ALLEN CAREER INSTITUTE KOTA (RAJASTHAN) path to success

DISTANCE LEARNING PROGRAMME

LEADER TEST SERIES / JOINT PACKAGE COURSE

TARGET : PRE-MEDICAL

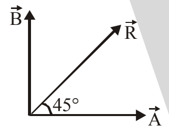
Test Type : MAJOR **ALL INDIA OPEN TEST** Test Pattern : AIIMS

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

HINT – SHEET

1.



$R = \sqrt{A^2 + B^2}$

3. After long time induction behaves like wire. then.

$$i = \frac{E}{R_1R_2}(R_1 + R_2)$$

4. $P_1 = P_2 \Rightarrow \frac{F_1}{A_1} = \frac{F_2}{A_2}$

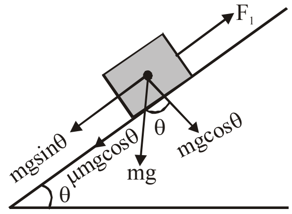
$$\Rightarrow \frac{10^7}{10^2} = \frac{2000 \times 10^3 \times 10^3}{A_2}$$

$\therefore$ $A_2 = 2 \times 10^4$ cm^2 (g = 980 ≈ 10^3 cm/s^2)

5. Field at –q is stronger than +q

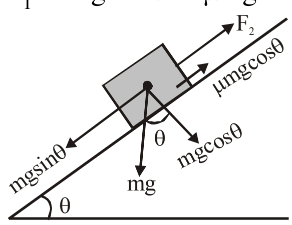
$\therefore$ force will be more on –q (towards left)

6.



The minimum force required to start pushing a body up a rough inclined plane is

$F_1 = mg\sin\theta + \mu mg\cos\theta$ ...(i)



Minimum force needed to prevent the body from sliding down the inclined plane is

$F_2 = mg\sin\theta - \mu mg\cos\theta$ ...(ii)

Divide (i) by (ii), we get

$$\vec{M} = \frac{\pi a^2 i}{4}\left(\hat{i} + \hat{j} + \hat{k}\right)$$

$$\frac{F_1}{F_2} = \frac{\sin\theta + \mu\cos\theta}{\sin\theta - \mu\cos\theta} = \frac{\tan\theta + \mu}{\tan\theta - \mu}$$

$$= \frac{2\mu + \mu}{2\mu - \mu} = 3 \;\; (\because \tan\theta = 2\mu(\text{Given}))$$

7. The given circuit is a parallel resonant circuit when $X_L = X_C$. This is also known as rejector circuit. At resonant the impedance of the circuit is maximum and current drawn from the alternating source is minimum. Hence, ammeter A_3 gives minimum reading.

8. interference pattern will not appear.

9. Electric field of removed charge will equal and opposite to the field of other four charges.

$$\boxed{E = \frac{kq}{r^2}}$$

10. Here, $u = 90 \text{ m s}^{-1}$, $v = 0$

$m = 40 \text{ g} = \frac{40}{1000}\text{kg} = 0.04 \text{ kg}$

$s = 60 \text{ cm} = 0.6 \text{ m}$

Using $v^2 - u^2 = 2as$

$\therefore (0)^2 - (90)^2 = 2a \times 0.6$

$a = \frac{-(90)^2}{2 \times 0.6} = -6750 \text{ms}^{-2}$

–ve sign shows the retardation.

$\therefore$ The average resistive force exerted by block on the bullet is

$F = m \times a = (0.04\text{kg})(6750 \text{ ms}^{-2}) = 270\text{N}$

11. Here intensity, $I = \frac{\text{power}}{\text{area}}$

$$= \frac{100 \times 2.5}{4\pi(3)^2 \times 100} = \frac{2.5}{36\pi}\text{W m}^{-2}$$

