



**JEE
MAIN
4th
Attempt**

CHEMISTRY

31st August 2021 [SHIFT – 2]

QUESTION WITH SOLUTION

JEE | NEET | Foundation

MOTION[®]

29900+
SELECTIONS SINCE 2007

हो चुकी है ऑफलाइन क्लासरूम की शुरुआत
अपने सपने को करो साकार, कोटा कोचिंग के साथ

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Now Offline associated with Motion Kota Classroom



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Join

JEE DROPPER BATCH

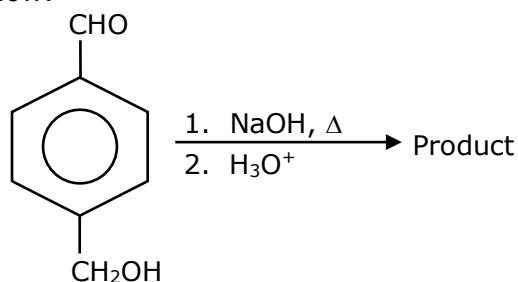
Online + Offline Mode

English & Hindi Medium

Batch Starting from :
22nd Sept. 2021

SECTION - A

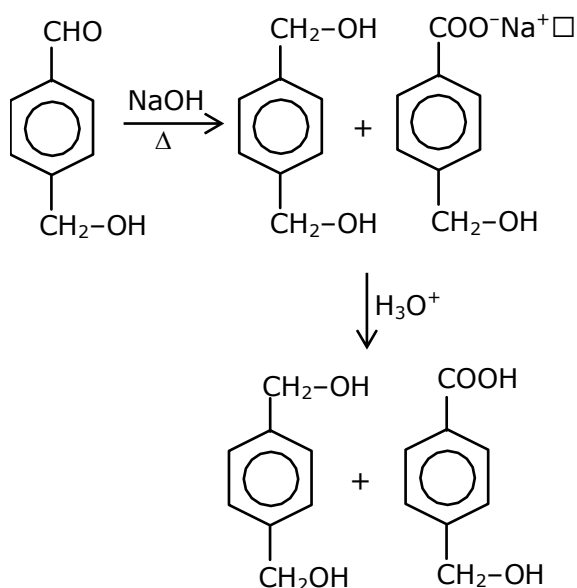
1. For the reaction given below:



The compound which is not formed as a product in the reaction is a:

- (1) Compound with both alcohol and acid functional groups
- (2) dicarboxylic acid
- (3) diol
- (4) monocarboxylic acid

Sol. (2)



2. In which one of the following sets all species show disproportionation reaction?

- (1) MnO_4^- , ClO_2^- , Cl_2 and Mn^{3+}
- (2) ClO_4^- , MnO_4^- , ClO_2^- and F_2
- (3) ClO_2^- , F_2 , MnO_4^- and $\text{Cr}_2\text{O}_7^{2-}$
- (4) $\text{Cr}_2\text{O}_7^{2-}$, MnO_4^- , ClO_2^- and Cl_2

Sol. (1)

Motion Bonus

No option contains all species that show disproportionation reaction.



Mn is in +7 oxidation state (highest) hence cannot be simultaneously oxidized or reduced.



