

JEE Main 2021 August 31, Shift 1 (Chemistry)

1. The major component of portland cement is

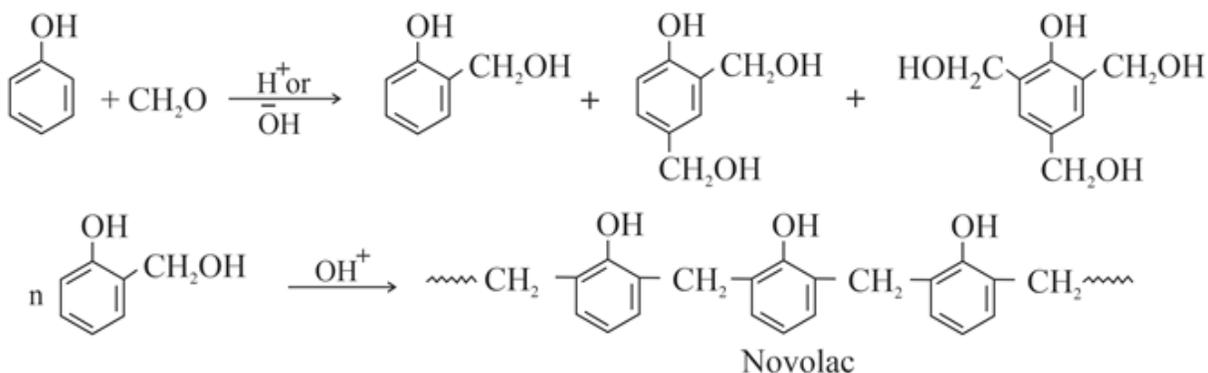
- (A) MgO
- (B) CaO
- (C) SiO_2
- (D) Al_2O_3

Ans. (b)

Sol. CaO present in 50 – 60% oxide. Remaining composition includes: Silica (20-25%), MgO (2-3%) etc.

2. Novolac is a polymer of :

- (A) o-methyl hydroxyphenol
- (B) Phenol + formaldehyde
- (C) 1,3- butadiene + styrene
- (D) None of these



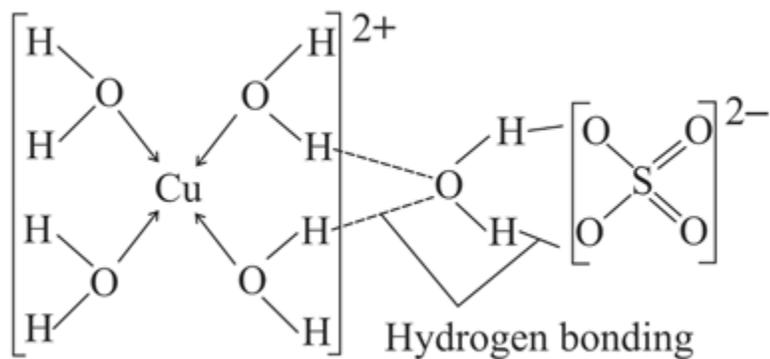
Sol. (B)

3. Number of hydrogen bonds in $CuSO_4 \cdot 5H_2O$

- (A) 4
- (B) 6
- (C) 8
- (D) 2

Ans. (A)

Sol. Number of hydrogen bonds in $CuSO_4 \cdot 5H_2O$ four hydrogen bonds are present. One molecule goes out of the Coordination sphere.



4. Which lanthanide shows +2 oxidation state?

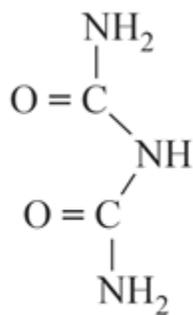
- (A) *La*
- (B) *Yb*
- (C) *Ce*
- (D) *Nd*

Ans. (B)

Sol. $Yb^{2+} = 4f^{14}$

Yb and Lu show +2 oxidation states.

5. The denticity of organic ligand Biuret is:

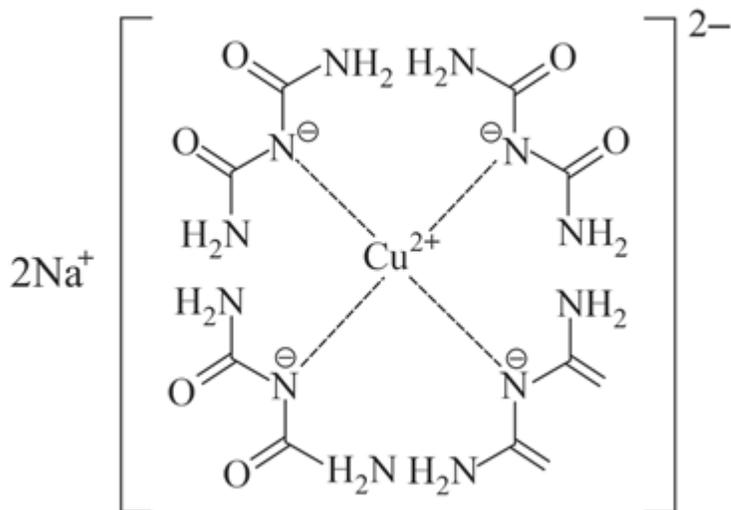


Biuret

- (A) Monodentate
- (B) Bidentate
- (C) Hexadentate

(D) Hexadentate

Ans. (A)



Sol.

