

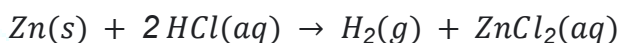
JEE Main 2021 August 31, Shift 2 (Chemistry)

1. Which of the following statement is incorrect?

- (A) Zn reacts with $NaOH$ and HCl to form H_2
- (B) At 2000 K , 8.1% of the H_2 molecules are dissociated into atoms
- (C) $H - H$ bond is the strongest single bond among gases with single bond
- (D) H_2 molecules can be dissociated by increasing temperature and shining UV light.

Ans. (B)

Sol. The dissociation of dihydrogen into its atoms is only $\sim 0.081\%$ around 2000 K .



$H - H$ bond is the strongest single bond among gases with a single bond, due to the very small size of H atom. and it dissociates by increasing temperature and shining UV light.

2. The stability of X_2O type oxides is

- (A) $I > Cl > Br$
- (B) $Cl > I > Br$
- (C) $Br > Cl > I$
- (D) $Cl > Br > I$

Ans. (A)

Sol. Iodine oxygen bond is stable due to the greater polarity of bond and stability of chlorine oxygen bond is due to multiple bond formation with orbital of chlorine atom now, Br lacks both characteristics so, the stability order of oxide is given as $I > Cl > Br$.

3. 50 ml of 1 M HCl is mixed with 30 ml of 1 M NaOH . What is $pH \times 10^4$? [Given: $\log 2.5 = 0.3979$]

Ans. 6021

Sol. Milli equivalents of $HCl(N_aV_a) = 50 \times 1 = 50$

Milli equivalents of $NaOH(N_bV_b) = 30 \times 1 = 30$

Since $N_aV_a > N_bV_b$

$$[H^+] = \frac{N_aV_a - N_bV_b}{V_a + V_b} = \frac{50 - 30}{80} = \frac{20}{80} = 0.25 = 2.5 \times 10^{-1}$$

$$pH = -\log [H^+] = -\log (2.5 \times 10^{-1}) = 1 - 0.3979 = 0.6021$$

$$pH \times 10^4 = 0.6021 \times 10^4 = 6021$$

4. Number of unpaired electrons present in O_2^{-2} ion is :

(A) 0

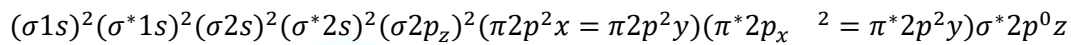
(B) 2

(C) 1

(D) 3

Ans. (A)

Sol. $O_2^{-2} = 18e^-$, there is no unpaired electron



5. The outermost shell configuration of Eu^{+2} ($Z = 63$) is :

(A) $4f^7, 6s^2$

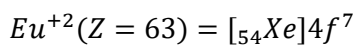
(B) $4f^7$

(C) $4f^6$

(D) $4f^6, 6s^2$

Ans. 2

Sol. $Eu(Z = 63) = [_{54}Xe]4f^7 6s^2$



6. In A_xB compound B present in the CCP crystal lattice and A occupies all octahedral voids and find the value of "x" :

Ans. 1

Sol. In A_xB

Effective number of B atoms = 4 (in CCP)

Effective number of A atoms = 4 (all O.V.)

So formula of the compound = $A_4B_4 = AB$

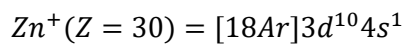
So $x = 1$

7. Find the magnetic moment of Zn^{+2} in B.M.

Ans. 1.73

Sol. Magnetic moment (μ) = $\sqrt{n(n+2)}$ B.M.

n = No. of unpaired electrons



$$n = 1$$

$$(\mu) = \sqrt{1(1 + 2)} = \sqrt{3} = 1.73 \text{ B.M.}$$

8. The number of $\text{S} = \text{O}$ bonds present in pyrosulphuric acid, peroxodisulphuric acid and sulphurous acid respectively

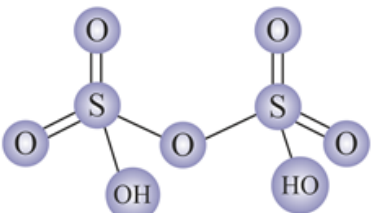
(A) 4,4,1

(B) 1,4,4

(C) 2,1,4

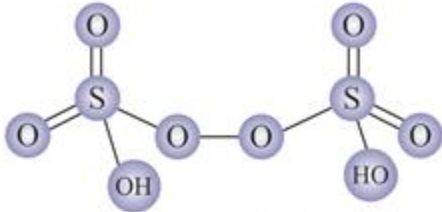
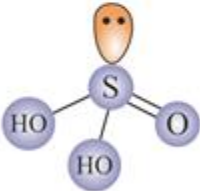
(D) 3,4,2

Ans. (A)

Oxoacids of sulphur	Number of $\text{S} = \text{O}$ Bonds
 <p>Pyrosulphuric acid (Oleum) ($\text{H}_2\text{S}_2\text{O}_7$)</p>	4

Sol.