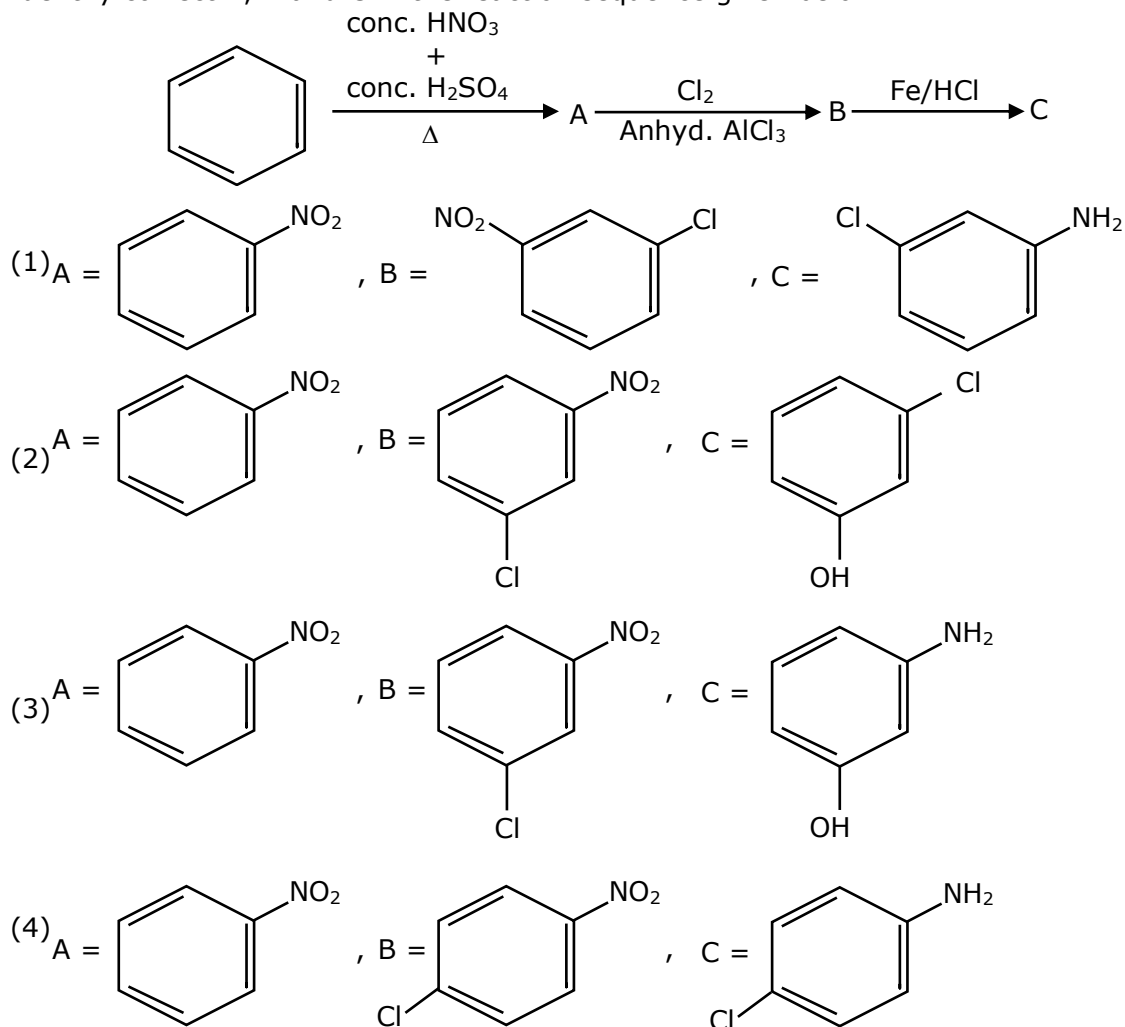
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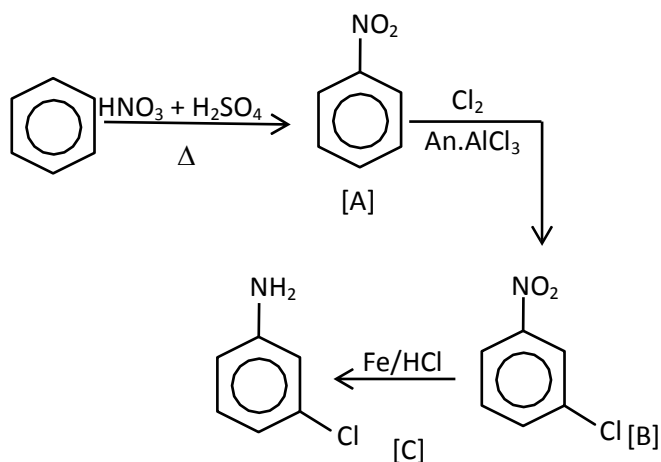
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3. Identify correct A, B and C in the reaction sequence given below:



Sol. (1)



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4. The deposition of X and Y on ground surfaces is referred as wet and dry depositions, respectively. X and Y are:

- (1) X = Ammonium salts, Y = CO₂ (2) X = SO₂, Y = Ammonium salts
 (3) X = Ammonium salts, Y = SO₂ (4) X = CO₂, Y = SO₂

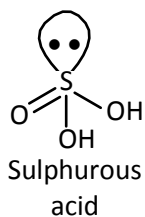
Sol. (3)

Oxides of nitrogen and sulphur are acidic and settle down on ground as dry deposition. Ammonium salts in rain drops result in wet deposition

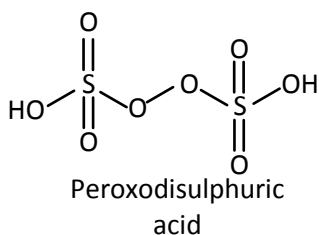
5. The number of S=O bonds present in sulphurous acid, peroxodisulphuric acid and pyrosulphuric acid, respectively are:

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

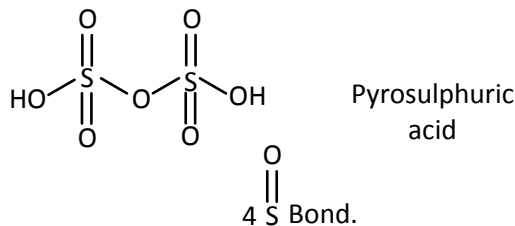
Sol. (4)



