

**PART : CHEMISTRY**

1. The  $\text{ClF}_5$  at room temperature  
 (1) Colourless liquid, Square pyramidal  
 (2) Colourless gas, Bent T-shaped  
 (3) Colourless gas, Pentagonal bipyramidal  
 (4) Yellow green liquid, Bent T-shaped

Ans. (1)  
 Sol.  $\text{ClF}_5$  colourless liquid Square pyramidal

2. In which of the following process, the bond order has increased and paramagnetic character has changed to diamagnetic ?  
 (1)  $\text{NO} \rightarrow \text{NO}^+$  (2)  $\text{O}_2 \rightarrow \text{O}_2^+$   
 (3)  $\text{N}_2 \rightarrow \text{N}_2^+$  (4)  $\text{O}_2 \rightarrow \text{O}_2^{2+}$

Ans. (1)  
 Sol.

| Molecule / Ion    | Electronic configuration  | Bond order          | Magnetic behaviour |
|-------------------|---|---------------------|--------------------|
| $\text{N}_2$      | $(\sigma 1s)^2 (\sigma^* 1s)^2 (\sigma 2s)^2 (\sigma^* 2s)^2 (\pi 2p_x)^2 = (\pi 2p_y)^2 (\sigma 2p_z)^2$                                 | $1/2(10 - 4) = 3$   | Diamagnetic        |
| $\text{N}_2^+$    | $(\sigma 1s)^2 (\sigma^* 1s)^2 (\sigma 2s)^2 (\sigma^* 2s)^2 (\pi 2p_x)^2 = (\pi 2p_y)^2 (\sigma 2p_z)^1$                                 | $1/2(9 - 4) = 2.5$  | Paramagnetic       |
| $\text{O}_2$      | $(\sigma 1s)^2 (\sigma^* 1s)^2 (\sigma 2s)^2 (\sigma^* 2s)^2 (\sigma 2p_x)^2 (\pi 2p_y)^2 = (\pi 2p_z)^2 (\pi^* 2p_x)^1 = (\pi^* 2p_y)^1$ | $1/2(10 - 6) = 2$   | Paramagnetic       |
| $\text{O}_2^+$    | $(\sigma 1s)^2 (\sigma^* 1s)^2 (\sigma 2s)^2 (\sigma^* 2s)^2 (\sigma 2p_x)^2 (\pi 2p_y)^2 = (\pi 2p_z)^2 (\pi^* 2p_x)^1 = (\pi^* 2p_y)^1$ | $1/2(10 - 5) = 2.5$ | Paramagnetic       |
| $\text{O}_2^{2+}$ | $(\sigma 1s)^2 (\sigma^* 1s)^2 (\sigma 2s)^2 (\sigma^* 2s)^2 (\sigma 2p_x)^2 (\pi 2p_y)^2 = (\pi 2p_z)^2 (\pi^* 2p_x)^2 = (\pi^* 2p_y)^2$ | $1/2(10 - 8) = 1.0$ | Diamagnetic        |
| $\text{NO}$       | $(\sigma 1s)^2 (\sigma^* 1s)^2 (\sigma 2s)^2 (\sigma^* 2s)^2 (\sigma 2p_x)^2 (\pi 2p_y)^2 = (\pi 2p_z)^2 (\pi^* 2p_x)^1 = (\pi^* 2p_y)^1$ | $1/2(10 - 5) = 2.5$ | Paramagnetic       |
| $\text{NO}^+$     | $(\sigma 1s)^2 (\sigma^* 1s)^2 (\sigma 2s)^2 (\sigma^* 2s)^2 (\pi 2p_x)^2 = (\pi 2p_y)^2 (\sigma 2p_z)^2$                                 | $1/2(10 - 4) = 3$   | Diamagnetic        |

3. What happens when lyophilic sol is added to lyophobic sol ?  
 (1) Coagulation  
 (2) Lyophilic sol surrounded by lyophobic sol  
 (3) Dispersion of Lyophilic sol  
 (4) Lyophobic sol surrounded by Lyophilic sol

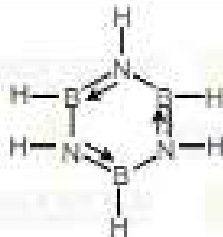
Ans. (4)  
 Sol. Lyophilic colloids have a unique property of protecting lyophobic colloids. When a lyophilic sol is added to the lyophobic sol, the lyophilic particles form a layer around lyophobic particles and thus protect the latter from electrolytes.

