ANSWER KEY (AIPMT-2003)

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

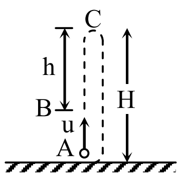
HINTS & SOLUTIONS

1. Let time of flight be T then $T = \frac{u}{g}$

Let h be the distance covered during last 't' second of its ascent

Velocity at point B = $v_B = u - g(T - t)$

$= u - g\left(\frac{u}{g} - t\right) = gt$



$\Rightarrow h = v_B t - \frac{1}{2}gt^2 \Rightarrow h = gt^2 - \frac{1}{2}gt^2 = \frac{1}{2}gt^2$

2. Here $\frac{dv}{dt}$ = constant = a (say)

Use $v^2 = u^2 + 2as$ where

$s = 2 \times 2\pi r = 80$ m, u = 0, v = 80 m/s

3. Use law of conservation of angular momentum.

$Mr^2\omega = (Mr^2 + 4mr^2)\omega' \Rightarrow \omega' = \frac{M\omega}{M + 4m}$

4. $m_1v_1 = m_2v_2$ ($P_1 = P_2$);

$$\frac{E_1}{E_2} = \frac{\frac{1}{2}m_1v_1^2}{\frac{1}{2}m_2v_2^2} = \frac{\frac{P_1^2}{2m_1}}{\frac{P_2^2}{2m_2}} = \frac{m_2}{m_1}$$

5. $mgh = \frac{1}{2}mv^2\,(1 + K^2/R^2)$

$\Rightarrow v = \sqrt{\frac{2gh}{(1 + K^2/R^2)}}$

6. $U = \frac{1}{2}K(2)^2$; $U' = \frac{1}{2}K(10)^2 = 25U$

7. Height of jump on the planet B

$= \frac{g_A}{g_B} \times$ height of jump on the planets A

($\because$ mgh = constant)

8. $T_{max} = 25$ g; $ma = T_{max} - mg$

$\Rightarrow a = \frac{g}{4} = \frac{10}{4} = 2.5\ m/s^2$

9. Reading of weighing scale = m(g + a)

= 80 (10 + 5) = 1200 N

10. T.K.E. $= \frac{1}{2}mv^2\,(1 + K^2/R^2)$

R.K.E. $= \frac{1}{2}mv^2(K^2/R^2)$

11. $(\vec{A} + \vec{B}).(\vec{A} - \vec{B}) = 0$

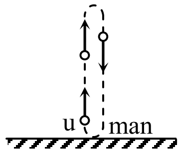
$\Rightarrow A^2 - \vec{A}.\vec{B} + \vec{B}.\vec{A} - B^2 = 0$

$\Rightarrow A = B$ ($\because \vec{A}.\vec{B} = \vec{B}.\vec{A}$)

12. Gravitational force does not depend on medium.

In this case time of flight of a ball $\geq 2 \times 2 = 4$ sec.

$\because$ Time of flight $= \dfrac{2u}{g} \geq 4$



$\Rightarrow u \geq 2g \Rightarrow u \geq\ 19.6$ m/s $\quad (\because\ g = 9.8\ m/s^2)$

14. Use $\dfrac{1}{f} = (\mu - 1)\ (1/R_1 - 1/R_2)$,

Here $\mu = \dfrac{\mu_{\text{convex lens}}}{\mu_{\text{liquid}}} = 1 \quad \therefore\ f = \infty$

15. Source is stationary $\Rightarrow \lambda =$ constant

$\&\ f' = \dfrac{v + v_s}{v}\ f = \left(1 + \dfrac{v_s}{v}\right) f = \left(1 + \dfrac{1}{5}\right) f = 1.2f$

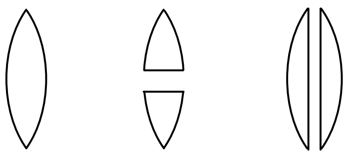
16. $K\ell =$ constant $\Rightarrow K' = 4K$

$\&\ T = 2\pi\sqrt{\dfrac{m}{K}} \Rightarrow T' = \dfrac{T}{2}$

17. PE in SHM $= \dfrac{1}{2}Kx^2$[equation of parabola]

18. In forced vibration, the resonance wave becomes very sharp when damping force is small (i.e. negligible)

19.



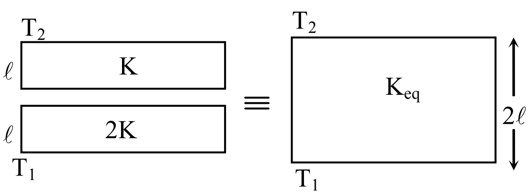
$f \qquad f' = f \qquad f'' = 2f$

20. A general body emits radiations of longer wavelength than absorbed radiations.

$\underbrace{\text{UV VIBGYOR}}_{\text{absorbed radiations}} \quad \underbrace{\text{IR}}_{\text{emitted radiations}} \rightarrow \lambda$

21. Use $\eta = 1 - \dfrac{T_2}{T_1} = \dfrac{W}{Q}$

22.