1 S Bond.

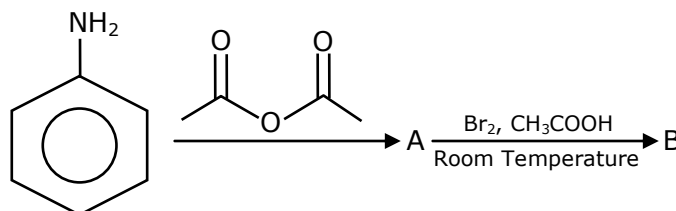


4 S Bond.



4 S Bond.

6. The major products A and B formed in the following reaction sequence are:

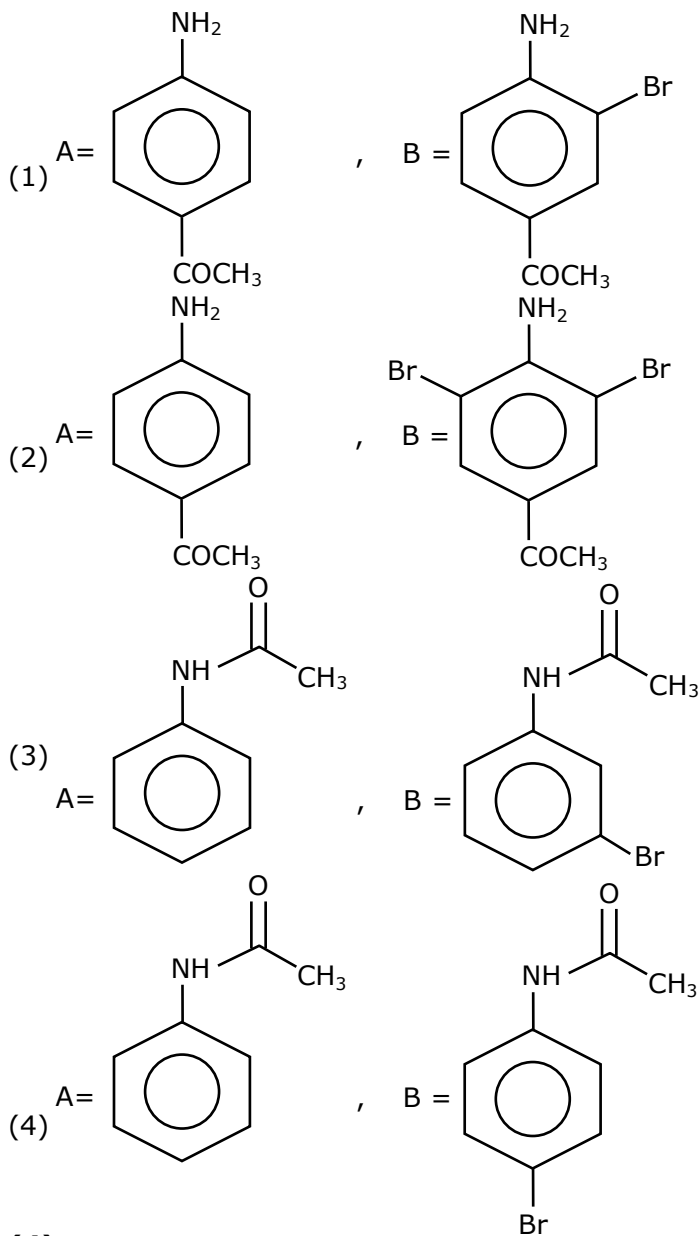


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Sol. (4)

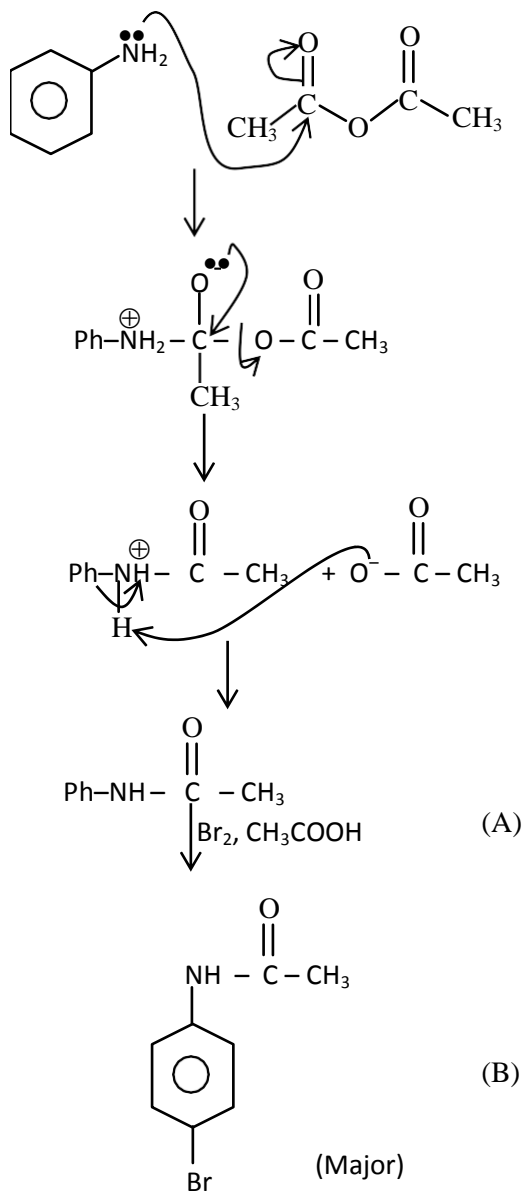


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7. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): Lithium salts are hydrated.

Reason (R) : Lithium has higher polarising power than other alkali metal group members.

In the light of the above statements, choose the **most appropriate** answer from the options given below:

- (1) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**.
- (2) **(A)** is correct but **(R)** is not correct.
- (3) **(A)** is not correct but **(R)** is correct.
- (4) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**.