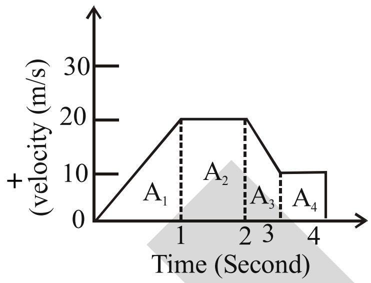
$$\therefore \quad I = \frac{1}{2}\varepsilon_0 C.E_0^2$$

$$\text{or} \quad E_0 = \sqrt{\frac{2I}{\varepsilon_0 c}} = \sqrt{\frac{2 \times \frac{2.5}{36\pi}}{\frac{1}{4\pi \times 9 \times 10^9} \times 3 \times 10^8}} = 4.08 \text{V m}^{-1}$$

$$\therefore \quad B_0 = \frac{E_0}{c} \times \frac{4.08}{3 \times 10^8} = 1.36 \times 10^8 \text{T}$$

12. Velocity of EMW and vibration planes of electric and magnetic fields are mutually perpendicular.

13. Distance =



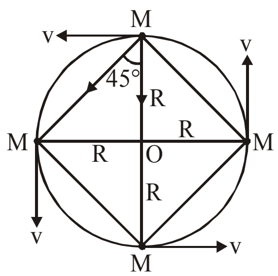
$$= \frac{1}{2} \times 1 \times 20 + (20\times1) + \frac{1}{2}(20+10) \times 1 + (10\times1)$$

$= 10 + 20 + 15 + 10 = 55$ m

14. $\frac{1}{2}mv^2 = \frac{1}{2}Kx^2 \quad x = V\sqrt{\frac{m}{K}} = .15$ m

15. $\frac{dI}{dt} = \frac{E_0}{L} = \frac{1.6}{0.20} = 8 \;\frac{\text{AmP}}{\text{sec.}}$

16. Gravitational force on each due to other three particles provides the necessary centripetal force.



$$\therefore \quad 2\frac{GM^2}{(\sqrt{2}R)^2}\cos 45° + \frac{GM^2}{(2R)^2} = \frac{M\upsilon^2}{R}$$

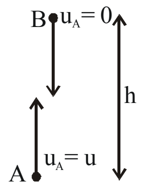
Simplifying it, we get

$$\upsilon = \sqrt{\frac{GM}{R}\left(\frac{2\sqrt{2}+1}{4}\right)} \quad F = \frac{GMm}{r^2}$$

17. At time t

Velocity of A, $v_A = u - gt$ upward

Velocity of B, $v_B = gt$ downward



If we assume that height h is smaller than or equal to the maximum height reached by A, than at every instant v_A and v_B are in opposite directions.

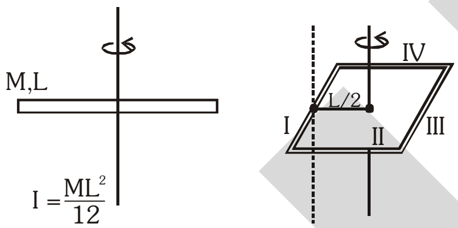
$\therefore V_{AB} = v_A + v_B$

= u–gt + gt [Speeds in opposite directions get added]

= u

18. $v = \sqrt{2g(.5)} = \sqrt{10}$

$R = \sqrt{\frac{2h}{g}} \quad v = \sqrt{\frac{1}{10}}\sqrt{10} = 1$ m

19. 

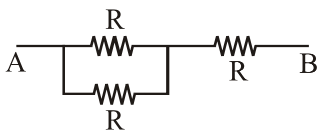
for one rad, $I_1 = \frac{ML^2}{12} + M\left(\frac{L}{2}\right)^2 = \frac{4ML^2}{12}$

$I_{total} = 4I_1 = 4 \times \frac{4ML^2}{12} = \frac{16ML^2}{12}$

so, $I_{total} = 16I$

20. $\Delta\phi = \pi/2$

$\therefore A = \sqrt{a^2 + b^2}$

21. 

$R_e = \frac{3R}{2}$

22. due to straight wire

$B_{AB} = \frac{\mu_0 I}{4\pi(OC)}[2\sin\theta]$

But OC = r cosθ

or $B_{AB} = \frac{\mu_0 I}{2\pi r}\tan\theta$

Magnetic field due to circular portion.

