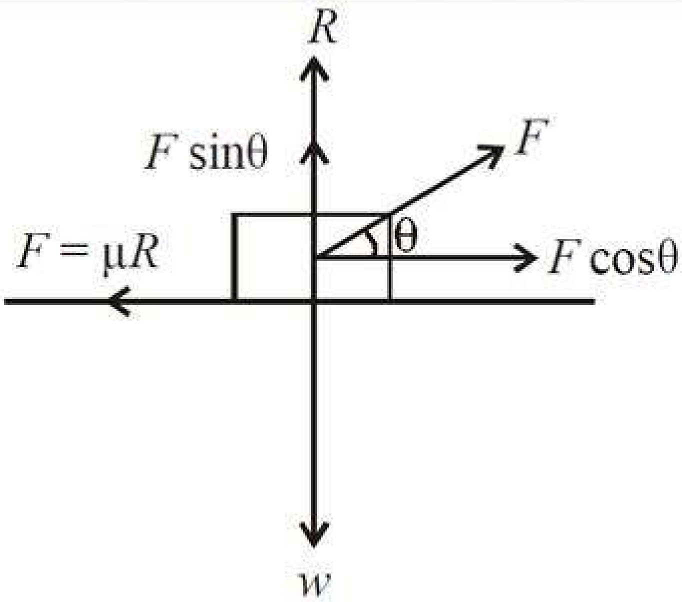
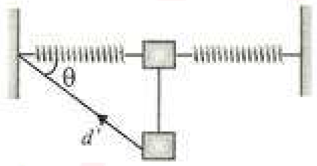
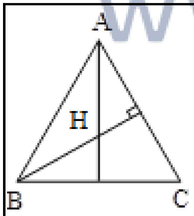
1to1 GURU

Learn to Lead, Learn to Succeed

Date :-04/02/2022 **Time :-50 Minutes** **Exam Name :-IIT-JEE-1to1Guru-4** **Mark :- 84**

1.	**c**	(c) $E = aT + bT^2$ At temperature of inversion, $E = 0$, $\therefore aT_i + bT_i^2 = 0$ $\Rightarrow T_i = -\frac{a}{b}$ $\Rightarrow T_i = -\frac{10 \times 10^{-6}}{(0.02 \times 10^{-6})} = 500°\text{C}$
2.	**a**	(a) At high reverse voltage, the minority charge carriers, acquires very high velocities. These by coll This mechanism is called Avalanche breakdown.
3.	**a**	(a) For the path AC , $W_{AC} = Fs\cos(90-\theta) = mgs\sin\theta = mgh$ $(\because F = mg)$ For path, $AB, W_{AB} = Fa\cos 90° = 0$ For path BC, $W_{BC} = Fh\cos 0° = mgh$ So that $W_{AB} + W_{BC} = mgh = W_{AC}$ i.e., $W_{ABC} = W_{BC}$ *Note: This shows that in a conservation field, work is path independent. Moreover, work is also independent of the slope of inclined plane and depends on height h only*
4.	**d**	(d) In linear S.H.M., the restoring force acting on particle should always be proportional to the displa position. i.e., $F \propto x$ or $F = -bx$ where b is a positive constant.
5.	**a**	(a) Let the force F is applied at an angle θ with the horizontal.  For horizontal equilibrium, $F\cos\theta = \mu R$.(i) For vertical equilibrium, $R + F\sin\theta = mg$ or, $R = mg - F\sin\theta$ ...(ii) Substituting this value of R in eq. (i), we get $F\cos\theta = \mu(mg - F\sin\theta)$ $= \mu mg - \mu F\sin\theta$ or, $F(\cos\theta + \mu\sin\theta) = \mu mg$ or, $F = \frac{\mu mg}{\cos\theta + \mu\sin\theta}$ ...(iii)