Sol. (1)

Lithium salts are hydrated due to high hydration energy of Li^+
 Li^+ due to smallest size in IA group has highest polarizing power.



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8. Which among the following is not a polyester?

- (1) Glyptal
- (2) PHBV
- (3) Dacron
- (4) Novolac

Sol. (4)

Novolac is a linear polymer of $[\text{Ph} - \text{OH} + \text{HCHO}]$.

So ester linkage not present.

So novolac is not a polyester.

9. Which one of the following statements is **incorrect**?

- (1) Dihydrogen is produced on reacting zinc with HCl as well as NaOH (aq.)
- (2) Atomic hydrogen is produced when H_2 molecules at a high temperature are irradiated with UV radiation.
- (3) Bond dissociation enthalpy of H_2 is highest among diatomic gaseous molecules which contain a single bond.
- (4) At around 2000K, the dissociation of dihydrogen into its atoms is nearly 8.1%

Ans. (4)

Atomic hydrogen is produced at high temperature in an electric arc or under ultraviolet radiations. The dissociation of dihydrogen at 2000 K is only 0.081%

H-H bond dissociation enthalpy is highest for a single bond for any diatomic molecule.

Dihydrogen can be produced on reacting Zn with dil. HCl as well as NaOH(aq).

10. The incorrect expression among the following is:

(1) For isothermal process $w_{\text{reversible}} = -nRT \ln \frac{V_f}{V_i}$

(2) $\ln K = \frac{\Delta H^\circ - T\Delta S^\circ}{RT}$

(3) $K = e^{-\Delta G^\circ/RT}$

(4) $\frac{\Delta G_{\text{system}}}{\Delta S_{\text{Total}}} = -T$ (at constant P)

Sol. (2)

Option (2) is incorrect

$$\Delta G^\circ = -RT \ln K$$

$$\Delta H^\circ - T\Delta S^\circ = -RT \ln K$$

$$\ln K = - \left[\frac{\Delta H^\circ - \Delta S^\circ}{RT} \right]$$



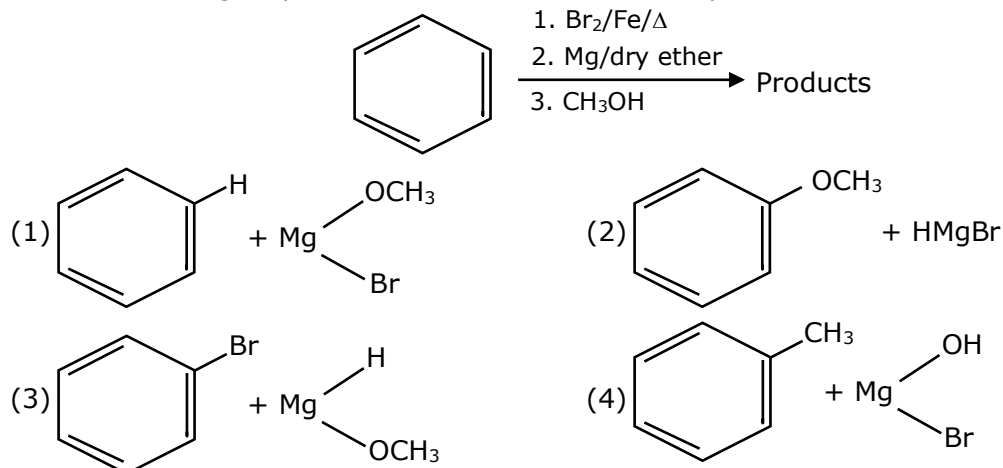
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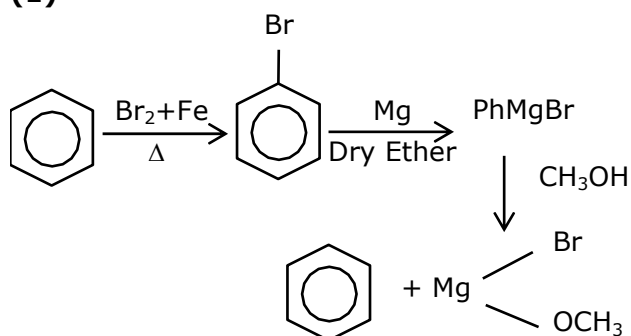
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11. For the following sequence of reactions, the correct products are:



Sol. (1)