$B_{AB} = \frac{\mu_0 I}{2r}\frac{2\pi - 2\theta}{2\pi} = \frac{\mu_0 I}{2\pi r}(\pi - \theta)$

Total magnetic field

$= \frac{\mu_0 I}{2\pi r}\tan\theta + \frac{\mu_0 I}{2\pi r}(\pi - \theta) = \frac{\mu_0 I}{2\pi r}[\tan\theta + \pi - \theta]$

23. Open mouth

V = constant

P = constant

PV = nRT

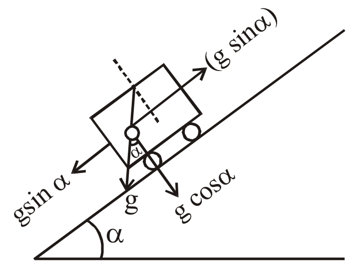
therefore nT = constant

$n_1T_1 = n_2T_2$

$n(333) = \left(\frac{3}{4}n\right)T_2$ [$n_2 = \frac{3}{4}n$ as $\left(\frac{1}{4}\right)n$ escapes]

$T_2 = 444$ K

$T_2 = 171$ºC

24. 

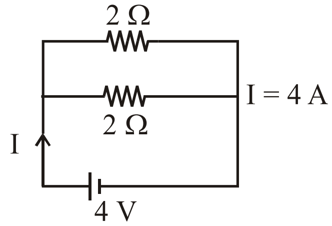
$g_{eff} = \sqrt{g^2 + (g\sin\alpha)^2 + 2(g)(g\sin\alpha)\cos(90+\alpha)}$

$= g\sqrt{1 + \sin^2\alpha - 2\sin\alpha(\sin\alpha)}$

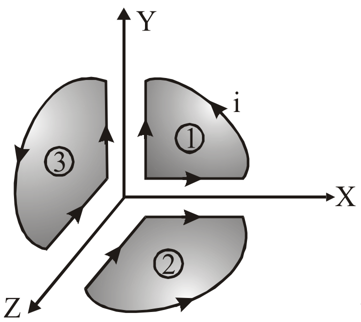
$= g\sqrt{1 - \sin^2\alpha}$

$= g\cos\alpha$

25.



26. The circular segments in each of the quadrants can be considered individually for calculating the magnetic magnet. Thus, segments in each of the quadrants are considered as loops individual by joining the two ends hypothetically in the same plane. When all the three segments are considered together, the contribution by hypothetical elements are cancelled.



$$M_1 = i\left(\frac{\pi a^2}{4}\right)\hat{k}$$

Similarly, $M_2 = i\left(\frac{\pi a^2}{4}\right)\hat{j}$

$$M_3 = i\left(\frac{\pi a^2}{4}\right)\hat{i}$$

So, net magnetic moment

$$\vec{M} = \vec{M}_1 + \vec{M}_2 + \vec{M}_3$$

27. $\frac{\Delta V}{V} = +0.24\% = \gamma\,\Delta T$

$$\gamma = \frac{0.24}{100} \times \frac{1}{40}$$

$\gamma \Rightarrow 6 \times 10^{-5}/^{\circ}C$ $\qquad (\gamma = 3\alpha)$

$$\alpha = \frac{\gamma}{3} = 2 \times 10^{-5}\ ^{\circ}C$$

28. For Lyman series, $n_1 = 1$ and $n_2 = 2$ for first line

$$\therefore \frac{1}{\lambda_1} = R\left[\frac{1}{1^2} - \frac{1}{2^2}\right] = R\left[\frac{1}{1} - \frac{1}{4}\right] = \frac{3R}{4}$$

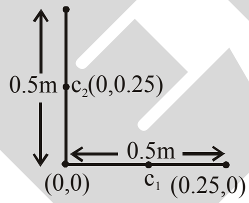
For Paschen series, $n_1 = 3$ and $n_2 = 4$ for first line

$$\therefore \frac{1}{\lambda_2} = R\left[\frac{1}{3^2} - \frac{1}{4^2}\right] = R\left[\frac{1}{9} - \frac{1}{16}\right] = \frac{7R}{144}$$

$$\frac{\lambda_1}{\lambda_2} = \frac{4/3R}{144/7R} = \frac{7}{108}.$$

29. ε_e may be greater, less or equal in parallel combination but r_e is always less than each internal resistance.

