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

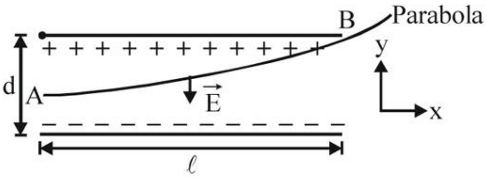
UTS NEET-2020
MOCK TEST-01 SOLUTION

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	3	3	2	3	1	1	2	4	3	3	3	2	3	1	1	2	1	1	1	4
Que.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	2	1	1	2	4	3	2	2	1	3	3	2	3	3	1	4	2	2	3	2
Que.	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	3	1	4	3	3	1	2	4	3	2	4	4	4	4	1	2	2	4	1	2
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
Ans.	2	4	2	3	2	3	4	1	2	3	2	1	3	4	1	2	1	2	3	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	1	2	2	2	4	2	2	2	3	4	1	4	4	3	4	3	1	3
Que.	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Ans.	2	3	1	2	2	4	2	3	2	4	3	2	1	2	4	4	2	4	4	4
Que.	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
Ans.	4	4	4	1	2	2	4	1	3	3	1	4	2	1	1	4	3	2	3	3
Que.	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
Ans.	4	3	2	4	1	3	3	3	1	2	1	2	4	3	4	2	3	4	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	1	3	2	4	4	1	3	3	3	2	3	3	3	2	4	2	3	1	4

1.

Let be the time taken by the electron to move from A to B. For the motion along x-axis



$$\ell = v_x t \quad \Rightarrow \quad t = \frac{\ell}{v}$$

or $$t = \frac{3\times10^{-2}\,m}{3\times10^{7}\,m/s} = 10^{-9}\,s$$

The force on the electron along +y direction

$$F_y = eE = \frac{eV}{d}$$

where V = 550 volts and d = 10^{-2} m

The acceleration along +y direction is

$$a_y = \frac{F_y}{m} = \frac{eV}{md}$$

For the motion along +y-axis.

$$y = 0 + \frac{1}{2}a_y t^2$$

or $$\frac{d}{2} = \frac{1}{2}\left(\frac{eV}{md}\right)t^2$$

or $\frac{e}{m}=\frac{d^2}{Vt^2}=\frac{10^{-4}}{550\times10^{-18}}=1.8\times10^{11}C/kg$

2.

$$\frac{1}{2}mv_{max}^2=eV_s$$

$$V_s=\frac{mv_{max}^2}{2e}=\frac{v_{max}^2}{2(e/m)}$$

$$=\frac{(1.2\times10^6)^2}{2\times1.8\times10^{11}}=4V$$

3.

$$\frac{1}{2}mv^2=\frac{3}{2}kT$$

where k is the Boltzmann constant

$$\therefore \quad v=\sqrt{\frac{3kT}{m}}$$

Now the de-Broglie wavelength is given by

$$\lambda=\frac{h}{mv}=\frac{h}{m}\sqrt{\frac{m}{3kT}}$$

$$\lambda=\frac{h}{\sqrt{3mkT}}$$

$$\therefore \quad \frac{\lambda_H}{\lambda_{He}}=\sqrt{\frac{m_{He}}{m_H}\times\frac{T_{He}}{T_H}}$$

$$=\sqrt{\frac{4}{2}\times\frac{127+273}{27+273}}$$

$$=\sqrt{\frac{4\times400}{2\times300}}=\sqrt{\frac{8}{3}}$$

4.

Let A_0 be the initial activity.

$$A_1=A_0e^{-\lambda t_1}$$

and $$A_2=A_0e^{-\lambda t_2}$$

$$\therefore \quad \frac{A_1}{A_2}=e^{-\lambda(t_1-t_2)}$$

$\because$ Mean life $T=\frac{1}{\lambda}$

$$\therefore \quad \frac{A_1}{A_2}=e^{-(t_1-t_2)/T}$$

or $$A_2=A_1e^{(t_1-t_2)/T}$$

5.