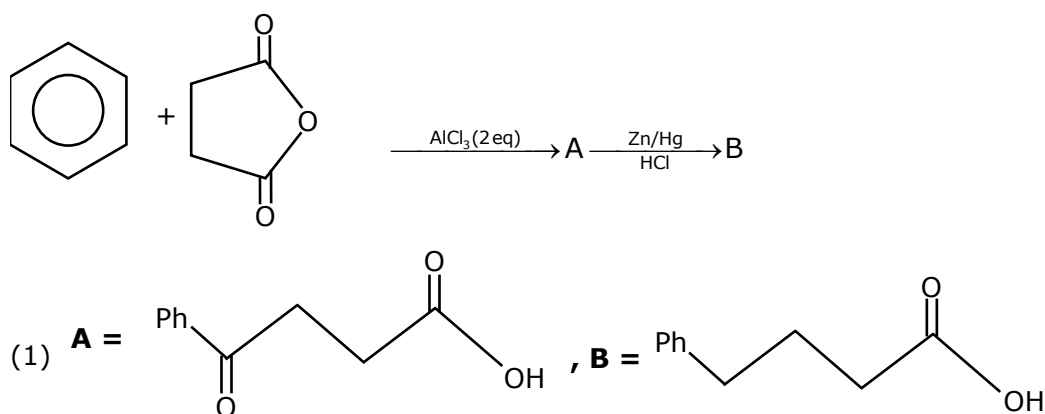
12. Which one of the following correctly represents the order of stability of oxides, X_2O ; (X=Halogen)?

- (1) $\text{Br} > \text{Cl} > \text{I}$ (2) $\text{I} > \text{Cl} > \text{Br}$ (3) $\text{Br} > \text{I} > \text{Cl}$ (4) $\text{Cl} > \text{I} > \text{Br}$

Sol. (2)

Stability of oxides of Halogens is $\text{I} > \text{Cl} > \text{Br}$

13. The structures of A and B formed in the following reaction are: [Ph = $-\text{C}_6\text{H}_5$]

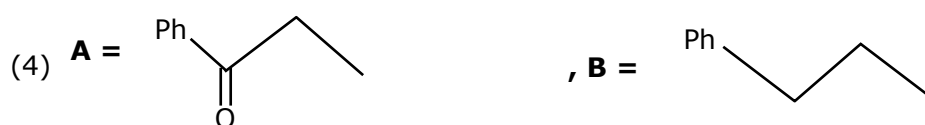
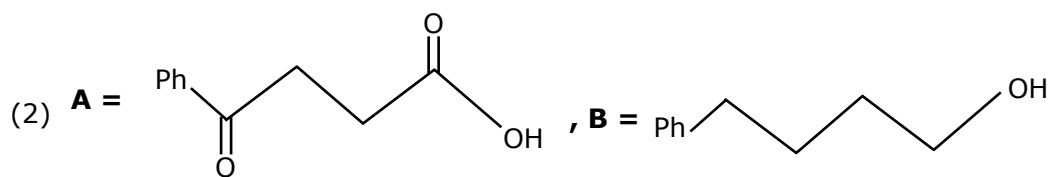


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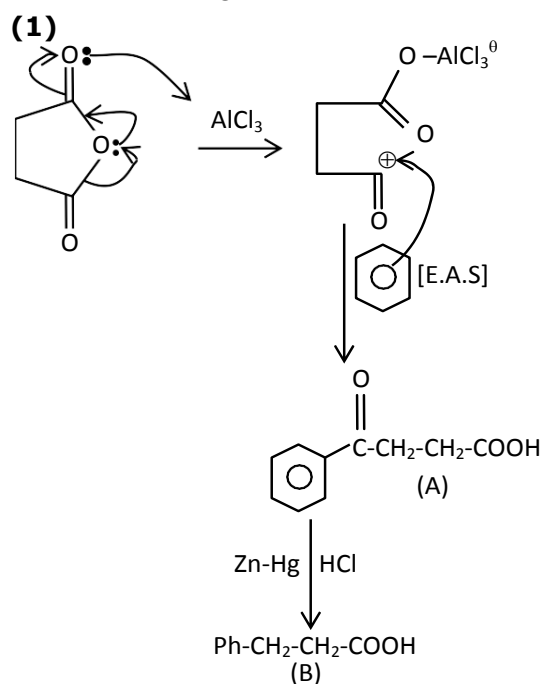
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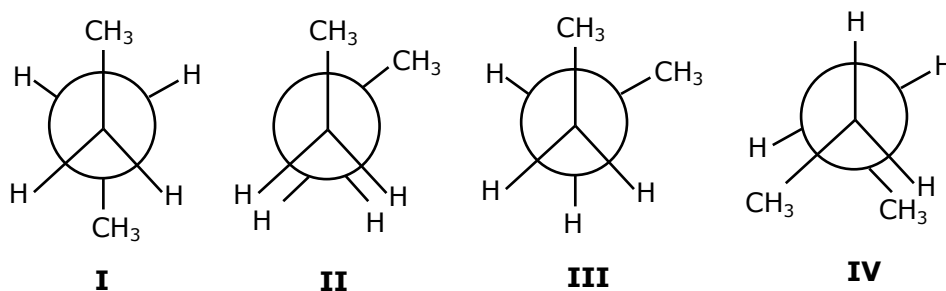




Sol.



14. Arrange the following conformational isomers of n-butane in order of their increasing potential energy:



- (1) II < III < IV < I
 (3) I < IV < III < II

- (2) I < III < IV < II
 (4) II < IV < III < I



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Sol. (2)

More stable less potential energy.

Stability order : I > III > IV > II

So

Potential energy : II > IV > III > I

15. Which of the following is NOT an example of fibrous protein?

(1) Myosin (2) Collagen (3) Keratin (4) Albumin

Sol. (4)

Keratin, collagen and myosin are example of fibrous protein.