4. In a first order reaction the ratio of  $T_{50\%}$  to  $T_{25\%}$  is :

Ans. (3)  
 Sol.  $T_{50\%} = 3 \times T_{25\%}$

5. Which is incorrect about borazine  
 (1) It is cyclic (2) It has banana bond  
 (3) Delocalisation possible (4) It reacts with water

Ans. (2)



Sol.

In borazine coordination bond is formed between B & N.



6. 12 g of compound is dissolved in 1000 mL solution has same osmotic pressure as that of 0.05 M glucose. The compound has empirical formula as  $CH_2O$  and if molecular formula is  $(CH_2O)_x$ . Find n :

Ans. (8)

Sol.

$$C_1 = C_2$$

$$C_1 = C_2$$

$$\frac{12}{M} \times \frac{1000}{1000} = 0.05$$

$$M = \frac{12}{0.05} = 240$$

Molar mass of compound = 240

Empirical formula mass = 30

$$n = \frac{240}{30} = 8$$

7. Radius of 2<sup>nd</sup> orbit of  $He^+$  is  $r_0$  radius of 4<sup>th</sup> orbit of  $Be^{+2}$  is  $xr_0$  find x :

Ans. (2)

Sol.

$$r \propto \frac{n^2}{Z}$$

$$\frac{r_{He^+}}{r_{Be^{+2}}} = \frac{n_1^2 / Z_1}{n_2^2 / Z_2} = \frac{2^2 / 2}{4^2 / 4} = \frac{2}{4}$$

$$r_{Be^{+2}} = 2r_{He^+} = 2r_0$$

$$x = 2$$

8. Which Lanthanide element has more value of 3<sup>rd</sup> ionisation energy

(1) Lu & Yb

(2) Eu & Gd

(3) Eu & Yb

(4) Dy & Yb

Ans. (3)

Sol.

| Element         | Electronic configuration                              |
|-----------------|---|
| Europium (Eu)   | [Xe] 4f <sup>7</sup> 6s <sup>2</sup>                  |
| Gadolinium (Gd) | [Xe] 4f <sup>7</sup> 5d <sup>1</sup> 6s <sup>2</sup>  |
| Dysprosium (Dy) | [Xe] 4f <sup>10</sup> 6s <sup>2</sup>                 |
| Ytterbium (Yb)  | [Xe] 4f <sup>14</sup> 6s <sup>2</sup>                 |
| Lutetium (Lu)   | [Xe] 4f <sup>14</sup> 5d <sup>1</sup> 6s <sup>2</sup> |

9. An organic compound is burnt in excess of air then  $\text{CO}_2$  obtained is 0.220 g & water obtained is 0.126 g if mass percentage of carbon is 24%, find percentage of hydrogen ?

Ans. (6)

Sol.  $n\text{CO}_2 \rightarrow \frac{0.220}{44} = 0.005 \rightarrow n\text{C} = 0.005$

$n\text{H}_2\text{O} \rightarrow \frac{0.126}{18} = 0.007 \rightarrow n\text{H} = 0.014$

$m\text{C} = 0.06 \quad \frac{m\text{C}}{m\text{H}} = \frac{0.06}{0.014} = \frac{24}{x\%}$

$x\% = 5.6\%$

percentage of hydrogen = 5.6% > 6%

10. If in acidic medium 2 molecule of  $\text{KMnO}_4$  is titrated with hexahydrated ferrous ammonium sulphate then how many water molecules will be required ?

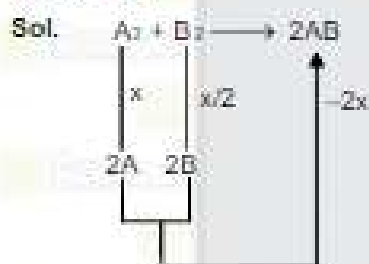
Ans. (8)



11.  $\text{A}_2 + \text{B}_2 \rightarrow 2\text{AB}$ ;  $\Delta H = -200 \text{ J}$

$\text{A}_2$ ,  $\text{B}_2$  &  $\text{AB}$  has bond enthalpy in the ratio as 1 :  $\frac{1}{2}$  : 1. Find Bond enthalpy of  $\text{A}_2$

Ans. 400



$\Delta H = x + x/2 - 2x = -200$

$= -x/2 = -200$

$x = 400 \text{ J}$

12. Statement-I : Permutit method is better than synthetic resin method.

Statement-II : In Synthetic resin method  $\text{Na}^+$  is soluble.

(1) Statement-I is correct and Statement - II is incorrect.

(2) Statement-I is incorrect and Statement-II is correct.