B I B E

 <p>Peroxodisulphuric acid ($H_2S_2O_8$)</p>	4
 <p>Sulphurous acid (H_2SO_3)</p>	1

9. In electrolytic refining of copper, how many of the following metals may be present in Anode mud :
Te, Au, Ag, Pb, Sb, Pt, Se, As

Ans. 6

Sol. Impurities from the blister copper deposit as anode mud which contains antimony, selenium, tellurium, silver, gold and platinum. These are basically less active metals which cannot be oxidized at anode.

10. Match the following:

Lons	Group number (According to Qualitative Analysis)
(p) Mn^{+2}	(i) IIA
(q) As^{+3}	(ii) IV
(r) Cu^{+2}	(iii) IIB
(s) Fe^{+3}	(iv) III

(A) (p) – (ii); (q) – (iii); (r) – (i); (s) – (iv)

(B) (p) – (i); (q) – (iv); (r) – (ii); (s) – (iii)

(C) (p) – (ii); (q) – (i); (r) – (iii); (s) – (iv)

(D) (p) – (iv); (q) – (iii); (r) – (ii); (s) – (i)

Ans. (A)

Sol. IIA Group Cations: Hg^{2+} , Pb^{2+} , Bi^{3+} , Cu^{2+} , $*Cd^{2+}$

IIB Group Cations: As^{3+} , Sb^{3+} , Sn^{2+} , Sn^{4+}

IIIrd Group Cations : Al^{3+} , Cr^{3+} , Fe^{3+}

IVth Group Cations : Zn^{2+} , Mn^{2+} , Ni^{2+} , Co^{2+}

11. Match the following:

Column-I	Column-II
(p) Cell constant	(i) $\Omega^{-1} m^{-1}$
(q) Conductivity	(ii) m^{-1}
(r) Molar conductivity	(iii) Dimensionless
(s) Degree of dissociation	(iv) $Sm^2 mol^{-1}$

(A) (p) – (i); (q) – (ii); (r) – (iii); (s) – (iv)

(B) (p) – (ii); (q) – (i); (r) – (iv); (s) – (iii)

(C) (p) – (iii); (q) – (iv); (r) – (i); (s) – (ii)

(D) (p) – (i); (q) – (iii); (r) – (ii); (s) – (iv)

Ans. (B)

Sol. Cell constant = $\frac{l}{A} = m^{-1}$

Conductivity $k = \frac{1}{\rho} = \frac{l}{RA} = \Omega^{-1} m^{-1}$

Molar Conductivity = $\lambda_m = \frac{k \times 1000}{\text{Molarity}} = Sm^2 mol^{-1}$

Degree of dissociation = Number of moles dissociated out of one mole. It is a ratio. Hence, it is dimensionless.

12. Which one of the following set of given species can show disproportionate reaction :

(A) F_2 , Cr_2O_3 , MnO_4^{-2} , ClO^-

(B) Cl_2 , Cr_2O_3 , MnO_4^{-2} , Mn^{+3}

(C) Cl_2 , Cr_2O_3 , MnO_4^- , ClO_2^-

(D) $F_2, Cl_2, Cr_2O_3, MnO_4^-$

Ans. (B)

Sol. Disproportionation reactions are a special type of redox reactions. One of the reactants in a disproportionate reaction always contains an element that can exist in at least three oxidation states. The element of the reacting species is in an intermediate oxidation state and simultaneously gets oxidised and reduced. The elements present in option B are present in their intermediate oxidation state. Hence, they can undergo disproportionation reaction.

13. Statement–1: Lithium forms hydrated salt.

Statement–2 : Lithium has more polarizing power than other alkali metals.

