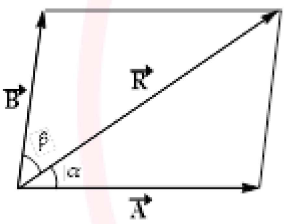
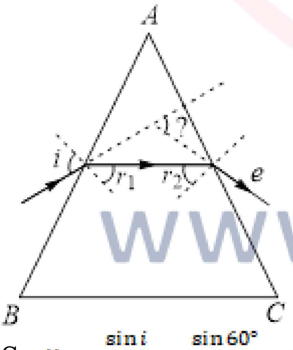
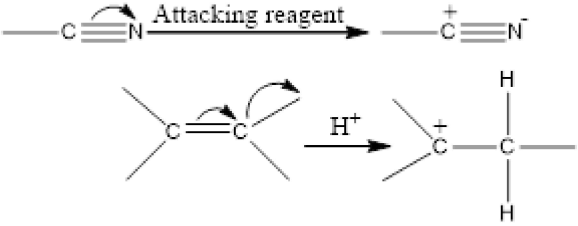
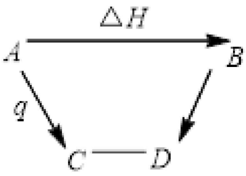
1to1 GURU

Learn to Lead, Learn to Succeed

Date :-15/01/2022 **Time :-50 Minutes** **Exam Name :-IIT-JEE-1to1Guru-2** **Mark :- 84**

1.	**b**	(b) $B_{\text{centre}} = 0$ $\frac{\mu_0 I}{4\pi b} \odot + \frac{\mu_0 I}{4\pi b} \odot + \frac{\mu_0 I}{2b} \odot + \frac{\mu_0 I}{2b} \otimes = 0$ $\Rightarrow \frac{\mu_0 I}{2\pi b} + \frac{\mu_0 I}{2b} - \frac{\mu_0 I}{2b} = 0 \Rightarrow \frac{1}{2\pi b} + \frac{1}{2b} = \frac{1}{2a} \Rightarrow \frac{a}{b} = \frac{\pi}{\pi + 1}$
2.	**a**	(a) Effective gravity $= g\cos\alpha$ $\therefore T = 2\pi\sqrt{\frac{L}{g\cos\alpha}}$
3.	**d**	(d) Here the restoring force of charge Q is inversely proportional to the square of the distance, hence the motion will be oscillatory but not SHM, for which restoring force $\propto$ displacement
4.	**c**	(c)
5.	**c**	(c) $\alpha < \beta$ if $\vec{B} < \vec{A}$ or $B < A$ 
6.	**3**	(3) Given $i = 60°, \delta = 30°$ and $A = 30°$ We have $\delta = i + e - A$ From Eq. (i), we get $30° = 60° + e - 30°$ or $e = 0$ So r_2 is also zero, then $r_1 = A = 30°$  So $\mu = \frac{\sin i}{\sin r_1} = \frac{\sin 60°}{\sin 30°} = \sqrt{3}$ Hence the value of $a = 3$
7.	**4**	(4) $E_{\text{photon}} = 13.6\left(1 - \frac{1}{25}\right)\text{eV} = 13.0\text{ eV}$ $E/c =$ mv (momentum conserved) $v = \frac{E}{mc} = \frac{(13)(1.6 \times 10^{-19})}{(1.67)(10^{-27})(3)(10^8)} = 4\text{ m/s}$
8.	**b**	
9.	**b**	(b) Electromeric effect occurs only in the presence of attacking reagent. It operates in the

		molecules having multiple bonds. Since, it exists only on the demand of attacking reagent, it is a temporary effect. *e.g.,* 
10.	**c**	(c) According to Hess s law, the total heat changes occurring during a chemical reaction are independent of path.  $\Delta H = q + V + 2x$
11.	**c**	
12.	**c**	(c) Relation between ΔH (enthalpy change) and ΔE (internal energy change) is $\Delta H = \Delta E + \Delta_{n_g} RT$ where Δ_{n_g} =moles of gaseous products-moles of gaseous reactants =2= -1 $\Rightarrow -1366.5 = \Delta E - 1 \times 8.314 \times 10^{-3} \times 300$ $\Delta E = -1364.0 \text{ kJ mol}^{-1}$
13.	**158**	Let solubility of AgBr (s) in $AgNO_3$ soluiton = s (M) AgBr (s) $\rightleftharpoons$ $Ag^+ + Br^-$ $(s + 10^{-7})$ s $s(s + 10^{-7}) = 3 \times 10^{-13}$ or $s^2 + 10^{-7} s - 30 \times 10^{-14} = 0$ or $s^2 + 6 \times 10^{-7} s - 5 \times 10^{-7} s - 30 \times 10^{-14} = 0$ or $s(s + 6 \times 10^{-7}) -5 \times 10^{-7} (s + 6 \times 10^{-7}) = 0$ or $(s - 5 \times 10^{-7})(s + 6 \times 10^{-7}) = 0$ $s = 5 \times 10^{-7}$(M) $\Lambda_m^\infty (AgNO_3) = \lambda_m^\infty (Ag^+) + \lambda_m^\infty (NO_3^-)$ $= 13 \times 10^{-3} \text{ S m}^2 \text{ mol}^{-1}$ $\Lambda_m^\infty (AgBr) = \lambda_m^\infty (Ag^+) + \lambda_m^\infty (Br^-)$ $= 14 \times 10^{-3} \text{ S m}^2 \text{ mol}^{-1}$ $k (AgNO_3) = [\Lambda_m^\infty (AgNO_3)]\, C$ $= 13 \times 10^{-7} \text{ S m}^{-1}$ $k (AgBr) = [\Lambda_m^\infty (AgBr)]\, C$ $= 70 \times 10^{-7} \text{ S m}^{-1}$ $k_{solution} = k (AgNO_3) + k (AgBr) + k (H_2O)]$ $= (13 \times 10^{-7} + 70 \times 10^{-7} + 75 \times 10^{-7})$ $= 158 \times 10^{-7} \text{ S m}^{-1}$
14.	**6**	
15.	**d**	(d) $y = \cos^{-1}(\log_2^x)$ $\frac{dy}{dx} = \frac{-1}{\sqrt{1 - (\log_2^x)^2}} \left(\frac{1}{x \log_e^2} \right)$

