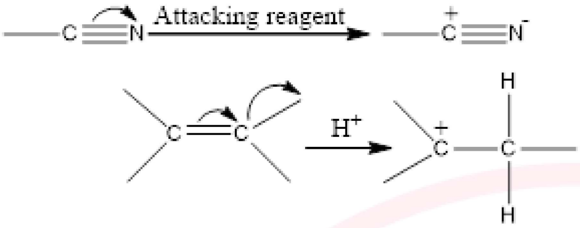
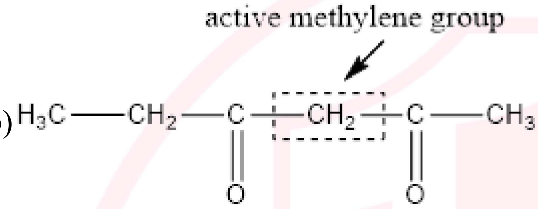
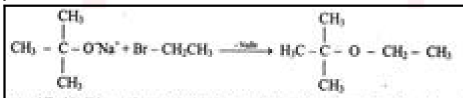
1to1 GURU

Learn to Lead, Learn to Succeed

Date :-07/01/2022 **Time :-25 Minutes** **Exam Name :-MHTCET-1to1Guru-1** **Mark :- 30**

1.	**a**	(A) For ideal gas $PV = nRT$ $PV = \frac{m'}{M}RT = \frac{m'}{V} \cdot \frac{RT}{M}$ (where m' is the mass of the gas and M molecular weight) $\therefore P = \frac{\rho RT}{M}$ (where ρ is the density of the gas) $\therefore \rho = \frac{PM}{RT} = \frac{PM}{NKT}$ (where N is Avogadro number) $\therefore \rho = \frac{Pm}{KT}$ (where $m = \frac{M}{N} =$ mass of each molecule)
2.	**c**	(c) When atoms of an element are bombarded by neutrons, the atomic nuclei are (artificially) disintegrated and emit lighter particle (eg . $\alpha-$ particle, $\beta-$ particle ,proton etc.). Sometimes a neutron is observed by the nucleus which is converted into its heavier isotope and energy is emitted in the form of γ -photons. This process in which heavy nucleus is broken into two nearly equal fragments is called nuclear fission.
3.	**c**	As the bridge is balanced, $\frac{R_{AB}}{R_{BC}} = \frac{R_{AD}}{R_{DC}}$ $\therefore \frac{15+6}{(X\parallel 8)+3} = \frac{15+(6\parallel 6)}{4+(4\parallel 4)}$ $\therefore \frac{21}{\left(\frac{8X}{8+X}\right)+3} = \frac{18}{4+2}$ $\therefore 168+21X = 33X+72$ $\therefore 12X = 96 \Rightarrow X = \frac{96}{12} = 8\,\Omega$
4.	**a**	(a) Power factor $= \cos\phi = \frac{R}{Z}$ $= \frac{12}{15} = \frac{4}{5} = 0.8$
5.	**d**	(D) $I_L = \frac{V}{X_L}$ and $I_C = \frac{V}{X_C}$ i.e. $I_L \propto \frac{1}{\omega}$ and $I_C \propto \omega$ $\therefore$ With increase in ω, I_L decreases while I_C increases.
6.	**c**	(c) From 0 to 2 s: at any time $t, F = 10\,t$ $\Rightarrow a = F/m = 10t/m$ $\Rightarrow \int_0^v dv = \int_0^t \frac{10t}{m}dt \Rightarrow v = \frac{5t^2}{m}$ Momentum: $P = mv = 5t^2$ At $t = 2$ s, $P = 5(2)^2 = 20$ kg ms^{-1}, $v = 20/m$ From 2 to 4 s; $F = 40 - 10\,t$

		$\int_{20/m}^{v} dv = \int_{2}^{t} \frac{40-10t}{m} dt \Rightarrow v = \frac{1}{m}[40t - 40 - 5t^2]$ $P = mv = 40t - 40 - 5t^2$
7.	**c**	
8.	**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.*, 
9.	**b**	(b)  2, 4-hexanedione When methylene group $(-CH_2)$ is attached with two electron withdrawing groups (like, $-CHO, > C = O, -COOH, -CN, -X, etc$) , its acidity will increase due to $-I$ effect of the electron withdrawing groups.
10.	**a**	 tert-Alkyl halides undergo elimination reaction with sodium alkoxides (strong bases) easily. $(CH_3)_3CBr \xrightarrow{RONa} (H_3C)_2C=CH_2 + ROH + NaBr$. This will be the product in 'B'. 3° alcohols in presence of H_2SO_4 can be easily dehydrated. Hence the alkene will result rather than the ether. An alkyl halide and an alcohol do not react to give ether.
11.	**c**	(c) Given, $\frac{p_2}{p_1} = 2, \frac{T_2}{T_1} = 2, V_1 = 4\ \mathrm{dm}^3, V_2 = ?$ From gas equation $\frac{p_1V_1}{T_1} = \frac{p_2V_2}{T_2}$ $or\ \frac{V_1}{V_2} = \frac{p_2}{p_1} \times T_1/T_2$ $\therefore \frac{4}{V_2} = 2 \times \frac{1}{2} = 1$ $\therefore V_2 = 4\ \mathrm{dm}^3$
12.	**b**	Hydrolysis of methyl acetate can be represented as $CH_3COOH_{(aq)} + H_2O_{(l)} \longrightarrow CH_3COOH_{(aq)} + CH_3OH_{(aq)}$ The solvent (H_2O) participates in the reaction, and it is expected to have second order kinetics. But it follows first order kinetics, as the presence of huge amount of water, keeps its concentration unchanged. $\therefore$ $[H_2O]$ = constant = k_1 $\therefore$ rate = k $[CH_3COOH]$ k_1
13.	**c**	(C) The mixture is an acidic buffer; hence the pH would be less than 7 .
14.	**c**	(3) The properties, which do not depend on the amount of substance, are called intensive property. *e.g.*, surface tension, viscosity etc.
15.	**c**	