16. Match List-I with List-II

List-I

(Metal Ion)

(a) Mn^{2+}

(b) As^{3+}

(c) Cu^{2+}

(d) Al^{3+}

List-II

(Group in Qualitative analysis)

(i) Group - III

(i) Group - II A

(i) Group - IV

(i) Group - II-B

Choose the **most appropriate** answer from the options given below:

(1) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i) (2) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)

(3) (a)-(iv), (b)-(ii), (c)-(iii), (d)-(i) (4) (a)-(i), (b)-(iv), (c)-(ii), (d)-(iii)

Sol. (1)

$Mn^{2+} \rightarrow$ III group , $As^{3+} \rightarrow$ II B group,

$Cu^{2+} \rightarrow$ II A group , $Al^{3+} \rightarrow$ IV group

17. The Eu^{2+} ion is a strong reducing agent in spite of its ground state electronic configuration (outermost): [Atomic number of Eu = 63]

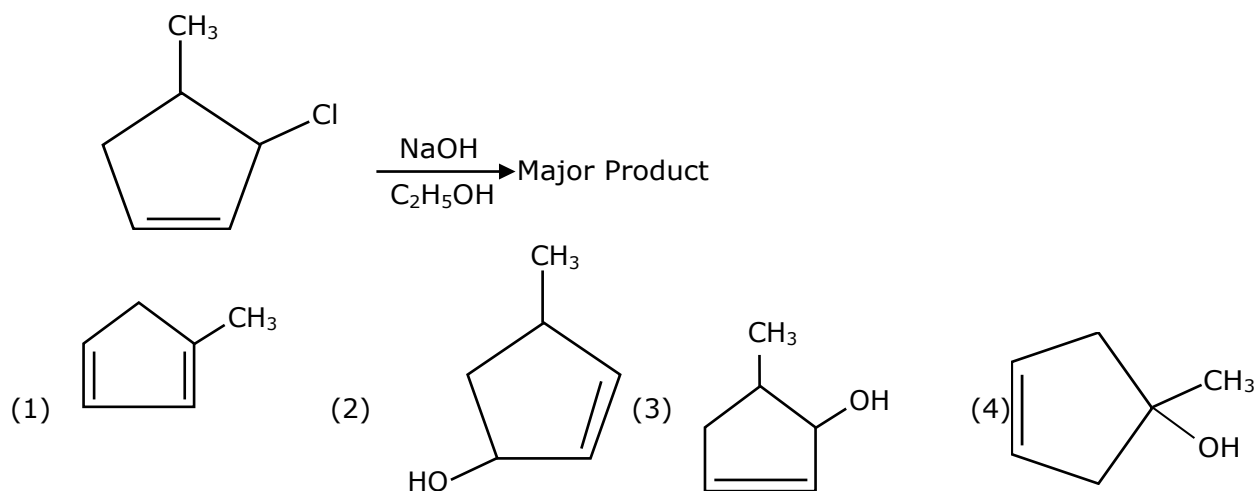
(1) $4f^6$ (2) $4f^6 6s^2$ (3) $4f^7$ (4) $4f^7 6s^2$

Sol. (3)

$Eu \rightarrow [Xe]4f^7 6s^2$

$Eu^{2+} \rightarrow [Xe]4f^7$

18. The major product of the following reaction is:



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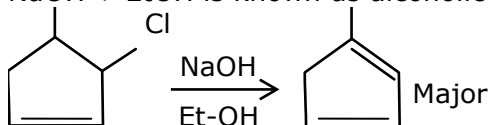
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Sol. (3)

Motion Ans. 1

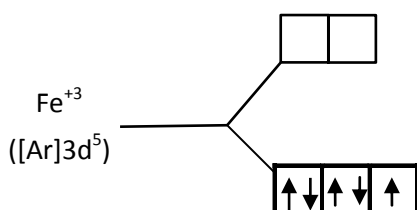
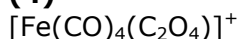
NaOH + EtOH is known as alcoholic NaOH, so it give E² reaction with given alkyl halide.



19. Spin only magnetic moment in BM of $[\text{Fe}(\text{CO})_4(\text{C}_2\text{O}_4)]^+$ is:

- (1) 1 (2) 0 (3) 5.92 (4) 1.73

Sol. (4)



One unpaired electron
Spin only magnetic moment
 $= \sqrt{3}$ B.M. = 1.73 BM

20. Match **List-I** with **List-II**:

List-I

(Parameter)

- (a) Cell constant
(b) Molar conductivity
(c) Conductivity
(d) Degree of dissociation of electrolyte

List-II

(Unit)

- (i) $\text{S cm}^2 \text{mol}^{-1}$
(ii) Dimensionless
(iii) m^{-1}
(iv) $\Omega^{-1}\text{m}^{-1}$

Choose the **most appropriate** answer from the options given below:

- (1) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)
(2) (a)-(ii), (b)-(i), (c)-(iii), (d)-(iv)
(3) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)
(4) (a)-(i), (b)-(iv), (c)-(iii), (d)-(ii)

Sol. (3)

Cell constant = $\left(\frac{\ell}{A}\right) \Rightarrow \text{Units} = \text{m}^{-1}$

Molar conductivity (Λ_m) $\Rightarrow \text{Units} = \text{Sm}^2 \text{mole}^{-1}$

Conductivity (K) $\Rightarrow \text{Units} = \text{S m}^{-1}$

Degree of dissociation (α) \rightarrow Dimensionless

- \therefore (a) - (iii)
(b) - (i)
(c) - (iv)
(d) - (ii)



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Section B

1. In the electrolytic refining of blister copper, the total number of main impurities, from the following, removed as anode mud is _____.