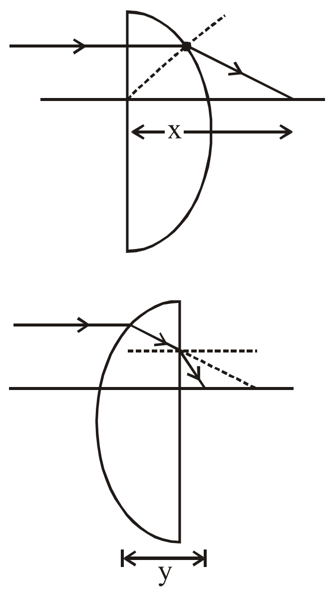
30.



$$\vec{R}_{cm} = \frac{m_1\vec{r}_1 + m_2\vec{r}_2}{m_1 + m_2} = \frac{m(0.25\hat{i}) + m(0.25\hat{j})}{m + m}$$

$$\vec{R}_{cm} = 0.125\hat{i} + 0.125\hat{j} \quad \Rightarrow \left|\vec{R}_{cm}\right| = 17.7\text{cm}$$

31.



Ray in second case bends twice as lens is thick

$$x > y$$

32. $E = \Delta mc^2$

$E = (M_i - M_f)c^2$

$E = (1.002\ u + 1.004\ u - 1.001\ u + 1.003\ u)c^2$

$E = 0.002 \times 931.5\ \text{MeV} = 1.862\ \text{MeV}$

33. $C = 4\pi\varepsilon_0 R\varepsilon_r \quad \left[\because 2\pi R = 2 \Rightarrow R = \frac{1}{\pi}\right]$

$C = \frac{4\pi\varepsilon_0\varepsilon_r}{\pi}$

$C \approx 2800$ pF

34. $\vec{F} = \frac{\Delta\vec{P}}{\Delta t} = m\frac{\Delta\vec{v}}{\Delta t}$

$F = m \times \frac{2v}{t} = \frac{2 \times 2 \times 50}{1/20} = 4 \times 10^3$ N

35. $f_o = 144$ cm, fe = 6.0 cm

$L = f_o + f_e$

$= 144 + 6$

$L = 150$ cm.

36. The plucking point of the string will be the antinode and touching point will be node.

38. Induced emf $|e| = \frac{d(\phi)}{dt} = \frac{d(BA)}{dt}$

$= B.\frac{dA}{dt} = B\frac{\Delta A}{t}$

$\text{or} |e| = B\left[\frac{\text{Area of circular shape} - \text{Area of square shape}}{t}\right]$

Side of the square $a = \frac{2\pi r}{4} = \frac{\pi r}{2}$

$\therefore \quad |e| = B\left[\frac{\pi r^2 - \left(\frac{\pi r}{2}\right)^2}{t}\right]$

$= \frac{\pi r^2 B}{t}\left[1 - \frac{\pi}{4}\right]$

39. $l \propto \frac{1}{Y} \Rightarrow \frac{Y_s}{Y_c} = \frac{l_c}{l_s}$

$\Rightarrow \frac{l_c}{l_s} = \frac{2 \times 10^{11}}{1.2 \times 10^{11}} = \frac{5}{3}$ .....(i)

Also $l_c - l_s = 0.5$ ......(ii)

On solving (i) and (ii) $l_c = 1.25$ cm and $l_s = 0.75$ cm.