For the shortest possible wavelength of Lyman series,

$n_1 = 1$ and $n_2 = \infty$

$$\frac{1}{\lambda}=C\left[\frac{1}{1^2}-\frac{1}{\infty}\right]=C \qquad ...(i)$$

For the largest wavelength of Lyman series,

$n_1 = 1$ and $n_2 = 2$

$$\frac{1}{\lambda'}=C\left[\frac{1}{1^2}-\frac{1}{2^2}\right]=C\left(1-\frac{1}{4}\right)=\frac{3}{4}C \qquad ...(ii)$$

From eq. (i)

$$C=\frac{1}{\lambda}=\frac{1}{91.2\text{ nm}}$$

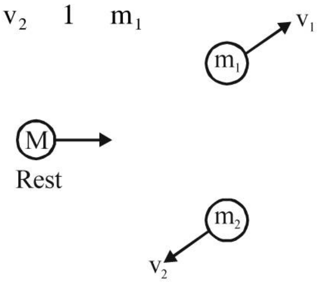
$$\therefore \quad \frac{1}{\lambda'}=\frac{3}{4\times91.2\text{ nm}}$$

or $\lambda'=\frac{4}{3}\times 91.2\text{ nm} = 121.6\text{ nm}$

6.

$$m_1 v_1 = m_2 v_2$$

$$\frac{v_1}{v_2} = \frac{8}{1} = \frac{m_2}{m_1}$$



Also from $r \propto A^{1/3}$

$$\frac{r_1}{r_2} = \left(\frac{A_1}{A_2}\right)^{1/3}$$

$$= \left(\frac{1}{8}\right)^{1/3} = \frac{1}{2}$$

7.

Since, the resistance offered by the junction in forward bias is zero, therefore effective voltage across the base-emitter junction V_{be} = 7 V.

Now, $I_b = \frac{V_{be}}{R_b} = 35 \times 10^{-6}$ A (given)

$\therefore$ $R_b = \frac{7V}{35 \times 10^{-6} A} = 200\ k\Omega$

8.

During forward bias the majority charge carriers (i.e., holes from p-section and electrons from n-section) crosses the junction resulting in a reduction of depletion region. This will decrease the width of potential barrier by striking the combination of holes and electrons.

The option (1) and (2) show the potential barrier in reverse bias whereas the option (3) and (4) show the potential barrier in reverse bias. Moreover the width of depletion barrier in reverse bias. Moreover the width of depletion layer option (4) is less than shown in option (3). Thus, the potential barrier in the depletion region will be of the form as shown in option (4).

9.

Volume $V = \pi r^2 t$

$$V = \pi \frac{d^2}{4} \ell$$

where, ℓ and d are the length and diameter of the rod respectively.

Percentage error in the volume is

$$\frac{\Delta V}{V} \times 100 = \left[2\frac{\Delta d}{d} + \frac{\Delta \ell}{\ell}\right] \times 100$$

$$= \left[\frac{2 \times 0.01}{2.00} + \frac{0.1}{5.0}\right] \times 100 = 3\%$$

10.

$$r = \left(\frac{\ell_1}{\ell_2} - 1\right) R$$

$$= \left(\frac{3.4}{1.7} - 1\right) \times 10 = 10\ \Omega$$

11.

In the absence of convex mirror the real & inverted image of the object is formed at a distance v from the convex lens using $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

$$\frac{1}{v} = \frac{1}{f} + \frac{1}{u} = \frac{1}{20} + \frac{1}{-30}$$

v = 60 cm

When a convex mirror is introduced in between the lens and the real and inverted image such that the image is formed at the object O itself, then the rays are incident normally over the convex mirror and in the absence of the convex mirror the position of the real and inverted image would be the centre of curvature of the mirror. The focal length of the mirror is

$$f = \frac{R}{2} = \frac{(60 - 10)\ cm}{2} = \frac{50\,cm}{2} = 25\,cm$$

12.

Since Q = CV and V = IR

$\therefore \qquad C = \frac{Q}{V} = \frac{Q}{IR}$

or $\qquad RC = \frac{Q}{I} = \frac{[AT]}{[A]} = [T]$

13.

Momentum $p = mv = 5t^2 - t + 5$

Given $\qquad m = 5$ kg

$\therefore \qquad v = t^2 - \frac{t}{5} + 1$

$\text{Acceleration} = \frac{dv}{dt} = 2t - \frac{1}{5}$

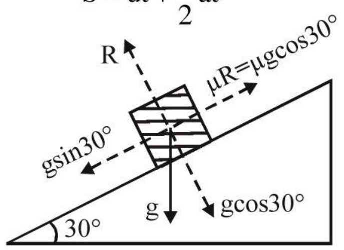
As the time 't' increases, the acceleration dv/dt also increase linearly.