		For F to be minimum, the denominator $(\cos\theta+\mu\sin\theta)$ should be maximum. $\therefore \frac{d}{d\theta}(\cos\theta+\mu\sin\theta)=0$ or, $-\sin\theta+\mu\cos\theta=0$ or, $\tan\theta=\mu$ or, $\theta=\tan^{-1}(\mu)$ Then, $\sin\theta=\frac{\mu}{\sqrt{1+\mu^2}}$ and $\cos\theta=\frac{1}{\sqrt{1+\mu^2}}$ Hence, $F_{\min}$ $=\frac{\mu w}{\frac{1}{\sqrt{1+\mu^2}}+\frac{\mu^2}{\sqrt{1+\mu^2}}}=\frac{\mu w}{\sqrt{1+\mu^2}}$
6.	**2**	(2) Initial stretch in both springs $=d-\frac{3d}{4}=\frac{d}{4}$ $F_{\text{restering}}=k\left(\frac{d}{4}+x\right)-k\left(\frac{d}{4}-x\right)=2kx$ $\Rightarrow T_a=2\pi\sqrt{\frac{m}{2k}}$  $d'=d\sec\theta$ $x'=d\sec\theta-\frac{3d}{4}=d\left(\frac{1}{\cos\theta}-\frac{3}{4}\right)$ Force towards equilibrium position $(kx'\sin\theta)$ $=dk\left(\tan\theta-\frac{3\sin\theta}{4}\right)$ due to one spring and Net $=2dk\left(\tan\theta-\frac{3\sin\theta}{4}\right)$ for small θ , force $=2\,dk\left[\theta-\frac{3\theta}{4}\right]=k\left(\frac{d\theta}{2}\right)$ $d\theta=$ displacement from mean position $\Rightarrow F-\frac{kx}{2}\Rightarrow T_B=2\pi\sqrt{\frac{2m}{k}}$ $\Rightarrow \frac{T_B}{T_A}=2\pi\sqrt{\frac{m}{2k}}\Big/2\pi\sqrt{\frac{2m}{k}}$ $\Rightarrow \frac{T_B}{T_A}=2$
7.	**2**	$\frac{\lambda_A}{\lambda_B}=\frac{1}{2}$ Probabilities of getting a and b particles are equal. Thus rate of disintegration are equal $l_A N_A = l_B N_B$
8.	**b**	
9.	**c**	(c) Silver metal is obtained by Mac -Arthur Forrest process which is called cyanide process. The con and a current of O_2 is continuously passed. Silver sulphide goes into solution in the form of soluble c $2Ag_2S+8NaCN+O_2+2H_2O\longrightarrow$ $4Na[Ag(CN)_2]+4NaOH+2S$ The soluble complex is treated with zinc dust, when silver gets precipitated. $2Na[Ag(CN)_2]+Zn\longrightarrow Na_2[Zn(CN)_4+2Ag\downarrow$
10.	**c**	
11.	**a**	(a) $2Ag_2O(s)\rightleftharpoons 4Ag(s)+O_2(g)$ $K_p=p_{O_2}$ ($\because$ Ag and Ag_2O are solids)

12.	**b**	(2) $\text{M.f.} = \dfrac{\text{moles of solute}}{\text{moles of solute} + \text{moles of water}}$ $= \dfrac{1}{1+\frac{1000}{18}} = 0.018$
13.	**3981**	DW=-dVorDW=-RTln-aorDW=-0.082x300x2.303xlog-5orDW=-0.082x300x2.303x0.7+orDW=-39.66+0.3969=-39.2631Latm.orDW=-39.2631xJ=-3980.89
14.	**37**	$\text{NO} \rightarrow \text{NO}^{+} + e^{-}$ $25 + 12 \rightarrow 37$ $\text{Fe}^{2+} + e^{-} \rightarrow \text{Fe}^{+}(25e)$
15.	**c**	(c) Given that, AM =8, GM =5, if α, β are the roots of quadratic equation, then the required quadratic $x^2 - x(\alpha+\beta) + \alpha\beta = 0$ (i) Here, AM $= \frac{\alpha+\beta}{2} = 8 \Rightarrow \alpha+\beta = 16$ And GM $= \sqrt{\alpha\beta} = 5 \Rightarrow \alpha\beta = 25$ From Eq. (I) $x^2 - 16x + 25 = 0$
16.	**d**	(d) Given equation of parabola is $y^2 = 16x$ If $(1, 1)$ is the mid point of the chord, then its equation of chord is $T = S_1$ $\therefore y(1) - 8(x+1) = 1 - 16$ $\Rightarrow y - 8x - 8 = -15$ $\Rightarrow 8x - y = 7$
17.	**a**	(a) The director circle of $16x^2 - 25y^2 = 400$ is $x^2 + y^2 = 9$ Clearly, $(2\sqrt{2}, 1)$ lies on it. So, angle between tangents drawn from $(2\sqrt{2}, 1)$ is a right angle
18.	**b**	(b) General term , $T_{r+1} = {}^{10}C_r (x^2)^{10-r} \left(-\frac{1}{x^3}\right)^r$ $= {}^{10}C_r x^{20-5r} (-1)^r$ Since, this term condition x^{-10} $\therefore$ $20 - 5r = -10 \Rightarrow r = 6$ $\therefore$ Coefficient of $x^{-10} = {}^{10}C_6 (-1)^6 = 210$
19.	**d**	(d) Given, $f(x) = [x], x \in (-3.5, 100)$ As we know greatest integer is discontinuous on integer values. In given interval, the integer values are $(-3, -2, -1, 0, \ldots, 99)$ $\therefore$ Total numbers of integers are 103.
20.	**4**	 QR = $\dfrac{a}{2 \sin A} = \dfrac{2+\sqrt{5}}{2.\sin 30^\circ}$ R = 2 + $\sqrt{5}$ Now AH = 2R cosA = 2 (2 + $\sqrt{5}$) cos30 = (2 + $\sqrt{5}$) $\sqrt{3}$

		$= \left(\sqrt{4}+\sqrt{5}\right)\sqrt{3}$ k = 4
21.	**24**	Any point on the ellipse $\frac{x^2}{(3\sqrt{2})^2}+\frac{y^2}{(4\sqrt{2})^2}$ = 1 can be taken as $(3\sqrt{2}\cos\theta, 4\sqrt{2}\sin\theta)$ and the slope of t … = … Gi… Fr… cot… Hence the equation of the tangent is $\frac{x.\frac{1}{\sqrt{2}}}{3\sqrt{2}}+\frac{y.\frac{1}{\sqrt{2}}}{4\sqrt{2}}$ = (i.e.) $\frac{x}{6}+\frac{y}{8}$ = 1 Hence A = (6, 0), B = (0, 8) Area of D OAB = $\frac{1}{2}$ x 6 x 8 = 24 sq. units