lambda = \frac{h}{mv} = \frac{n2\pi r}{nh}\ \left[\because mvr = \frac{nh}{2\pi}\right]$$

$$= \frac{2\pi}{2}\times\frac{0.529\times 4}{1}\text{Å} = 6.6\ \text{Å} = 6.6 \times 10^{-10}\ m$$

77. $\lambda = \frac{h}{\sqrt{2mKE}}\ ;\ \frac{\lambda_A}{\lambda_B} = \frac{\sqrt{m_B(KE)_B}}{\sqrt{m_B(KE)_B}}$

$$\frac{1}{5} = \sqrt{\frac{m_B}{4m_B}\times\frac{KE_B}{KE_A}}\ ;\ \frac{(KE)_A}{(KE)_B} = \frac{25}{4}$$

78.

	A_2	+ B_2	→ 2A
t = 0	1	1	0
$t = t_{equal}$	$1-\alpha$	$1-\alpha$	2α

$$K_P = \frac{\left(\frac{2\alpha}{1}\times P\right)^2}{\left(\frac{1-\alpha}{1}P\right)\left(\frac{1-\alpha}{1}P\right)} = \frac{4\alpha^2}{(1-\alpha)^2}$$

$$\Rightarrow \sqrt{K_P} = \frac{2\alpha}{1-\alpha}$$

$$\Rightarrow \sqrt{K_P} - \sqrt{K_P}\alpha = 2\alpha$$

$$\Rightarrow \alpha = \frac{\sqrt{K_P}}{2+\sqrt{K_P}} = \frac{\sqrt{2}}{2+\sqrt{2}} = \frac{1}{1+\sqrt{2}}$$

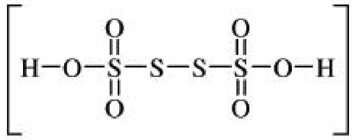
79. (1) $\left[Ag^+\right]_{required} = \frac{K_{sp}}{[Br^-]} = 5\times 10^{-12}$

(2) $\left[Ag^+\right]_{required} = 1.8\times 10^{-9}$

(3) $\left[Ag^+\right]_{required} = \sqrt{\frac{K_{sp}}{\left[CO_3^{2-}\right]}} = \sqrt{\frac{8.1\times 10^{-12}}{0.1}} = 9\times 10^{-6}$

(4) $\left[Ag^+\right]_{required} = \sqrt{\frac{K_{sp}}{\left[AsO_4^{3-}\right]}} = \sqrt[3]{\frac{1\times 10^{-12}}{0.1}} = 10^{-7}$

80.



82. $\frac{\text{wt of metal oxide}}{\text{wt of metal chloide}} = \frac{E_{metal} + E_{(O^{-2})}}{E_{metal} + E_{(Cl^-)}}$

$$\Rightarrow \frac{8}{16.25} = \frac{E+8}{E+35.5}$$

$\Rightarrow$ 8.25 E = 154

E = 18.66

83. $I_2 + 2Cl_2 \rightarrow ICl + ICl_3$

Initially $\left(\frac{38.1}{254} = 0.15mol\right)\left(\frac{28.4}{71} = 0.4mol\right)$ 0 0

↓

L.R.

Remaining	0.15–0.25	0.4–0.3	0+0.15
Moles	=0	=0.15 mol	=0.15 mol

Total moles after reaction = 0.1 + 0.15 +0.15

= 0.40 moles

86. moles of $C_4H_{10} = \frac{5.8\times 1000}{58} = 100$

Heat evolve due to 100 moles of C_4H_{10}

= 2650 × 100