14.

When the block starts sliding from the top of the incline, then after 2 seconds

$u = 0,\ t = 2s,\ s = 8m,\ a = ?$

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



where $\qquad a = g\sin30° - \mu g\cos30°$

$= \frac{g}{2}\left[1 - \sqrt{3}\mu\right]$

Thus $\qquad 8 = 0 + \frac{1}{2}\frac{g}{2}\left(1 - \sqrt{3}\mu\right) \times 4$

$1 - \sqrt{3}\mu = \frac{8}{g} = \frac{8}{10} = \frac{4}{5}$

$\sqrt{3}\mu = 1 - \frac{4}{5} = \frac{1}{5}$

$\mu = \frac{1}{5\sqrt{3}}$

15.

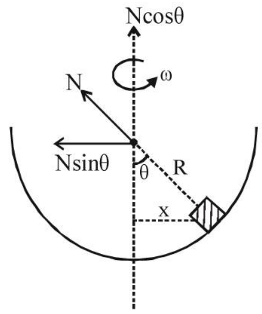
Forces on the block have been shown in the figure (b).

For horizontal forces,

$N\sin\theta = mx\omega^2 \qquad ...(i)$

For vertical forces,

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



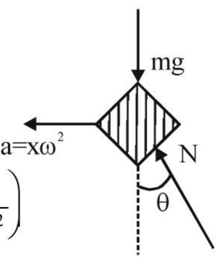
$\tan\theta = \frac{x\omega^2}{g}$

But $\qquad x = R\sin\theta$

$\therefore \qquad \frac{\sin\theta}{\cos\theta} = \frac{R\sin\theta.\omega^2}{g}$

or $\qquad \cos\theta = g/R\omega^2$

or $\qquad \theta = \cos^{-1}\left(\frac{g}{R\omega^2}\right)$



16.

θ = 0°

17. (1)

18.

Let T be the tension at a point distance x from the free end. Then,

T = (mass of x meter length of string) × g

$= \frac{M}{L}x.g$

Velocity of transverse wave

$v = \sqrt{\frac{T}{m}} = \sqrt{\frac{Mgx/L}{M/L}} = \sqrt{gx}$

19.

Within the uniform sphere (i.e., if $r_1 < R$ and $r_2 < R$), the gravitational force is given by,

$$F = -\frac{GMm}{R^3}r \quad \text{or} \quad F \propto r$$

So, $$\frac{F_1}{F_2} = \frac{r_1}{r_2}$$

Hence, the only correct choice is (1).

20.

$$\frac{V}{V_0} = \frac{C_0}{C} = \frac{1}{K} = \frac{1}{8}$$

$\therefore$ $K = 8$

21.

A galvenometer of resistance G can be used as a voltmeter of range V if a high resistance R is connected in its series where,

$$R = \frac{V}{I_g} - G$$

I_g is the current in the galvenometer for full scale deflection.
For the choice (1),

$$R = \frac{50}{50 \times 10^{-6}} - 100 \neq 10\ k\Omega$$

For the choice (2)

$$R = \frac{10}{50 \times 10^{-6}} - 100 = 2 \times 10^5 - 100$$

$$\simeq 2 \times 10^5\ \Omega$$

$$\simeq 200\ k\Omega$$

Hence, the choice (2) is correct.

Further, the galvanometer may be converted into an ammeter if a small resistance 's' is connected (or shunted) in parallel with the galvenometer.

where $$S = \frac{I_g}{I - I_g} \times G$$

I is the range of the ammeter.
For the choice (3)

$$S = \frac{50 \times 10^{-6}}{5 \times 10^{-3} - 50 \times 10^{-6}} \times 100 \simeq \frac{50 \times 10^{-6}}{5 \times 10^{-3}} \times 100$$

$$\simeq 1\ \Omega$$

Hence, the choices (3) and (4) are not correct.

22.

$$\tan\phi = \frac{\omega L}{R} = \frac{2\pi f L}{R}$$

$$= \frac{2\pi \times 50 \times 0.01}{4} = \frac{\pi}{4}$$

$$\phi = \tan^{-1}\left(\frac{\pi}{4}\right)$$

23.