(A) Statement– 1 is true & Statement–2 is false

(B) Statement– 1 is false & Statement–2 is true

(C) Both Statement– 1 & Statement–2 are true

(D) Both Statement–1 & Statement–2 are false

Ans. (C)

Lithium Ions have smaller sizes as compared to other Ions of the group. Hence, it has a greater value of charge to radius ratio and polarising power. Hence, it can form hydrated salts easily.

14. A solution of 20g of substance in 200g of benzene shows elevation in B.P. is 0.17 Kelvin and another solution which contains 20g of same substance in 200g of C_2H_5OH shows the elevation in B.P. is " X " Kelvin. The value of X.

Given: Substance form dimer (100%) in benzene while substance exists as monomer in ethyl alcohol

(C_5H_5OH).

k_b of $C_6H_6 = 2.53^\circ C/molal$, k_b of $C_2H_5OH = 0.374^\circ C/molal$

Ans. 0.05

Sol. $\Delta T_b = i \times k_b \times molality$

For Ist Solution

$$0.17 = \frac{1}{2} \times 2.53 \times \frac{20}{GMM} \times \frac{1000}{200}$$

$$GMM \text{ of substance} = \frac{2.53 \times 20 \times 1000}{200 \times 0.17} = 744.12 \text{ gram/mol}$$

For IIst solution

$$\Delta T_b = i \times k_b \times m = 1 \times 0.37 \times \frac{20}{744.12} \times \frac{1000}{200} = 0.05 \text{ Kelvin}$$

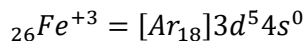
15. Magnetic moment (in B.M.) of $[Fe(CO)_4(C_2O_4)]^+$ is

(A) 1

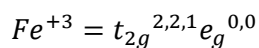
- (B) 0
 (C) 1.73
 (D) 5.89

Ans. 3

Sol. In $[Fe(CO)_4(C_2O_4)]^+$ Oxidation Number of Fe = +3



CO is a strong field ligand, so pairing occurs



number of unpaired electron = 1

so magnetic moment (μ) = $\sqrt{n(n+2)} B.M.$

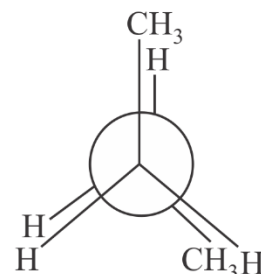
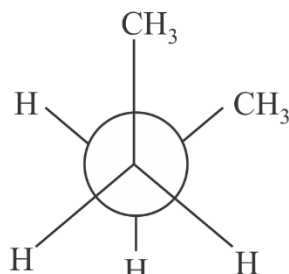
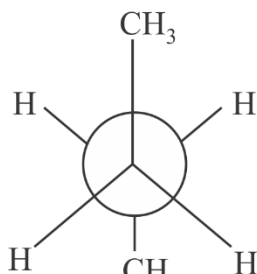
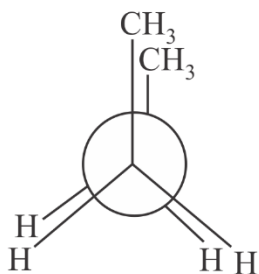
$$= \sqrt{1(1+2)} = \sqrt{3} = 1.73 B \cdot M$$

16. Which of the following is not polyester

- (A) PHBV
 (B) Dacron
 (C) Novolac
 (D) Glyptal

Ans. (C)

Sol. Dacron, PHBV and Glyptal are polyesters.



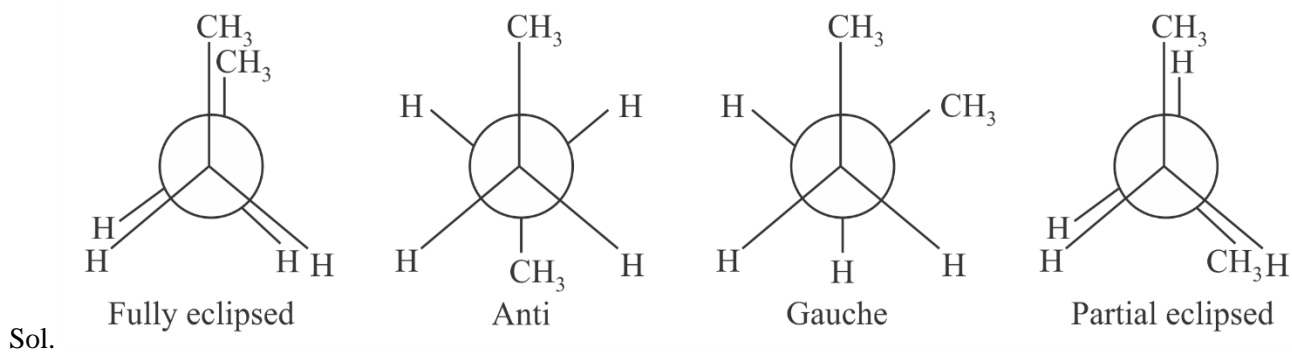
17.