(3) Both statement-I and statement-II are correct.

(4) Both statement-I and statement-II are incorrect.

Ans. (2)

Sol. Theory Based.

13. Which is mismatched about purification ?

(1) Ni - Mond process

(2) Zn - Liquation

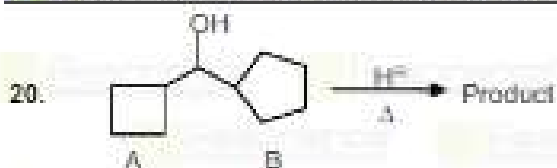
(3) Ti - Van Arkel process.

(4) Cu - Electrolysis

Ans. (2)

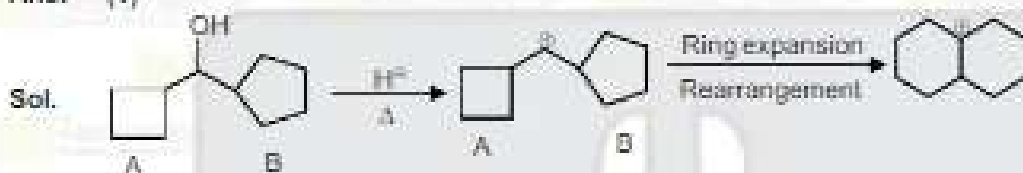
Sol. Zn is refined mainly by distillation.





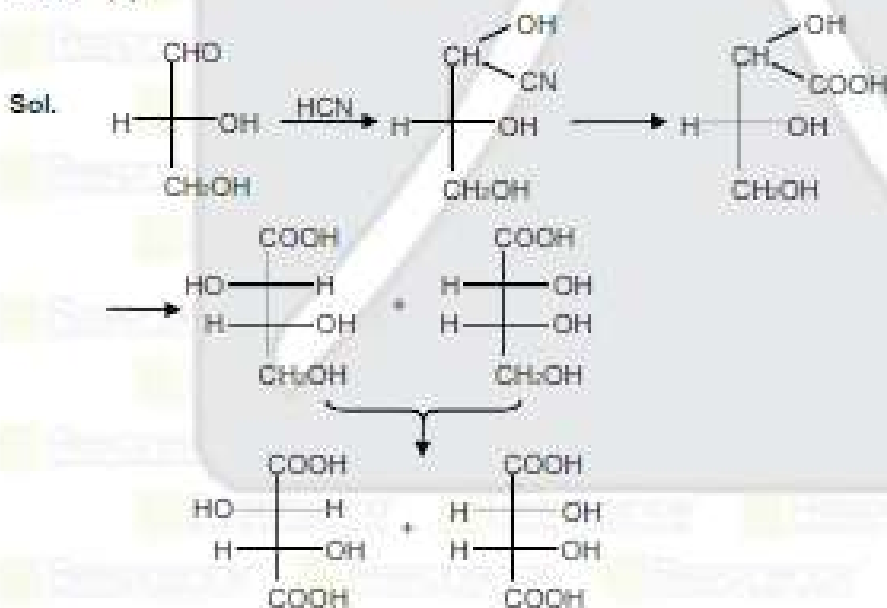
- (1) A and B both are 6-membered ring.
- (2) A and B both are 5-membered ring.
- (3) Only A is 5-membered ring.
- (4) One ring is 7-membered ring.

Ans. (1)



- (1) One product optically inactive and one product meso.
- (2) One product optically active and one product meso.
- (3) Both product are optically active.
- (4) Both product are optically inactive.

Ans. (2)



22. The correct match of the polymer and their code.

|     | List-I                |       | List-II        |
|-----|-----------------------|-------|----------------|
| (A) | Nylon-6               | (i)   | Natural rubber |
| (B) | Cis-1-4-poly isoprene | (ii)  | Caprolactams   |
| (C) | Vulcanised Rubber     | (iii) | Cross linkage  |
| (D) | Polychloroprene       | (iv)  | Neoprene.      |

- (1) (A) - (i) ; (B) - (iii) ; (C) - (ii) ; (D) - (iv)  
 (2) (A) - (ii) ; (B) - (i) ; (C) - (iii) ; (D) - (iv)  
 (3) (A) - (iii) ; (B) - (i) ; (C) - (iv) ; (D) - (i)  
 (4) (A) - (i) ; (B) - (iv) ; (C) - (ii) ; (D) - (iii)

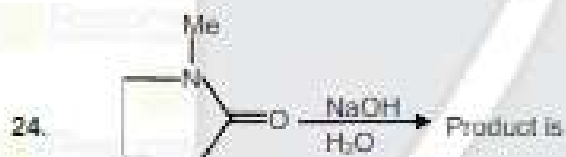
Ans. (2)