For the ball A,

$$v_A^2 = (-v)^2 + 2gh$$

or $$v_A^2 = u^2 + 2gh$$

For the ball B,

$$v_B^2 = u^2 + 2gh$$

Hence, $v_A = v_B$

24.

In general, the length of string is $L = \frac{(n-1)\lambda}{2}$

$n \rightarrow$ Number of loops = Number of harmonics in question $n = 4$; $\lambda = 10$ cm

$$L = (4-1) \times \frac{10}{2} = 15\,cm$$

25.

At a height of 3L/4 from the lower end of the freely suspended wire, the total weight is = weight of $\frac{3L}{4}$ length of the wire + W_1

$$= \frac{3}{4}W + W_1$$

Longitudinal stress = $$\frac{\frac{3}{4}W + W_1}{A}$$

26.

Since force constant $k \propto \frac{1}{\ell}$

and $\ell_2 = 3\ell_1$

where $\ell = \ell_1 + \ell_2$

So, $$\frac{k_1}{k} = \frac{\ell}{\ell_1} = \frac{\ell_1 + \ell_2}{\ell_1} = \frac{\ell + 3\ell_1}{\ell_1} = 4$$

and similarly

$$\frac{k_2}{k} = \frac{\ell}{\ell_2} = \frac{\ell_1 + \ell_2}{\ell_2} = \frac{\ell + 3\ell_1}{3\ell_1} = \frac{4}{3}$$

$\therefore$ $$k_2 = \frac{4}{3}k$$

27.

The loop shown in figure can be considered as made up to two square current loops one in x-z plane, the other in x-y plane.

The magnitude of magnetic moment of each loop is $I\ell^2$ and these are directed perpendicular to each other. Hence there resultant is given by

$$M = \sqrt{(I\ell^2)^2 + (I\ell^2)^2} = \sqrt{2}I\ell^2$$

28.

Direction of magnetic field at every point on the axis of a current carrying circular coil remains same. Though its magnitude varies. Hence B always remains positive.

Therefore, (3) and (4) are wrong.

Further,

$$B = \frac{\mu_0 N i a^2}{2(a^2 + x^2)^{3/2}}$$

where a is the radius of the coil

At x = 0, $B = \frac{\mu_0 N i}{2a}$

when $x \to \infty$, $B \to 0$

Slope of the graph will be $\frac{dB}{dx} = \frac{3\mu_0 N i a^2 x}{2(a^2 + x^2)^{5/2}}$

which means at x = 0, slope is equal to zero or tangent to the graph at x = 0 must be parallel to x-axis. Hence (2) is correct and (1) is wrong.

29.

Those wavelengths will be absent whose dark fringe fall on the hole. The distance of n^{th} dark fringe from the central achromatic fringe is

$$y_n = \left(n - \frac{1}{2}\right)\frac{D\lambda}{2d} = (2n-1)\frac{D\lambda}{2(2d)}$$

where y_n = 3.0 mm = 0.30 cm, D = 120 cm, 2d = 1.5 mm

$$\therefore \ \lambda = \frac{2 \times 0.30 \times 0.15}{120(2n-1)} = \frac{3}{4000(2n-1)} \text{cm}$$

or $$\lambda = \frac{3 \times 10^8}{4000(2n-1)} \text{Å}$$

$$\lambda = \frac{75000}{2n-1} \text{Å} \qquad \text{(where n = 1, 2, 3, ...)}$$

$$= 75000 \times \left(1, \frac{1}{3}, \frac{1}{5}, \frac{1}{7} \ .....\right) \text{Å}$$

= 75000 Å, 25000 Å, 15000 Å, 10714 Å, 8333 Å 6818 Å, 5769 Å, 5000 Å, 4411 Å

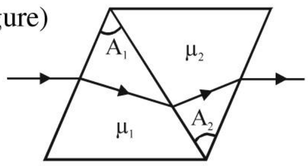
Thus, in the range (4500 – 7000 Å) the absent wavelengths are 6818 Å, 5769 Å, 5000 Å. Hence, the correct choice is (1).

30.