40. For a closed organ pipe, the frequency of fundamental mode is

$\upsilon_C = \frac{v}{4L_C}$

where v is the velocity of sound in air and L_C is the length of the closed pipe

For an open organ pipe, the frequency of fundamental mode is

$\upsilon_O = \frac{v}{2L_O}$

where L_O is the length of the open pipe

$\because \ L_C = L_O$ (Given)

$\therefore \ \upsilon_O = 2\upsilon_C$ .....(i)

$\upsilon_O = \upsilon_C = 2$ (Given) .....(ii)

Solving (i) and (ii), we get

$\upsilon_O = 4$ Hz, $\upsilon_C = 2$ Hz

When the length of the open pipe is halved, its frequency of fundamental mode is

$\upsilon'_O = \frac{v}{2\left(\frac{L_O}{2}\right)} = 2\upsilon_O = 2 \times 4\ \text{Hz} = 8\ \text{Hz}$

When the length of closed organ pipe is doubled, its fundamantal frequency

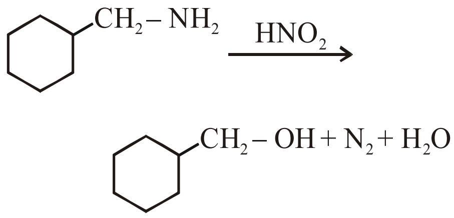
$v_C^1 = \frac{v}{4(2\ell_c)} = \frac{1}{2}v_C, \ \frac{1}{2} \times 2 = 1\text{Hz}$

$b = v_0^1 - v_C^1$

$= 8 - 1 = 7$ Hz

58. (1) $CH_3-CH_2-\underset{\underset{O}{\|}}{C}-NH_2 \xrightarrow[\Delta]{NaOH,\ Br_2}$

$CH_3-CH_2-NH_2 + K_2CO_3 + KBr$

(2) 

(3) $CH_3-CH=CH_2 + CH_2N_2 \xrightarrow{\Delta} CH_3-\underset{\diagdown\ \diagup}{CH-CH_2} + N_2$ (cyclopropane ring closed by CH_2)

(4) wolf kischner reduction

66. All are reducing sugar

83. NCERT-XI, Ch#9

86. NCERT Page#50

89. NCERT XI Page # 74

90. NCERT Page#53

96. NCERT-XI, Pg # 264, Para.-17.4.1

97. NCERT Pg # 50

101. Modul-1, Pg # 25

103. NCERT-XI, Page#232

105. NCERT Pg # 47, fig 3.5

107. NCERT-XI, Page#247

114. NCERT-XII, Page#109, II^{nd} point

118. NCERT-XII, Page#103, II^{nd} para.

181. Explanation: For developing cryo-electron microscopy for the high-resolution structure determination of biomolecules in solution. which simplifies and improves the imaging of biomolecules. This method has moved biochemistry into a new era.

182. India will host 2023 Cricket World Cup.

184. Explanation:

Sixteen-year-old Mohamad Al Jounde from Syria was awarded the International Children's Peace Prize for his efforts to ensure the rights of Syrian refugee children. Al Jounde, a refugee of the Syrian civil war, set up a school together with his family in a Lebanese refugee camp that currently provides 200 children with education. Al Jounde received the prize from Malala Yousafzai, who won the Nobel Peace Prize in 2014 for her work for children's rights.

186. Explanation:

Ace shuttler Kidambi Srikanth, who won four Super Series titles in 2017, has won the Sportsman of the Year award at the first edition of Indian Sports Honours (ISH) in Mumbai on November 27, 2017. Olympic silver medallist PV Sindhu was the Sportswoman of the Year award in the individual sport category. In the Team Sport category. Ravichandran Ashwin, who has became the fastest bowler to reach 'Club 300' in Test cricket, was awarded Sportsman of the Year award while women's cricket team skipper Mithali Raj was awarded Sportswoman of the Year award. The Indian Women's Cricket Team, which ended as runners-up in the ICC Women's World Cup, were named as the Team of the Year.

191. Explanation:

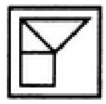
$$\frac{\left(\frac{1}{2}\right)x}{21}+\frac{\left(\frac{1}{2}\right)x}{24}=10$$

$$\Rightarrow \frac{x}{21}+\frac{x}{24}=20$$

$$\Rightarrow 15x = 168 \times 20$$

$$\Rightarrow x = \frac{(168\times 20)}{15}=224 \text{ km}$$

194. Explanation:



196. Explanation:

Except for the dots, the remaining part of the figure rotates through 180^o and shifts to the opposite side of the square boundary.

199. **Note:** Jaipur is not a hill station.