Pb, Sb, Se, Te, Ru, Ag, Au and Pt

Ans. 6

Anode mud contains Sb, Se, Te, Ag, Au and Pt

2. 1.22 g of an organic acid is separately dissolved in 100g of benzene ($K_b = 2.6 \text{ K kg mol}^{-1}$) and 100 g of acetone ($K_b = 1.7 \text{ K kg mol}^{-1}$). The acid is known to dimerize in benzene but remain as a monomer in acetone. The boiling point of the solution in acetone increases by 0.17°C . The increase in boiling point of solution in benzene in $^\circ\text{C}$ is $x \times 10^{-2}$. The value of x is _____. (Nearest integer). [Atomic mass : C = 12.0, H = 1.0, O = 16.0]

Ans. 13

With benzene as solvent

$$\Delta T_b = i K_b m$$

$$\Delta T_b = \frac{1}{2} \times 2.6 \times \frac{1.22 / M_w}{100 / 1000} \quad \dots(1)$$

With Acetone as solvent

$$\Delta T_b = i K_b m$$

$$0.17 = 1 \times 1.17 \times \frac{1.22 / M_w}{100 / 1000} \quad \dots(2)$$

(1)/(2)

$$\frac{\Delta T_b}{0.17} = \frac{\frac{1}{2} \times 2.6 + \frac{1.22 / M_w}{100 / 1000}}{1 \times 1.17 \times \frac{1.22 / M_w}{100 / 1000}}$$

$$\Delta T_b = \frac{0.26}{2}$$

$$\Delta T_b = 13 \times 10^{-2} \quad \Rightarrow x = 13$$

3. The empirical formula for a compound with a cubic close packed arrangement of anions and with cations occupying all the octahedral sites in A_xB . the value of x is _____.

Ans. 1

Anions froms CCP or FCC (A^-) = 4 A^- per unit cell

Cations occupy all octahedral voids (B^+) = 4 B^+ per unit cell

cell formula $\rightarrow A_4B_4$

Empirical formula $\rightarrow AB$

$\rightarrow (x = 1)$

4. Sodium oxide reacts with water to produce sodium hydroxide. 20.0 g of sodium oxide is dissolved in 500 mL of water. Neglecting the change in volume, the concentration of the resulting NaOH solution is _____ $\times 10^{-1}$ M. (Nearest integer).

[Atomic mass : Na = 23.0, O = 16.0, H = 1.0]



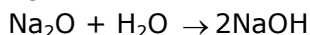
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Ans. 13

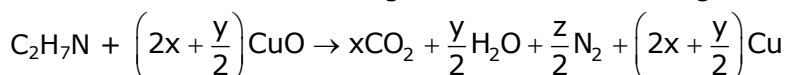


$$\frac{20}{62} \text{ moles}$$

$$\text{Moles of NaOH formed} = \frac{20}{62} \times 2$$

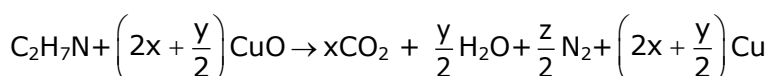
$$[\text{NaOH}] = \frac{\frac{40}{62}}{\frac{500}{1000}} = 1.29 \text{ M} = 13 \times 10^{-1} \text{ M} \quad (\text{Nearest integer})$$

5. The transformation occurring in Duma's method is given below:

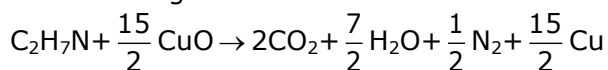


The value of y is _____. (Integer answer).

Ans. 7



On balancing



On Comparing

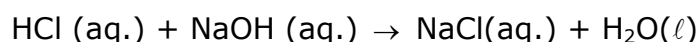
$$y = 7$$

6. The pH of a solution obtained by mixing 50 mL of 1 M HCl and 30 mL of 1 M NaOH is $x \times 10^{-4}$. The value of x is _____. (Nearest integer).

$$[\log 2.5 = 0.3979]$$

Ans. 6021

6021



	50 ml, 1M	30ml, 1M	-	-
t = 0	50 mm	30 mm		
t = ∞	20 mm	-		

$$[\text{HCl}] = \frac{20}{80} = \frac{1}{4} \text{ M} = 2.5 \times 10^{-1} \text{ M}$$

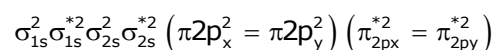
$$\text{pH} = -\log 2.5 \times 10^{-1} = 1 - 0.3979 = 0.6021$$

$$\text{pH} = 6021 \times 10^{-4}$$

7. According to molecular orbital theory, the number of unpaired electron(s) in O_2^{2-} is:

Ans. 0

Molecular orbital configuration of O_2^{2-} is



Zero unpaired electron



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8. CH_4 is adsorbed on 1 g charcoal at 0°C following the Freundlich adsorption isotherm. 10.0 mL of CH_4 is adsorbed at 100 mm of Hg, whereas 15.0 mL is adsorbed at 200 mm of Hg. The volume of CH_4 adsorbed at 300 mm of Hg is 10^x mL. the value of x is _____ $\times 10^{-2}$. (Nearest integer).