		$ax^2+2hxy+by^2=0 \Rightarrow$ $m_1+m_2=\frac{-2h}{b}$ and $m_1m_2=\frac{a}{b}$ Now $(m_1-m_2)^2=(m_1+m_2)^2-4m_1m_2 \Rightarrow$ $(m_1-m_2)^2=\frac{4h^2}{b^2}-\frac{4a}{b}=\frac{4h^2-4ab}{b^2}$ But $4ab=3h^2$, then $(m_1-m_2)^2=\frac{4h^2-3h^2}{b^2}=\frac{h^2}{b^2} \Rightarrow m_1-m_2=\frac{h}{b}$ Now $2m_1=\frac{-2h}{b}+\frac{h}{b}=\frac{-h}{b} \Rightarrow m_1=\frac{-h}{2b}$ and $\frac{-h}{2b}+m_2=\frac{-2h}{b} \Rightarrow m_2=\frac{-3h}{2b} \Rightarrow$ $m_1:m_2=1:3$
16.	**a**	(a) $\mathrm{I}=\int \frac{dx}{5x^2+7}$ $\mathrm{I}=\int \frac{dx}{(\sqrt{5}x)^2+(\sqrt{7})^2}$ $\mathrm{I}=\frac{1}{\sqrt{7}}\tan^{-1}\left(\frac{\sqrt{5}x}{\sqrt{7}}\right)\frac{1}{\sqrt{5}}+c$ $\mathrm{I}=\frac{1}{\sqrt{35}}\tan^{-1}\left(\frac{\sqrt{5}x}{\sqrt{7}}\right)+c$
17.	**c**	(c) Direction is not determinable , because if magnitude is zero we cannot determine where it moves, e.g. if displacement is zero
18.	**c**	$f(x)=x^5 \Rightarrow f'(x)=5x^4$ $a=4,\ h=0.01$ $f(4)=4^5=1024,\ f'(4)=5(4)^4=1280$ $f(4+0.01) \doteqdot f(4)+h\,f'(4) \Rightarrow$ $f(4.01) \doteqdot 1024+(0.01)(1280) \doteqdot 1024+12.80 \Rightarrow$ $(4.01)^5 \doteqdot 1036.80$
19.	**c**	$A^{-1}=\frac{1}{\lvert A\rvert}(\text{adj } A)=\frac{1}{-1+\sin^2\alpha}\begin{bmatrix}-1 & -\sin\alpha\\ \sin\alpha & 1\end{bmatrix}$ $=\frac{1}{\cos^2\alpha}\begin{bmatrix}1 & \sin\alpha\\ -\sin\alpha & -1\end{bmatrix}$
20.	**b**	$ax^2+2hxy+by^2=0 \Rightarrow$ $m_1+m_2=\frac{-2h}{b}$ and $m_1m_2=\frac{a}{b}$ One of the line given by $ax^2+2hxy+by^2=0$ bisects the angle between co-ordinate axes, then line is $y=x \Rightarrow m_1=-1$ Now $-m_2=\frac{a}{b} \Rightarrow m_2=\frac{-a}{b}$ and $-1-\frac{a}{b}=\frac{-2h}{b} \Rightarrow a+b=2h \Rightarrow (a+b)^2=4h^2$
21.	**c**	(c) $\mathrm{I}=\int_0^{\frac{\pi}{2}} \frac{\cos x}{(1+\sin x)(2+\sin x)}dx$ Put $\sin x=t$, $\cos x\,dx=dt$

		$I=\int_0^1 \frac{1}{(1+t)(2+t)}dt$ $I=\int_0^1 \frac{-1}{2+t}dt+\int_0^1 \frac{1}{1+t}dt$ $I=[\log(t+1)-\log(t+2)]_0^1$ $I=\left[\log\left(\frac{t-1}{t+2}\right)\right]_0^1$ $I=\log\left(\frac{2}{3}\right)-\log\left(\frac{1}{2}\right)$ $I=\log\left(\frac{4}{3}\right)$
22.	**c**	(c) Here, $\lim_{h\to 0}\frac{(a+h)^2\sin(a+h)-a^2\sin a}{h}$ $=\lim_{h\to 0}\left[\frac{a^2\{\sin(a+h)-\sin a\}}{h}+\frac{h\{2a\sin(a+h)+h\sin(a+h)\}}{h}\right]$ $=\lim_{h\to 0}\frac{a^2.2\cos\left[a+\frac{h}{2}\right].\sin\frac{h}{2}}{2.\frac{h}{2}}+\lim_{h\to 0}(2a+h)\sin(a+h)$ $=a^2\cos a+2a\sin a$