The order Potential energy of above conformations is

- (A) $III < II < IV < I$
 (B) $II < III < IV < I$
 (C) $I < II < IV < III$

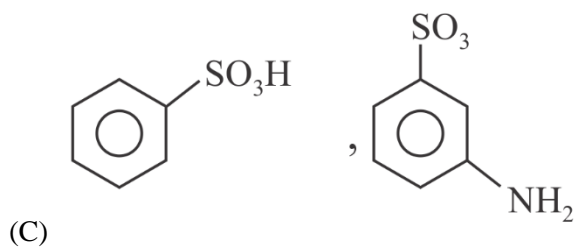
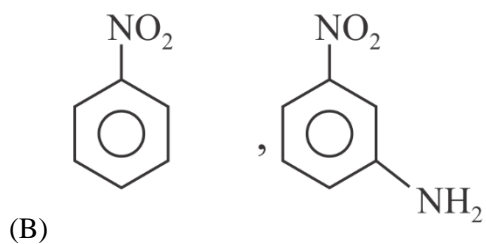
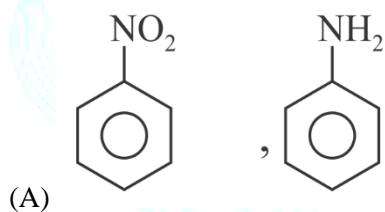
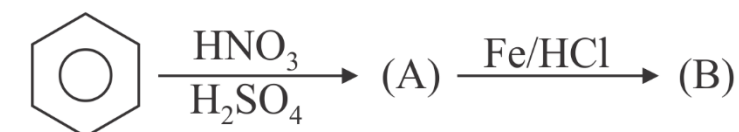
(D) $IV < II < III < I$

Ans. (B)

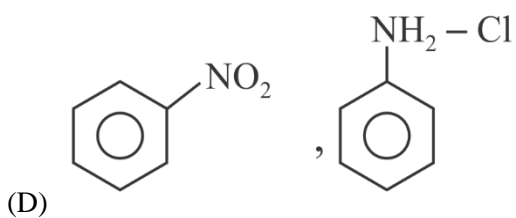


The order Potential energy of above conformations is Fully eclipsed > Partial eclipsed > Gauche > Anti

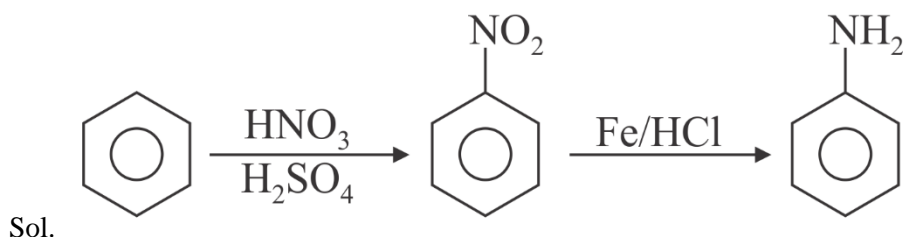
18. Find the product A and B:



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Ans. (A)

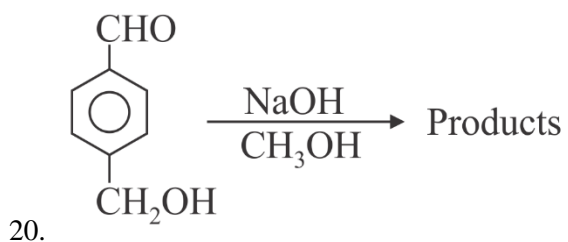


19. Which of the following is Globular protein?

- (A) Myosin
- (B) Keratin
- (C) Albumin
- (D) Collagen

Ans. (C)

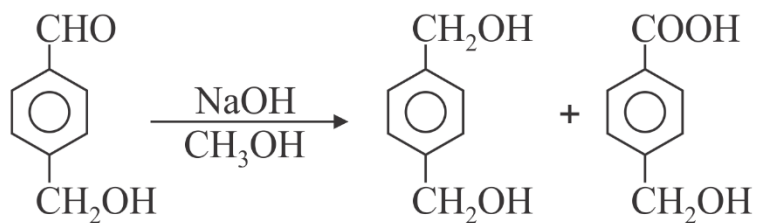
Sol. Insulin & Albumin are Globular proteins.