[Use $\log_{10} 2 = 0.3010$, $\log_{10} 3 = 0.4771$]

Ans. 128

We know

$$\frac{x}{m} = KP^{1/n}; \text{ using } (x \propto V)$$

$$\Rightarrow \frac{10}{1} = K \times (100)^{1/n} \quad \dots(1)$$

$$\frac{15}{1} = K \times (200)^{1/n} \quad \dots(2)$$

$$\frac{V}{1} = K \times (300)^{1/n} \quad \dots(3)$$

Divide

(2)/ (1)

$$\frac{15}{10} = 2^{1/n}$$

$$\log\left(\frac{3}{2}\right) = \frac{1}{n} \log 2$$

$$\frac{1}{n} = \frac{\log 3 - \log 2}{\log 2} = \frac{0.4771 - 0.3010}{0.3010}$$

$$\frac{1}{n} = 0.585$$

Divide

(3)/(1)

$$\frac{V}{10} = 3^{1/n}$$

$$\log\left(\frac{V}{10}\right) = \frac{1}{n} \log 3, \quad \log\left(\frac{V}{10}\right) = 0.585 \times 0.4771 = 0.2791$$

$$\frac{V}{10} = 10^{0.279} \quad \Rightarrow V = 10 \times 10^{0.279}$$

$$\Rightarrow V = 10^{1.279} = 10^x$$

$$\Rightarrow x = 1.279$$

$$\Rightarrow x = 128 \times 10^{-2} \text{ (Nearest integer)}$$

9. For the reaction $A \rightarrow B$, the rate constant k (in s^{-1}) is given by $\log_{10} k = 20.35 - \frac{(2.47 \times 10^3)}{T}$

The energy of activation in kJ mol^{-1} is _____. (Nearest integer)

[Given : $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$]

Ans. 47

Given $\log K = 20.35 - \frac{2.47 \times 10^3}{T}$

We know $\log K = \log A - \frac{E_a}{2.303RT}$



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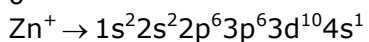
$$\Rightarrow \frac{E_a}{2.303RT} = 2.47 \times 10^3$$

$$E_a = 2.47 \times 10^3 \times 2.303 \times \frac{8.314}{1000} \text{ KJ/mole}$$

$$= 47.29 = 47 \text{ (Nearest integer)}$$

10. The value of magnetic quantum number of the outermost electron of Zn^+ ion is _____.
(Integer answer)

Ans. 0



Outermost electron is in 4s subshell

$$m = 0$$



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हो चुकी है ऑफलाइन क्लासरूम की शुरुआत
अपने सपने को करो साकार, कोटा कोविंग के साथ

Directors of Nucleus Education & Wizard of Mathematics

Now Offline associated with Motion Kota Classroom



Nitin Vijay (NV Sir)
Managing Director
Exp. : 18 yrs



Akhilesh Kanther (AKK Sir)
Exp. : 17 yrs



Vishal Joshi (VJ Sir)
Exp. : 18 yrs



Surendra K. Mishra (SKM Sir)
Exp. : 16 yrs



Gavesh Bhardwaj (GB Sir)
Exp. : 17 yrs

Academic Pillars of JEE MOTION KOTA



Ram Ratan Dwivedi (RRD Sir)
Joint Director
Exp. : 20 yrs



Amit Verma (AV Sir)
Joint Director
Exp. : 16 yrs



Vijay Pratap Singh (VPS Sir)
Vice President
Exp. : 20 yrs



Nikhil Srivastava (NS Sir)
Head JEE Academics
Exp. : 17 yrs



Aatish Agarwal (AA Sir)
Sr. Faculty
Exp. : 17 yrs



Jayant Chittora (JC Sir)
Sr. Faculty
Exp. : 16 yrs



Anurag Garg (AG Sir)
Sr. Faculty
Exp. : 17 yrs



Arjun Gupta (Arjun Sir)
Sr. Faculty
Exp. : 14 yrs



Devki Nandan Pathak (DN Sir)
Sr. Faculty
Exp. : 13 yrs



Avinash Kishore (AVN Sir)
Sr. Faculty
Exp. : 9 yrs



Vipin Sharma (VS Sir)
Sr. Faculty
Exp. : 12 yrs



Durgesh Pandey (Pandey Sir)
Sr. Faculty
Exp. : 8 yrs

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Batch Starting from :
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