

**PART : CHEMISTRY**

1. Give correct order of bond enthalpy for following :

- (1) C-C > Si-Si > Ge-Ge > Sn-Sn (2) C-C > Si-Si > Sn-Sn > Ge-Ge
 (3) Si-Si > C-C > Ge-Ge > Sn-Sn (4) Si-Si > Sn-Sn > Ge-Ge > C-C

Ans. (1)

Sol. As bond length increases, bond energy decreases.

2. Magnetic moment (spin only) of $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$ is :

- (1) $\sqrt{35}$ BM (2) $\sqrt{3}$ BM (3) $\sqrt{8}$ BM (4) $\sqrt{24}$ BM

Ans. (1)

Sol. $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$



Number of unpaired electron = 5

$$\mu = \sqrt{n(n+2)} = \sqrt{5 \times 7} = \sqrt{35} \text{ BM}$$

3. In composition of copper matte how many of following are present ?

Cu_2S , FeSiO_3 , CaSiO_3 , FeS , CuCO_3

Ans. (2)

Sol. Copper matte mostly contain Cu_2S and some FeS .

4. Which of the following has two structural isomers ?

- (1) $[\text{Co}(\text{NH}_3)_5\text{Cl}]^{+2}$ (2) $[\text{Co}(\text{NH}_3)_5(\text{NO}_2)]^{+2}$ (3) $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^{+2}$ (4) $[\text{Co}(\text{H}_2\text{O})_6]^{+3}$

Ans. (2)

Sol. $[\text{Co}(\text{NH}_3)_5(\text{NO}_2)]^{+2}$ will show structural isomerism as NO_2^- is ambidentate ligand

$\text{NO}_2^- \rightarrow$ nitrito-N

$\text{ONO}^- \rightarrow$ nitrito-O

5. Which element is not present in Nessler's reagent ?

- (1) K (2) I (3) Hg (4) O

Ans. (4)

Sol. Nessler's reagent is alkaline K_2HgI_4 .

6. Among the following which is set of isoelectronic species ?

- (1) Ca^{+2} , K^+ , Sc^{+3} , Cl^- (2) N^{-3} , Ca^{+2} , Cl^- , K^+
 (3) P^{-3} , Al^{+3} , Ca^{+2} , Cl^- (4) S^{-2} , Mg^{+2} , Na^+ , O^{-2}

Ans. (1)

Sol. Ca^{+2} , K^+ , Sc^{+3} , Cl^- contain same no. of electrons.

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PAGE # 1



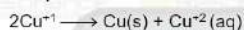
7. **Statement-I** : Cu^{2+} is stable in water as compared to Cu^{+}

Statement-II : Hydration energy of Cu^{2+} is less than Cu^{+}

- (1) Both **statement I** and **II** are correct.
 (2) **Statement I** is correct while **statement II** is incorrect.
 (3) **Statement I** is incorrect while **statement II** is correct.
 (4) Both **statement I** and **statement II** are incorrect.

Ans. (2)

Sol. In aqueous solution Cu^{+} is unstable and it disproportionate.



Hydration energy of Cu^{2+} is higher than Cu^{+} and this compensate it's ionisation energy.

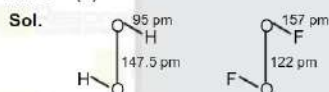
8. Regarding H_2O_2 and O_2F_2

Bond length of O–O in H_2O_2 is X than O–O bond length in O_2F_2

Bond length of O–H in H_2O_2 is Y than O–F bond length in O_2F_2 . Then :

- (1) X : Shorter Y : Shorter
 (2) X : Shorter Y : Longer
 (3) X : Longer Y : Longer
 (4) X : Longer Y : Shorter

Ans. (4)



O–O BL in H_2O_2 is longer than O–O BL in O_2F_2

O–H BL in H_2O_2 is shorter than O–F BL in O_2F_2

9. Which of the following order is incorrect regarding magnitude of first electron gain enthalpy ?

- (1) $\text{Cl} < \text{F}$ (2) $\text{O} < \text{S}$ (3) $\text{Te} > \text{O}$ (4) $\text{S} > \text{Se}$

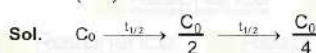
Ans. (1)

Sol. For halogens the electron gain enthalpy order $\text{Cl} > \text{F} > \text{Br} > \text{I}$

For oxygen family the electron gain enthalpy order $\text{S} > \text{Se} > \text{Te} > \text{O}$

10. A compound dissociate according to 1st order kinetics with half-life 50 min. The time required to reduce it's concentration 1/4 of it's initial concentration ismin.