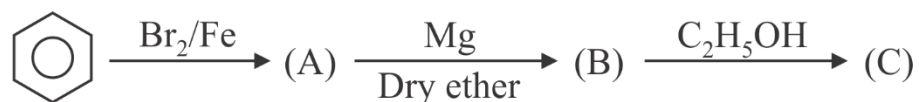
Which of the following is not formed as a product?

- (A) Dicarboxylic acid
- (B) Monocarboxylic acid
- (C) Diol
- (D) Alcohol & carboxylic acid

Ans. (A)

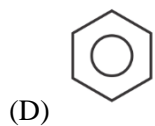
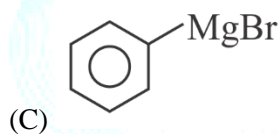
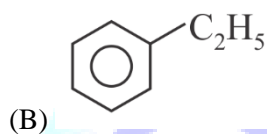
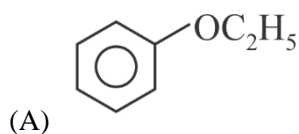


Sol.

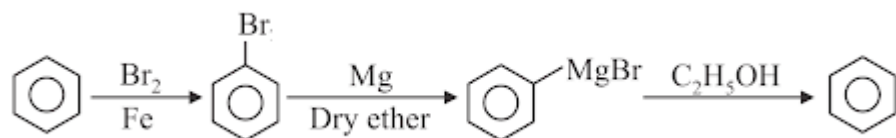


21.

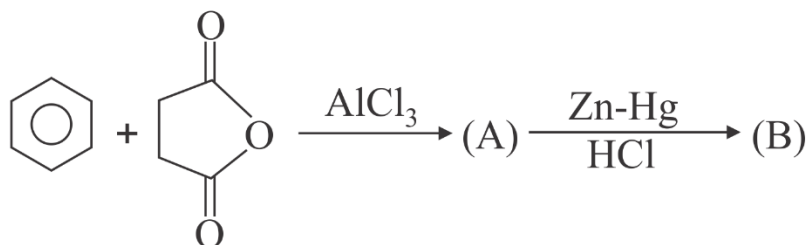
Product C is:



Ans. (D)



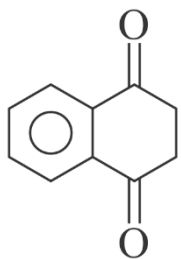
Sol.



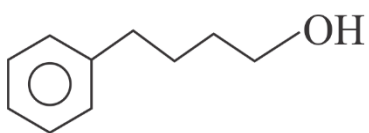
22.

Product B will be:

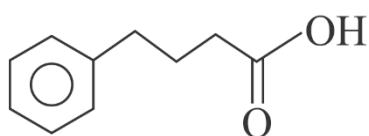
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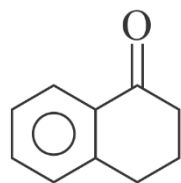
(A)



(B)



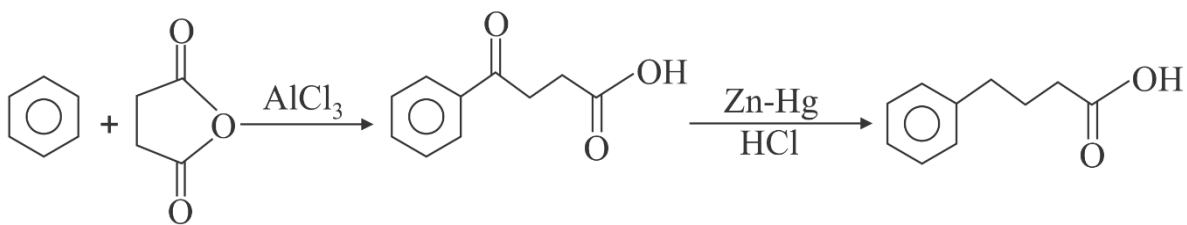
(C)



(D)

Ans. (C)

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Sol.