The deviation produced by a thin prism of prism angle A is given by

$$\delta = (\mu - 1)A$$

Since, the combined prism produce dispersion without deviation, therefore total deviation is zero (see figure)



$$\delta = \delta_1 + \delta_2 = 0$$

$$\delta = (\mu_1 - 1)A_1 + (\mu_2 - 1)A_2 = 0$$

or $(\mu_1 - 1)A_1 = -(\mu_2 - 1)A_2$

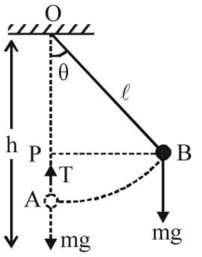
The negative sign indicates that the refracting angles of two prisms are in opposite directions

$$\therefore \quad A_2 = \frac{(\mu_1 - 1)A_1}{(\mu_2 - 1)} = \frac{(1.54 - 1)4°}{(1.72 - 1)}$$

$$= \frac{0.54}{0.72} \times 4° = \frac{3}{4} \times 4° = 3°$$

31.

Let the maximum angular amplitude be θ. When the pendulum bob moves from B to A, the decrease in potential energy = the increase in kinetic energy at A



$$mg(PA) = \frac{1}{2}mv^2 \; ; \; mgh = \frac{1}{2}mv^2$$

$$v^2 = 2g(PA) = 2g(OA - OP)$$

$$v^2 = 2g(\ell - \ell\cos\theta)$$

$$T - mg = \frac{mv^2}{\ell}$$

$$T - mg = \frac{m}{\ell}.2g\ell(1-\cos\theta)$$

$$T - mg = 2mg(1 - \cos\theta) \quad ...(i)$$

At A, $T = T_{max} = 2mg$

On putting this value of T in eq. (i), we get

$$2mg - mg = 2mg(1 - \cos\theta)$$

or $$1 - \cos\theta = \frac{1}{2}$$

$$\cos\theta = \frac{1}{2}$$

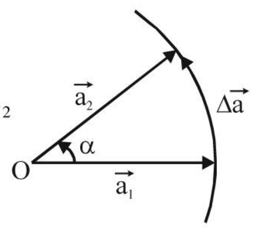
$$\theta = 60°$$

32.

$$\Delta\vec{a} = \vec{a}_2 - \vec{a}_1$$

$$|\Delta\vec{a}| = |\vec{a}_2 - \vec{a}_1|$$

$$|a_2^2 + a_1^2 - 2a_1a_2\cos\alpha|^{1/2}$$



Also, $|\vec{a}_1| = |\vec{a}_2| = a$

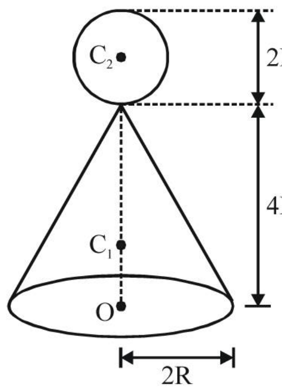
$\therefore$ $$|\Delta\vec{a}| = (a^2 + a^2 - 2a^2\cos\alpha)^{1/2}$$

$$= [2a^2(1 - \cos\alpha)]^{1/2}$$

$$= 2a\sin\frac{\alpha}{2}$$

33.

Let d be the density of the material of the cone and 12 d that of the sphere. Then the mass of the cone will be



$$m_c = \frac{1}{3}\pi(2R)^2(4R)d$$

$$= \frac{16}{3}\pi R^3 d$$

The position of centre of mass of the cone is C_1 is at a height $OC_1 = y_c = \frac{4R}{4} = R$ (from O)

Also the mass of the sphere will be

$$m_s = \frac{4}{3}\pi R^3(12\ d) = 16\pi R^3 d = 3m_c$$

and its position of centre of mass C_2 is

$$y_s = OC_2 = 4R + R = 5R \quad \text{(from O)}$$

Now $$y_{cm} = \frac{m_c y_c + m_s y_s}{m_c + m_s}$$

$$y_{cm} = \frac{m_c(R) + 3m_c(5R)}{m_c + 3m_c} = 4R \quad \text{(from O)}$$

34.

Rate of cooling $\frac{d\theta}{dt} \propto \theta - \theta_0$

at A, $\left(\frac{d\theta}{dt}\right)_{\theta=\theta_1} = \tan(180° - \alpha_1)$

$= \tan\alpha_1 = K(\theta_1 - \theta_0)$

and at B, $\left(\frac{d\theta}{dt}\right)_{\theta=\theta_2} = \tan(180° - \alpha_2) = \tan\alpha_2$

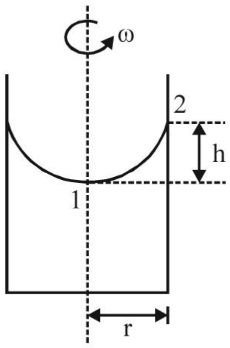
$= K(\theta_2 - \theta_0)$

where, K is proportionally constant.

