ANSWER KEY (AIPMT-2000)

Ques.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans	2	1	3	2	2	2	2	3	3	2	2	2	1	1	1	1	1	1	3	1
Ques.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans	2	2	3	2	1	1	1	2	1	2	1	2	1	2	2	1	1	2	3	2
Ques.	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans	2	2	4	2	2	1	2	2	3	2	1	2	4	2	1	1	2	1	2	1
Ques.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
Ans	3	1	3	1	1	4	1	2	2	2	3	4	2	1	2	2	1	2	3	1
Ques.	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Ans	1	2	1	2	1	1	3	3	3	1	1	1	1	1	1	1	4	2	2	1
Ques.	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Ans	2	1	3	2	1	3	4	4	1	1	2	3	1	1	1	4	2	3	3	1
Ques.	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
Ans	1	1	1	1	1	2	2	1	3	1	1	1	3	1	2	4	1	1	2	1
Ques.	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
Ans	2	4	1	3	2	1	3	1	1	2	2	2	1	1	1	1	3	1	2	3
Ques.	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Ans	1	1	1	1	1	1	2	3	1	1	1	1	1	3	3	1	1	1	1	2
Ques.	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
Ans	1	1	3	3	1	2	1	2	1	1	2	2	2	2	1	1	2	3	2	1

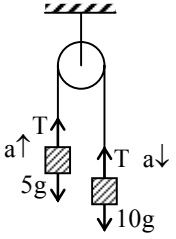
HINTS & SOLUTIONS

1. $10g - T = 10a$

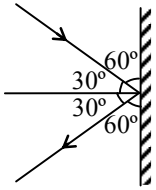
$T - 5g = 5a$

$5g = 15a$

$a = \frac{g}{3}$



2.



$$F = \frac{\Delta p}{\Delta t} = \frac{mv\cos 30^\circ - (-mv\cos 30^\circ)}{\Delta t}$$

$$= \frac{2mv\cos 30^\circ}{\Delta t} = \frac{2\times 3\times 10\times\sqrt{3}}{0.2\times 2} = 150\sqrt{3}\ \text{N}$$

3. Velocity after 5 second

$v = 100 - 10 \times 5$

$v = 50$ m/s.

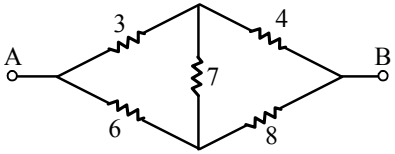
from conservation of momentum

$1 \times 50\,\hat{j} = 0.4 \times 25\,(-\hat{j}) + 0.6\,\vec{v}$

$50\,\hat{j} + 10\,\hat{j} = 0.6\,\vec{v}$

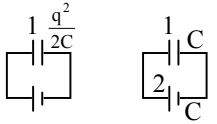
$$\vec{v} = \frac{60\hat{j}}{0.6} = 100\,\hat{j} = 100\ \text{m/s}\,\hat{j}$$

4. It is balanced wheatstone bridge so equivalent resistance between A & B



$$R = \frac{R_1 \times R_2}{R_1 + R_2} = \frac{14\times 7}{21} = \frac{14}{3}\ \Omega$$

5.



$$\text{energy stored (U)} = \frac{q^2}{2C}$$

After connecting with another capacitor

$$V_{Common} = \frac{q_1 + q_2}{C_1 + C_2} = \frac{q+0}{C+C} = \frac{q}{2C}$$

$\because$ Energy on each capacitor

$$= \frac{1}{2}\,CV_{Common}^2 = \frac{1}{2}\left(\frac{q}{2C}\right)^2 = \frac{U}{4}.$$

6. $R = \dfrac{2u^2 \sin\theta\cos\theta}{g}$

Range of a projectile for angles of projection θ and $90 - \theta$ are same.

7. Tension in the string at the lowest position B is maximum.

10. $F = mg = 72N$

$$g' = g\left(\frac{R_e}{R_e + h}\right)^2 = g\left(\frac{R_e}{R_e + R_e/2}\right)^2$$

$$= g\left[\frac{2R_e}{3R_e}\right]^2 = \frac{4}{9}g$$

$$F' = mg' = mg \times \frac{4}{9} = 72 \times \frac{4}{9} = 32N$$

13. Equivalent power of combination

$P_{eq} = 2P_L + P_M$

$$= 2(\mu - 1)\left(\frac{1}{R}\right) + 0$$

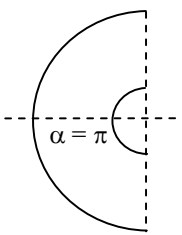
The required focal length

$$f = -\frac{1}{P_{eq}} = -\frac{R}{2(\mu-1)} = -\frac{10}{2(1.5-1)} = -10cm$$

17. $\because \ \gamma = 1 + \dfrac{2}{f}$

$$\Rightarrow \frac{2}{f} = \gamma - 1 \quad \Rightarrow f = \frac{2}{\gamma - 1}$$

19.



Electric field at $O = \dfrac{2K\lambda}{a} \sin(\alpha/2)$

$$= \frac{2\lambda}{4\pi\epsilon_0 a}\sin\frac{\pi}{2} = \frac{\lambda}{2\pi\epsilon_0 a}$$

20. $t = \dfrac{d}{\sqrt{u^2 - v^2}}$

$$\frac{1}{4} = \frac{1}{\sqrt{(5)^2 - v^2}}$$

$$\frac{1}{16} = \frac{1}{25 - v^2}$$

$v = 3$ km/hr.