$\dfrac{2\ell}{K_{eq}(A)} = \dfrac{\ell}{2KA} + \dfrac{\ell}{KA}$

(series connection $R = R_1 + R_2$)

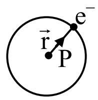
$\Rightarrow K_{eq} = \dfrac{4}{3}K$

23. $PE = \dfrac{1}{2}Kx^2 = \dfrac{1}{2}K\left(\dfrac{a}{2}\right)^2 = \dfrac{E}{4}$

24. Electric flux through any face

$= \dfrac{\text{Total flux}}{\text{number of faces}} = \dfrac{(q/E_0)}{6}$

25.



Coulomb force $= \dfrac{Ke^2}{r^2}(-\ \hat{r})$

$= -\dfrac{Ke^2}{r^3}\ \vec{r}$

26. $B = \mu_0 ni\ ;\ n' = \dfrac{n}{2}\ ;\ i' = 2i \Rightarrow B' = B$

27. Here $\vec{F} \perp \vec{v} \Rightarrow |\vec{v}| =$ constant

28. Use $T = 2\pi\sqrt{\dfrac{I}{MB}}$

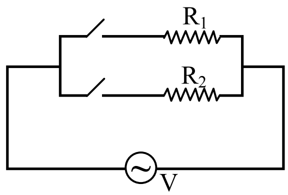
$\because I \propto$ mass $\Rightarrow T' = 2\pi\sqrt{\dfrac{4I}{MB}} = 2T$

29. If rated voltage = supply voltage then use

$\dfrac{1}{P} = \dfrac{1}{P_1} + \dfrac{1}{P_2}$ (series connection) &

$P = P_1 + P_2$ (parallel connection)

30.



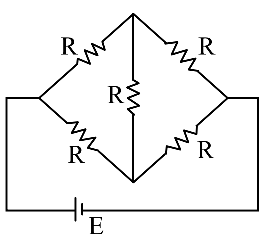
$Q = \dfrac{V^2}{R_1} \times t_1 = \dfrac{V^2}{R_2} \times t_2 = \dfrac{V^2}{R} \times t$

$\dfrac{1}{R} = \dfrac{1}{R_1} + \dfrac{1}{R_2} \Rightarrow \dfrac{Q}{V^2 t} = \dfrac{Q}{V^2 t_1} + \dfrac{Q}{V^2 t_2}$

$\Rightarrow \dfrac{1}{t} = \dfrac{1}{t_1} + \dfrac{1}{t_2} \Rightarrow t = \dfrac{t_1 t_2}{t_1 + t_2}$

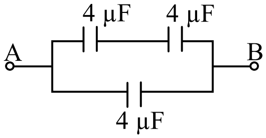
$= \dfrac{10 \times 40}{10 + 40} = 8$ min.

31.



Resistance seen by the battery = equivalent resistance b/w A & B = R

32.



$C_{AB} = (2+4)\mu F = 6\mu F$

33. Solar energy $\rightarrow$ fusion of protons into helium.

34. Fuse wire must have high resistance (per unit length) & low melting point.

35. $\dfrac{\text{Volume of atom}}{\text{volume of nucleus}} \sim \left(\dfrac{10^{-10}}{10^{-15}}\right)^3 = 10^{15}$

36. For a point source $I \propto \dfrac{1}{r^2}$

37. $N = N_0 e^{-\lambda t} \Rightarrow m = m_0 e^{-\lambda t} = m_0 e^{-\lambda(2/\lambda)}$

$= \dfrac{10}{e^2} = 1.35$ gm.

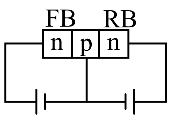
38. $r_n = 0.529\ \text{Å}\left(\dfrac{n^2}{Z}\right)$

39. Reverse bais increases the potential barrier.

40. $\left(\dfrac{e}{m}\right)_{\text{electron}} >> \left(\dfrac{e}{m}\right)_{\text{proton}}$

$\left[\because \left(\dfrac{e}{m}\right)_{\text{proton}} = \dfrac{1}{1837}\left(\dfrac{e}{m}\right)_{\text{electron}}\right]$

42.



In active region emitter base p-n junction is in FB & base collector p-n junction is in RB.

43. Curie law $\chi_m \propto \dfrac{1}{T}$

44. A diamagnetic material in a magnetic field moves from stronger to the weaker part of the field.

45. In FWR; ripple freq. = 2 × source Freq.

46. Barrier potential of a p-n junction diode does not depend on diode design.

47. BE = $\Delta m \times 931$

$= [2(1.0087 + 1.0073) - 4.0015] \times 931$

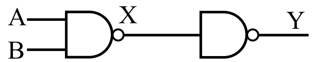
$= 28.4$ MeV

48. $A \geq Z$ [Equality sign $\rightarrow$ hydrogen nuclei]

49. Emission of electron (e^-) + antineutrino (γ^-)

$\Rightarrow$ β-decay.

50.



$X = \overline{A\,.\,B}\,;\ Y = \overline{X} = \overline{\overline{A\,.\,B}} = A \cdot B$

$\Rightarrow$ AND gate.