		$\frac{dy}{dx}=\frac{-1}{x\log 2\sqrt{1-(\log_2 x)^2}}$
16.	**b**	
17.	**d**	(d) Since $f: R \to R$ and $g: R \to R$, given by $f(x) = 2x - 3$ and $g(x) = x^3 + 5$ respectively, are bijections. Therefore, f^{-1} and g^{-1} exist We have, $f(x) = 2x - 3$ $\therefore f(x) = y$ $\Rightarrow 2x - 3 = y \Rightarrow x = \frac{y+3}{2}$ $\Rightarrow f^{-1}(y) = \frac{y+3}{2}$ Thus, f^{-1} is given by $f^{-1}(x) = \frac{x+3}{3}$ for all $x \in R$ Similarly, $g^{-1}(x) = (x-5)^{1/3}$ for all $x \in R$ Now, $(fog)^{-1}(x) = (g^{-1}of^{-1})(x) = g^{-1}(f^{-1}(x))$ $\Rightarrow (fog)^{-1}(x) = g^{-1}\left(\frac{x+3}{2}\right) = \left(\frac{x+3}{2} - 5\right)^{1/3} = \left(\frac{x-7}{2}\right)^{1/3}$
18.	**a**	(a) $\because f(y) = f\left(\frac{x+2}{x-1}\right) = \frac{\frac{x+2}{x-1}+2}{\frac{x+2}{x-1}-1}$ $\therefore \quad f(y) = x$
19.	**d**	(d) Let $I = \int_0^{\pi} \frac{x\,dx}{a^2\cos^2 x + b^2\sin^2 x}$ (i) and $I = \int_0^{\pi} \frac{(\pi - x)dx}{a^2\cos^2(\pi - x) + b^2\sin^2(\pi - x)}$ $\Rightarrow \quad I = \int_0^{\pi} \frac{(\pi - x)dx}{a^2\cos^2 x + b^2\sin^2 x}$ (ii) On adding Eqs.(i) and (ii), we get $2I = \int_0^{\pi} \frac{(x + \pi - x)dx}{a^2\cos^2 x + b^2\sin^2 x}$ $\Rightarrow \quad 2I = \pi \int_0^{\pi} \frac{dx}{a^2\cos^2 x + b^2\sin^2 x}$ $\Rightarrow \quad I = \frac{\pi}{2} \int_0^{\pi} \frac{dx}{a^2\cos^2 x + b^2\sin^2 x}$ $\Rightarrow I = 2 \cdot \frac{\pi}{2} \int_0^{\pi/2} \frac{dx}{a^2\cos^2 x + b^2\sin^2 x}$ On dividing numerator and denominator be $\cos^2 x$, we get $I = \pi \int_0^{\pi/2} \frac{\sec^2 x\,dx}{a^2 + b^2\tan^2 x}$ Put $b\tan x = t \Rightarrow b\sec^2 x\,dx = dt$ $\therefore \quad I = \frac{\pi}{b}\int_0^{\infty} \frac{dt}{a^2 + t^2} = \frac{\pi}{b} \cdot \frac{1}{a}\left[\tan^{-1}\frac{t}{a}\right]_0^{\infty}$ $= \frac{\pi}{ab}\left[\frac{\pi}{2} - 0\right] = \frac{\pi^2}{2ab}$
20.	**2**	(a) The equations of the circles are $x^2 + y^2 + \frac{\lambda}{2}x - \left(\frac{1+\lambda^2}{2}\right)y - 5 = 0 \quad ...(i)$ And, $x^2 + y^2 + 4x + 6y + 3 = 0 \quad ...(ii)$ These circles will be orthogonal, if

		$2(g_1g_2+f_1f_2)=c_1+c_2$ $\Rightarrow 2\left\{2\times\frac{\lambda}{4}+3\times\left(\frac{1+\lambda^2}{-4}\right)\right\}=-5+3$ $\Rightarrow \lambda-\frac{3}{2}(1+\lambda^2)=-2$ $\Rightarrow 2\lambda-3-3\lambda^2=-4 \Rightarrow 3\lambda^2-2\lambda-1=0 \Rightarrow \lambda=1,-1/3$ Hence, there are two circles
21.	**1**	Area of D = $\frac{1}{2}$ x 2 x sinθ (Q we know that sinθ[0, 1])