21. $v = \dfrac{ds}{dt} = \dfrac{d}{dt}(3t^3 + 7t^2 + 14t + 8)$

$= 9t^2 + 14t + 14$

$a = \dfrac{dv}{dt} = 18t + 14$

at, $t = 1$ sec.

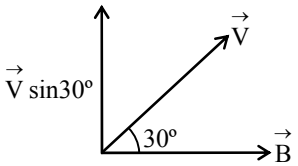
$a = 32\ ms^{-2}$.

23. Magnetic field due to 5A $\rightarrow \dfrac{5\mu_0}{2\pi \times 2.5} = \dfrac{2\mu_0}{2\pi} \otimes$

Magnetic field due to 2.5A $\rightarrow \dfrac{2.5\mu_0}{2\pi \times 2.5} = \dfrac{\mu_0}{2\pi} \odot$

Resultant Magnetic field $= \dfrac{2\mu_0}{2\pi} - \dfrac{\mu_0}{2\pi} = \dfrac{\mu_0}{2\pi} \otimes$

24.

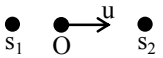


$$r = \frac{mV_\perp}{qB}$$

$$r = \left(\frac{m}{q}\right)\left(\frac{3\times10^5 \times \sin 30^\circ}{0.3}\right)$$

$$r = \frac{3\times10^5}{10^8 \times 0.3 \times 2} = 0.5 \times 10^{-2}\ m = 0.5\ cm$$

26.



For first source

$$n_1 = n\left(\frac{v-u}{v}\right) = \left(1 - \frac{u}{v}\right)n$$

for IInd source

$$n_2 = n\left(\frac{v+u}{v}\right) = \left(1 + \frac{u}{v}\right)n$$

Beat freq. $= |n_1 - n_2| = n + \dfrac{nu}{v} - n + \dfrac{nu}{v}$

$$= \frac{2nu}{v} = 2\frac{u}{\lambda}\left[\because v = n\lambda \ \therefore \frac{1}{\lambda} = \frac{n}{v}\right]$$

27. $\ell = \ell_1 + \ell_2 + \ell_3$

$$\frac{k}{n} = \frac{k}{n_1} + \frac{k}{n_2} + \frac{k}{n_3}$$

$$\Rightarrow \frac{1}{n} = \frac{1}{n_1} + \frac{1}{n_2} + \frac{1}{n_3}$$

30. $$\frac{W}{Q} = \frac{1}{6}$$

$$1 - \frac{T_L}{T_H} = \frac{1}{6}$$

$$\frac{T_L}{T_H} = n\frac{5}{6}$$

If sink temp. decrease by 62ºC then

$$1 - \frac{T_L - 62}{T_H} = \frac{2}{6} \Rightarrow \frac{T_L - 62}{T_H} = \frac{2}{3}$$

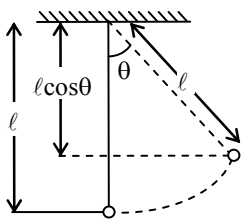
$$2T_H = 3T_L - 186 \Rightarrow 2T_H = 3 \times \frac{5}{6} T_H - 186$$

$$2T_H - \frac{5}{2} T_H = -186 \Rightarrow \frac{5-4}{2} T_H = 186$$

$T_H = 186 \times 2 \quad = 372\ K = 99ºC$

$T_L = \frac{5}{6} \times 372 \quad = 310\ K = 37ºC$

33.



Potential energy at extreme position = kinetic energy at mean position

$$mg\ell(1 - \cos\theta) = \frac{1}{2} mv^2$$

$$v = \sqrt{2g\ell(1 - \cos\theta)}$$

34 $P = \vec{F} . \vec{v}$

$= (60\,\hat{i} + 15\,\hat{j} - 3\,\hat{k}) . (2\,\hat{i} - 4\,\hat{j} + 5\,\hat{k})$

$= (120 - 60 - 15) = 45$ watt

35. For triangular lamina

Longest side $\rightarrow I_{min}$

Smallest side $\rightarrow I_{max}$

Therefore $I_2 > I_1 > I_3$

36. $$f = \frac{1}{2\pi} \sqrt{\frac{g}{\ell}}$$

$$f \propto \frac{1}{\sqrt{\ell}}$$

$$\frac{f_A}{f_B} = \sqrt{\frac{\ell_B}{\ell_A}}$$

$$\Rightarrow \frac{2f_B}{f_B} = \sqrt{\frac{\ell_B}{\ell_A}}$$

$$\Rightarrow 4 = \frac{\ell_B}{\ell_A}$$

$$\Rightarrow \ell_A = \frac{\ell_B}{4}$$

39. $V = E + IR$

$= 12 + 60 \times 5 \times 10^{-2}$

$= 12 + 3$

$= 15$ V

40. $$P = \frac{V^2}{R}, P \propto \frac{1}{R}$$

i.e. $R_{40} > R_{100}$

42. The minimum height of mirror

$$= \frac{h}{2} = \frac{6}{2} = 3 \text{ feet}$$

44. V_{es} for earth is 11.2 km/sec.

$$v_{es} = \sqrt{\frac{2GM_e}{R_e}} = 11.2 \text{ km/sec.}$$

$$v'_{es} = \sqrt{\frac{2GM_e \times 4}{R_e}} = 2\sqrt{\frac{2GM_e}{R_e}}$$

$= 2 \times 11.2 = 22.4$ km/sec.

49. From one side, $\frac{t - x}{5} = 1.5$

From other side, $\frac{x}{2} = 1.5 \rightarrow x = 3$

$\therefore \quad \frac{t-3}{5} = 1.5 \Rightarrow t = 7.5 + 3 = 10.5$ cm