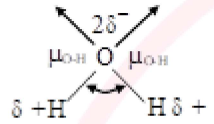
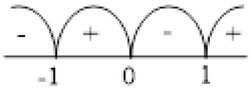
1to1 GURU

Learn to Lead, Learn to Succeed

Date :-07/01/2022 **Time :-50 Minutes** **Exam Name :-IIT-JEE-1to1Guru-1** **Mark :- 84**

1.	**d**	(d) The K, L, and M lines have different intercepts. The intercept of K is more than that of L, which in turn is more than that of M
2.	**b**	(b) Given that, $x = x_0 + a\cos\omega_1 t$ $y = y_0 + b\sin\omega_2 t$ $\frac{dx}{dt} = V_x \Rightarrow v_x = -a\omega_1\sin(\omega_1 t)$, and $\frac{dy}{dt} = v_y = b\omega_2\cos(\omega_2 t)$ $\frac{dv_x}{dt} = a_x = -a\omega_1^2\cos(\omega_1 t), \frac{dv_y}{dt} = a_y = -b\omega_2^2\sin(\omega_2 t)$ At $t = 0, x = x_0 + a, y = y_0$ $a_x = -a\omega_1^2, a_y = 0$ Now, $\vec{\tau} = \vec{r} \times \vec{F} = m(\vec{r} \times \vec{a})$ $= [(x_0 + a)\hat{i} + y_0\hat{j}] \times m(-a\omega_1^2\hat{i}) = +my_0a\omega_1^2\hat{k}$
3.	**a**	(a) Required work done, $W = QV$ $= (2e) \times 25$ $= 50e = 50 \times 1.6 \times 10^{-19}$ $= 8 \times 10^{-18}J$
4.	**b**	(b) $W = 8\pi R^2 T = 8\pi \times (1\times10^{-2})^2 \times 1.9\times10^{-2} = 15.2\times10^{-6}\pi J$
5.	**b**	(b) Let there be an element dx of rod at a distance x from the wire Emf developed in the element, $dE = B\ dx\ v$ $\therefore dE = \left(\frac{\mu_0}{4\pi}\frac{2I}{x}\right) dxv$ $\therefore\ E = \frac{\mu_0 Iv}{2\pi}\int_a^b \frac{dx}{x} = \frac{\mu_0 Iv}{2\pi}\log_e\frac{b}{a}$ $\therefore\ E = \frac{4\pi\times10^{-7}\times100\times5}{2\pi}\log_e\frac{100}{1}$ $= 4.6\times10^{-4}V = 0.46\ mV$
6.	**6**	(6) From energy conservation: $\frac{1}{2}CV_0^2 = \frac{1}{2}CV^2 + \frac{1}{2}LI^2$ $\Rightarrow \frac{1}{2}\times2\times10^{-6}\times12^2 = \frac{1}{2}\times2\times10^{-6}\times6^2 + \frac{1}{2}\times6\times10^{-6}\,I^2$ $\Rightarrow I = 6\ A$
7.	**4**	Numbers of significant digits in a number is equal numbers of all reliable digits in that number plus 1.
8.	**c**	
9.	**d**	(d) Formula and Concepts Only reactions whose E_a falls in the range of $50 - 55\ kJ\ mol^{-1}$ or $12 - 13\ kcal\ mol^{-1}$ are found to double their rate for $10°C$ rise in temperature i.e., from 298 to 308 K Alternatively Use Arrhenius equation $T_1 = 295\ K, T_2 = 305\ K$ $\log\frac{k_2}{k_1} = \frac{E_a}{2.3\times2\times10^{-3}}\left(\frac{10}{295\times305}\right)$