Ans. (100)



total time = $2t_{1/2} = 100$ min.

11. An atom forms two lattices FCC and BCC. The edge length of FCC lattice is 2.5 Å and edge length of BCC lattice is 2Å. Then find the ratio of density of FCC to density of BCC.

Ans. (1)

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PAGE # 2



Sol. $d = \frac{ZM}{a^3 N_A}$

or $d \propto \frac{Z}{a^3}$

$$\frac{d_{\text{FCC}}}{d_{\text{BCC}}} = \frac{4}{(2.5)^3} \times \frac{(2)^3}{2} = 1.024$$

12. An aqueous solution have 10% (w/w) CH_3COOH . If degree of dissociation of CH_3COOH in solution is 20%, then depression in freezing point is.....K

[Nearest integer]

[Given $K_f(\text{H}_2\text{O}) = 1.86 \text{ K.Kg/Mole}$]

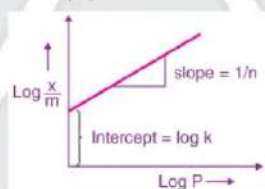
Ans. (4)

Sol. For CH_3COOH

$$i = 1 + (n-1)\alpha = 1 + (2-1)0.2 = 1.2$$

$$\Delta T_f = i K_f \times m = 1.2 \times 1.86 \times \frac{100}{54} = 4.1 \text{ K}$$

13. Following graph is drawn between $\log\left(\frac{x}{m}\right)$ with $\log P$



the graph follow equation $y = 3x + 2.505$ then value of $\log K$ and slope $\left(\frac{1}{n}\right)$ is :

- (1) 2.505, 3 (2) 3, 2.505 (3) 2, 2.505 (4) 2.505, 2

Ans. (1)

Sol. For straight line $y = mx + c$

$$\log\left(\frac{x}{m}\right) = m[\log P] + C$$

From freundlich adsorption

$$\log\left(\frac{x}{m}\right) = \frac{1}{n} \log P + \log K$$

$$\text{so } \frac{1}{n} = 3 \text{ and } \log K = 2.505$$

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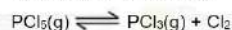
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PAGE # 3

14. For a reversible reaction





14. For a reversible reaction



if 'He' gas is added at constant volume to the reaction mixture at equilibrium then the equilibrium

- (1) Shifts towards forward direction (2) Shifts towards backward direction
(3) Shifts neither direction (4) PCl_5 and Cl_2 conc. increases

Ans. (3)

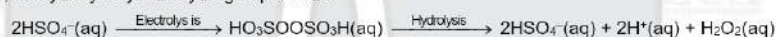
Sol. Inert gas addition has no effect at constant volume.

15. Which of the following compound is used in the preparation of D_2O_2 in laboratory.

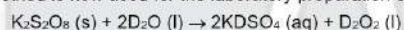
- (1) $\text{K}_2\text{S}_2\text{O}_8$ (2) H_3BO_3 (3) HNO_3 (4) $\text{Ca}(\text{HCO}_3)_2$

Ans. (1)

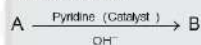
Sol. Peroxodisulphate, obtained by electrolytic oxidation of acidified sulphate solutions at high current density, on hydrolysis yields hydrogen peroxide.