Sol. NCERT based

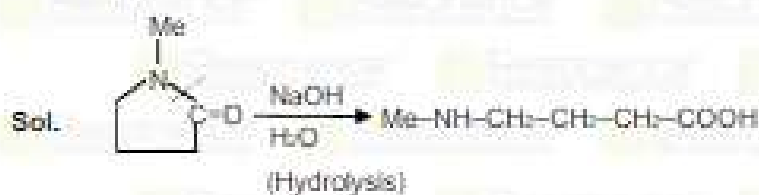
23. Which compound has maximum dipole moment?



Ans. (3)



Ans. (4)

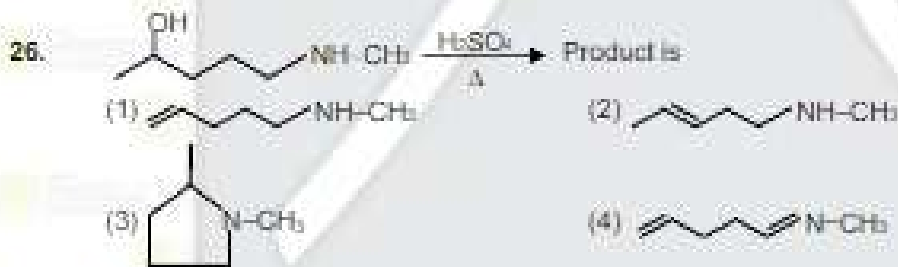
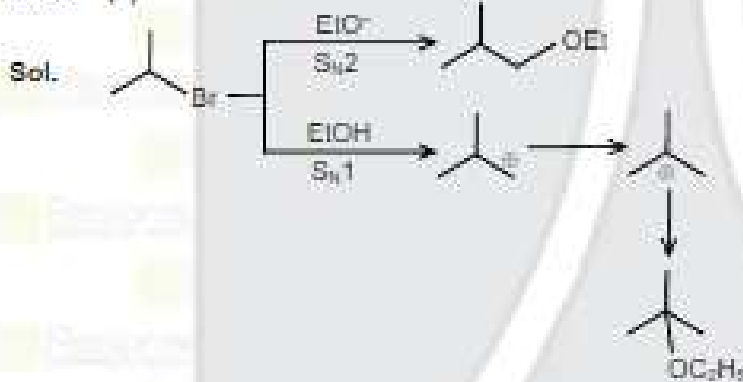




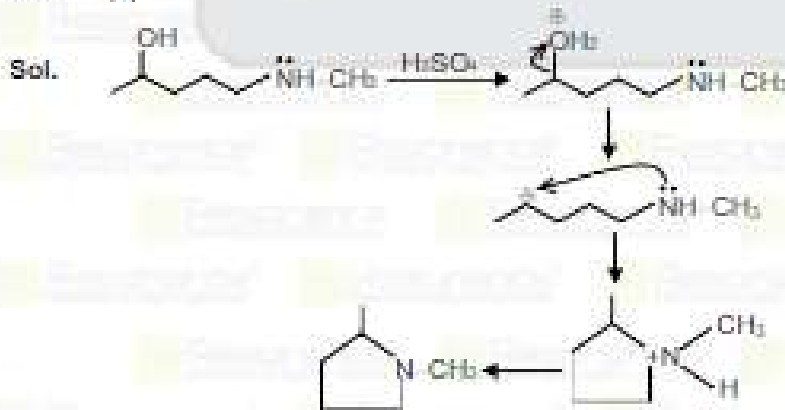
Correct option for product A and B

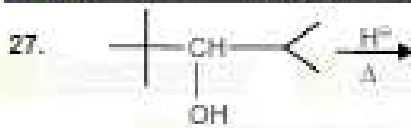
- (1) A - Isobutyl ethyl ether -  $S_N1$   
 B - Ethyl ter. Butyl ether -  $S_N1$
- (2) A - Isobutyl ethyl ether -  $S_N2$   
 B - Ethyl ter. Butyl ether -  $S_N2$
- (3) A - Isobutyl ethyl ether -  $S_N2$   
 B - Ethyl ter. Butyl ether -  $S_N1$
- (4) A - Isobutyl ethyl ether -  $S_N1$   
 B - Ethyl ter. Butyl ether -  $S_N2$

Ans. (3)



Ans. (2)





How many products will form by 3° carbocation?

Ans. (5)