		$E_a = \frac{\log(2) \times 2.3 \times 2 \times 10^{-3} \times 295 \times 305}{10}$ $E_a = \frac{0.3 \times 4.6 \times 295 \times 305}{10^4}$ $= 12.4 \text{ kcal mol}^{-1}$ $= 12 \text{ kcal mol}^{-1}$
10.	**b**	(b) Action of alcoholic caustic potash on chloroform and aniline forms a bad smelling compound phenyl isocyanide. $C_6H_5NH_2 + CHCl_3 + 3KOH(alc.) \rightarrow C_6H_5NC + 3KCl + 3H_2O$ aniline chloroform phenyl isocyanide This reaction is called carbylamine reaction and it is actually the test of primary amines.
11.	**b**	(b) CF_4 has more ionic character than CCl_4, SiF_4 and $SiCl_4$. Hence, it has more lattice energy and thermal stability.
12.	**d**	(d) Number of unit cell for bcc is 2 and fcc is 4
13.	**�67**	 Resultant dp moment $= \sqrt{2\mu^2_{O-H} + 2 \times \mu^2_{O-H} \times \cos 105°}$ $= \sqrt{2 \times \mu^2_{O-H} - \times 2 \times \mu^2_{O-H} \times 0.26}$ $= \sqrt{2}$ x $_{O-H}$ x $\sqrt{0.74}$ = 1.216 x $_{O-H}$ $_{O-H} = \frac{1.85}{1.216}$ = 1.52 D. = 1.52 x 10^{-18} esu-cm. ($_{O-H})_{cal}$ = 4.8 x 10^{-10} x 0.94 x 10^{-8} = 4.8 x 0.94 x 10^{-18} esu-cm fractional negative charge on oxygen atom for each O - H bond = $\frac{1.52}{4.8 \times 0.94}$ = 0.336 total fractional negative charge on oxygen atom = 0.336 x 2 = 0.672 % fractional negative charge on oxygen atom = 67.2 % $\simeq$ 67 %
14.	**5**	
15.	**b**	(b) $\int_0^2 \lvert x^2 - 1 \rvert dx = \int_0^1 -(x^2-1)dx + \int_1^2 (x^2-1)dx$ $= \left[-\frac{x^3}{3} + x\right]_0^1 + \left[\frac{x^3}{3} - x\right]_1^2$ $= -\frac{1}{3} + 1 + \frac{8}{3} - 2 - \frac{1}{3} + 1$ =2
16.	**b**	(b) Given, $y = ax\cos\left(\frac{1}{x} + b\right)$ $\Rightarrow y_1 = -ax\sin\left(\frac{1}{x} + b\right) \times \left(-\frac{1}{x^2}\right) + a\cos(\frac{1}{x} + b)$ $\Rightarrow y_1 = \frac{a}{x}\sin\left(\frac{1}{x} + b\right) + a\cos\left(\frac{1}{x} + b\right)$ $\Rightarrow xy_1 = a\sin\left(\frac{1}{x} + b\right) + y$ $\Rightarrow y_1 + xy_2 = a\cos\left(\frac{1}{x} + b\right)\left(-\frac{1}{x^2}\right) + y_1$

		$\Rightarrow x^3 y_2 = -a\cos\left(\frac{1}{x}+b\right)$ $\Rightarrow x^4 y_2 + y = 0$
17.	**d**	(d) Since, $f(x) = \frac{3}{4-x^2} + \log_{10}(x^3 - x)$ For domain of $f(x)$, $x^3 - 1 > 0\ ,\ 4 - x^2 \neq 0)$ $\Rightarrow\ x(x-1)(x+1) > 0$ and $x \neq \pm 2$ $\Rightarrow\ x \in (-1,0) \cup (1,\infty)\ ,\ x \neq \pm 2$  $\Rightarrow\ \ x \in (-1,0) \cup (1,2) \cup (2,\infty)$
18.	**c**	(c) In 8 squares $6x$ can be placed in 28 ways but there are two methods in which there is no x in first or last row. $\therefore$ required number of ways=28-2=26
19.	**d**	(d) Let area, $A = \pi r^2$ $\Rightarrow\ \frac{dA}{dt} 2\pi r \frac{dr}{dt}$ $\therefore\ \left.\frac{dA}{dt}\right\|_{r=5} = 10\pi \times 0.1 = \pi \frac{cm^2}{s}\ [\because \frac{dr}{dt} = 0.1 cm/s]$
20.	**1**	(a) $f(x) = \begin{cases} \|x^3 + x^2 + 3x + \sin x\| \left(3 + \sin\left(\frac{1}{x}\right)\right), & x \neq 0 \\ 0, & x = 0 \end{cases}$ Let g $(x) = x^3 + x^2 + 3x + \sin x$ g$'(x) = 3x^2 + 2x + 3 + \cos x$ $= 3\left(x^2 + \frac{2x}{3} + 1\right) + \cos x$ $= 3\left\{\left(x + \frac{1}{3}\right)^2 + \frac{8}{9}\right\} + \cos x > 0$ And $2 < 3 + \sin\left(\frac{1}{x}\right) < 4$ Hence, minimum value of $f(x) is\ 0\ at\ x = 0$ Hence, number of points=1
21.	**49**	If n is odd, then $3^n = 4 l_1 - 1$ $5^n = 4 l_2 + 1$ $2^n + 3^n + 5^n$ is divisible by four if n 49 i.e. n can take 49 different values. If n is even then $3^n = 4 l$, $5^n = 4 l_2 + 1$ $2^n + 3^n + 5^n$ is not divisible by 4 as $2^n + 3^n + 5^n$ will be in the form of $4 l + 2$. Thus total number of ways of selecting 'n' = 49.