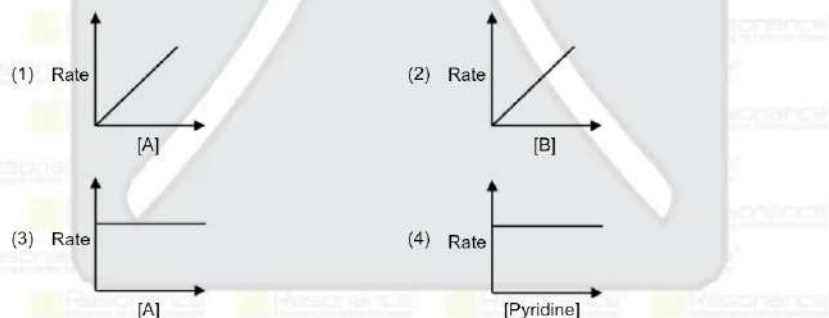
This method is now used for the laboratory preparation of D_2O_2 .



16. For a 1st order reaction



Identify the correct graph.



Ans. (4)

Sol. In chemical reaction concentration of Catalyst remain constant.

17. No. of tranquilizers

Veronal, Valium, Chlorodiazepoxide, Chloroxylenol

Ans. (3)

Sol. Veronal, Valium, and Chlorodiazepoxide are tranquilizers.

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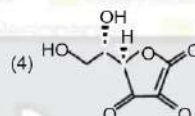
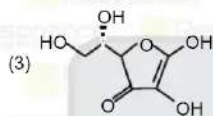
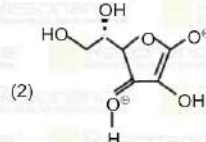
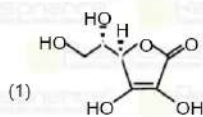
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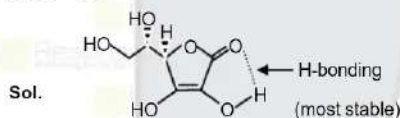
18. Most stable structure of Ascorbic acid is



18. Most stable structure of Ascorbic acid is



Ans. (1)



19. Which industry put least impact on global warming.

(1) Cement industry

(2) Urea industry

(3) Electricity produced by thermal power plant.

(4) Steel manufacture.

Ans. (2)

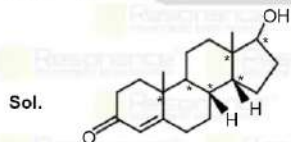
Sol. In urea industry N_2 , CO_2 and H_2 are consumed and no green house gases are emitted.

20.



Total number of unsymmetrical carbon in testosterone is

Ans. (6)



Testosterone

Total number of unsymmetrical carbon = 6

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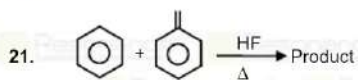
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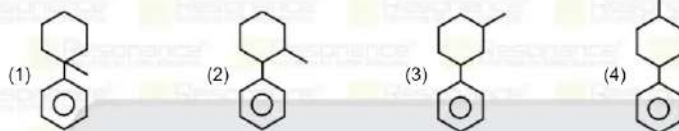
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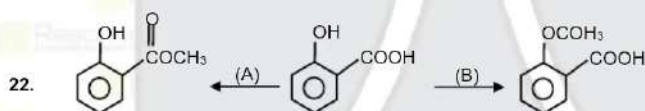
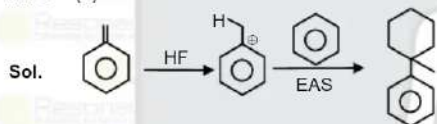




What is the product of the reaction.



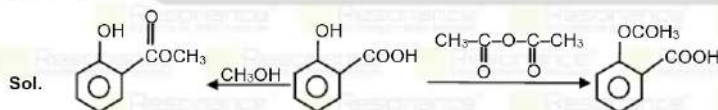
Ans. (1)



(A) & (B) are respectively.

- (A) (1) CH_3OH , (2) $\text{CH}_3\text{-C(=O)-O-C(=O)-CH}_3$, (3) CH_3OH , (4) $\text{CH}_3\text{-NH}_2$, (B) (1) $\text{CH}_3\text{-C(=O)-O-C(=O)-CH}_3$, (2) CH_3OH , (3) CH_3CONH_2 , (4) $\text{CH}_3\text{-C(=O)-O-C(=O)-CH}_3$

Ans. (1)







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