$\therefore \quad \frac{\tan\alpha_1}{\tan\alpha_2} = \frac{\theta_1 - \theta_0}{\theta_2 - \theta_0}$

35.

Using Bernaulli's theorem



$$P_1 + \frac{1}{2}\rho v_1^2 + \rho g h_1 = P_2 + \frac{1}{2}\rho v_2^2 + \rho g h_2$$

Here, $h_1 \simeq h_2$

$$\therefore \quad P_1 + \frac{1}{2}\rho v_1^2 = P_2 + \frac{1}{2}\rho v_2^2$$

or $$P_1 - P_2 = \frac{1}{2}\rho\left(v_2^2 - v_1^2\right)$$

Here, $v_1 = 0$, $v_2 = r\omega$ and $P_1 - P_2 = h\rho g$

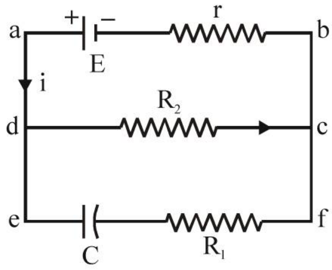
$$\therefore \quad h\rho g = \frac{1}{2}\rho(r\omega)^2$$

or $$h = \frac{r^2\omega^2}{2g}$$

36.

The current through the mesh abcda is given by,

$$i = \frac{E}{r + R_2}$$



Potential difference across d and c is given by,

$$V_{dc} = iR_2 = \frac{ER_2}{r + R_2}$$

Since, there is no current in the arm ef, therefore p.d. across the capacitor C is also V_{dc}.

Now, $$Q = CV_{dc} = \frac{CER_2}{r + R_2}$$

37.

Maximum range $R_{max} = \frac{v^2}{g}$

$$\text{Area} = \pi R_{max}^2 = \frac{\pi v^4}{g^2}$$

38.

Loss in PE between A and D = gain in KE between A and D

$$mg(h - 2r) = \frac{1}{2}m(v^2 - 0) \qquad (\because K_A = 0)$$

$$v^2 = 2g(h - 2r) \qquad ...(i)$$

If the block is to complete the loop path then at D

$$\frac{mv^2}{r} \geq mg$$

$$v^2 \geq rg \qquad ...(ii)$$

From Eqs. (i) and (ii)

$$2g(h - 2r) \geq rg$$

$$h \geq \frac{5}{2}r$$

39.

Using Bernoulli's theorem

$$P_1 + \frac{1}{2}\rho v_1^2 + \rho g h_1 = P_2 + \frac{1}{2}\rho v_2^2 + \rho g h_2$$

For the horizontal motion of the plane $h_1 = h_2$, then

$$P_1 + \frac{1}{2}\rho v_1^2 = P_2 + \frac{1}{2}\rho v_2^2$$

or $$P_2 - P_1 = \frac{1}{2}\rho\left(v_1^2 - v_2^2\right)$$

$$= \frac{1}{2} \times 1.3\left[120^2 - 90^2\right]$$

$$= 0.65[210 \times 30] = 4095 \text{ N/m}^2$$

40.

The apparent frequency of the horn of police van as heard by Motor-cyclist is

$$\nu' = \left(\frac{v - u_m}{v - 22}\right)176 \text{ Hz} \quad \left(\because \nu' = \left(\frac{v - v_0}{v - v_s}\right)\nu\right)$$

$\because$ v = 330 m/s

$$\nu' = \frac{(330 - u_m)}{308} \times 176 \text{ Hz} \qquad \text{...(i)}$$

The apparent frequency of, siren as heard by the motor cyclist must also be v' because the motorcyclist does not observe any beats. Thus,

$$\nu' = \left(\frac{330 + u_m}{330}\right) \times 165 \qquad \text{...(ii)}$$

$$\left(\because \nu' = \frac{v + v_0}{v}\nu\right)$$

From eq. (i), and (ii), we get

$$\frac{330 - u_m}{308} \times 176 = \frac{330 + u_m}{330} \times 165$$

Solving it for u_m, we get

$$u_m = 22 \text{ m/s}$$

41.

Fundamental frequency of open organ pipe

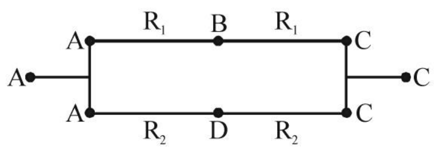
$$f = \frac{V}{2\ell} = \frac{340}{2 \times 0.34} = 500 \text{ Hz}$$

42. (1)

43.

Let R_1 and R_2 be the thermal of Wheat stone's bridge, the point B and D must be at the same temperature when the bridge is balanced. Therefore, thermal resistance of arm BD becomes ineffective.

Now the equivalent circuit at balance is



The effective resistance between A and C is

$$R = \frac{(2R_1)(2R_2)}{2R_1 + 2R_2}$$

$$= \frac{2R_1R_2}{R_1 + R_2}$$

$$R = \frac{2\frac{\ell}{K_1A}\cdot\frac{\ell}{K_2A}}{\frac{\ell}{K_1A} + \frac{\ell}{K_2A}} = \frac{2\ell}{(K_1 + K_2)A}$$

44.

$$e = -\frac{Mdi}{dt}$$

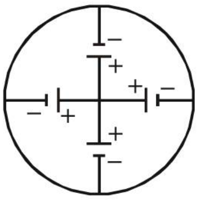
$$e \propto \frac{di}{dt}$$

Here di/dt represent the slope of i-t curve. In the given i-t graph, during the first half time the slope is constant and has positive value and in the next half time, the slope is again constant but has negative value. Hence the correct representation of the curve in e-t graph is (3).

45.

Refer to the problem no. 5, induced emf across the ends of each spoke is

$$e = \frac{1}{2}B\ell^2\omega$$



where ℓ is the length of each spoke i.e., the radius of the wheel ℓ = 0.4 m.

All the induced cells are connected in parallel as shown in the adjoining figure. Therefore induced emf between the rim and the centre of the wheel is

$$e = \frac{1}{2}B\ell^2\omega$$

$$= \frac{1}{2} \times 0.4 \times 10^{-4} \times (0.4)^2 \times \frac{2\pi \times 180}{60}$$

= 6 × 10^{-5} V

46.

Square pyramidal geometry = sp^3d^2 (5 Bond pair + 1 lone pair)

47.

Calculated μ = q × d

= 4.8 × 10^{-10} esu × 187.5 × 10^{-10} cm

= 9 × 10^{-18} esu cm

= 9 Debye (1×10^{-18} esu cm = 1 Debye)

Observed μ = 0.63 Debye

$$\% \text{ Ionic character } = \frac{\mu_{\text{observed}}}{\mu_{\text{calculated}}} \times 100$$

$$= \frac{0.63}{9} \times 100 = 7\%$$

48.

M.P. ∝ lattice energy of the crystal $\propto \frac{1}{r^+ + r^-}$

49.

$$MnO_4^- \xrightarrow[\text{medium}]{\text{basic}} MnO_4^{-2} \text{ or } MnO_2$$

50.

Tin is extracted from cassiterite ore (SnO_2)

It is reduced by carbon

$SnO_2 + 2C \rightarrow Sn + 2CO$

Crude metal contain impurity of Fe, W & Cu.

51.

B_2H_6 reacts with NH_3, 1° and 2° amines & form an ionic compound.

However with 3° amine, B_2H_6 forms an adduct

$B_2H_6 + 2N(CH_3)_3 \longrightarrow 2(CH_3)_3N \longrightarrow BH_3$

52. (4)

53. (4)

54.

$[Pt(NH_3)_4]Cl_2$ & $[CO(NH_3)_5NO_2]Cl$ both will give white ppt with $AgNO_3$

$[CO(NH_3)_3Cl_3]$ will have geometrical isomers, fae & mer

55.

Heat of hydration is higher for small sized cations. Thus solubility of these metals decreases down the group.

56. (2)

57. (2)

58.

Four isomers are possible are

$[Cu(NH_3)_4]$ $[PtCl_4]$

$[CuCl_4]$ $[Pt(NH_3)_4]$

$[PtCl_3(NH_3)]$ $[Cu(NH_3)_3Cl]$

$[Pt(NH_3)_3Cl]$ $[Cu(NH_3)Cl_3]$

59. (1)

60.

Cd^{+2} have no unpaired e^-, so colourless