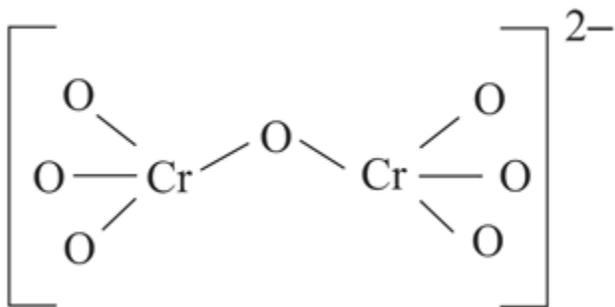
The Nitrogen atoms do not form 5 or 6 membered rings with the central atom. Hence, the denticity of the given ligand is 1.

6. Dichromate ion has:

- (A) Both linear and symmetrical $\text{Cr} - \text{O} - \text{Cr}$ bond
- (B) Both non linear and unsymmetrical $\text{Cr} - \text{O} - \text{Cr}$ bond
- (C) Symmetrical and non linear $\text{Cr} - \text{O} - \text{Cr}$ bond
- (D) Unsymmetrical and linear $\text{Cr} - \text{O} - \text{Cr}$ bond

Ans. (C)

Sol. Dichromate ion has Symmetrical and non linear $\text{Cr} - \text{O} - \text{Cr}$ bond



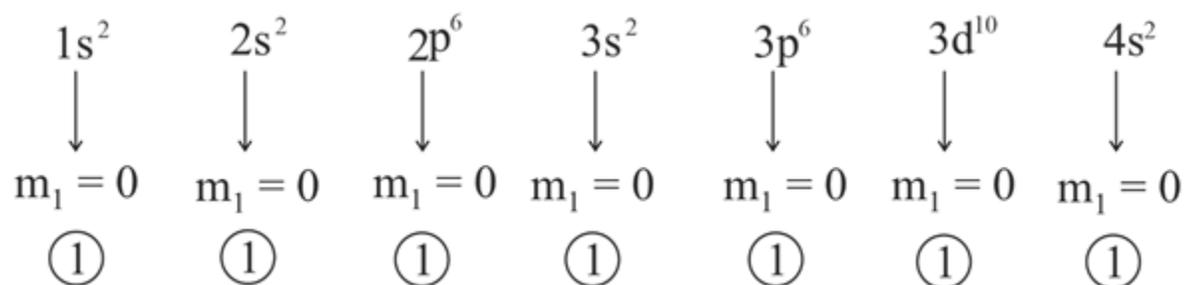
The terminal $\text{Cr}-\text{O}-\text{Cr}$ bonds are identical due to resonance. The middle $\text{Cr}-\text{O}-\text{Cr}$ bond and terminal $\text{Cr}-\text{O}-\text{Cr}$ bonds are different.

7. In Germanium, number of fully filled orbitals with $m_l = 0$:

- (A) 7
- (B) 5
- (C) 4
- (D) 3

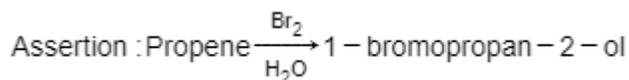
Ans. (A)

Sol. The electronic configuration of germanium is $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^2$



The 4p orbital in Ge is not fully filled and cannot be counted in the above list.

8.

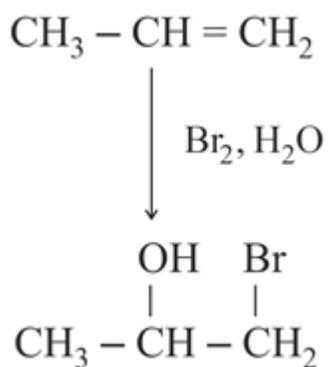


Reason : Reaction follows Markovnikov's addition

- (A) A and R are correct and R is the correct explanation of A
- (B) A and R are correct and R is not the correct explanation of A
- (C) Both A and R are incorrect
- (D) A is correct, R is incorrect

Ans. (A)

This reaction takes place via formation of cyclic bromonium ion intermediate. The cyclic ring is opened by nucleophile water. The overall reaction takes place according to the markonikov's rule.



Sol.

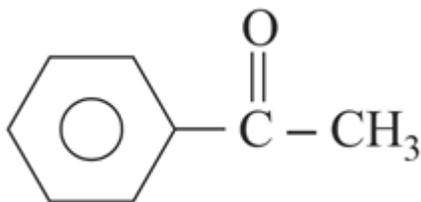
9. BOD value of clean and polluted water respectively are:

- (A) Greater than 10 ppm; less than 5 ppm
- (B) Greater than 17 ppm; less than 11 ppm
- (C) Lesser than 7 ppm; greater than 7 ppm
- (D) Lesser than 5 ppm; greater than 17 ppm

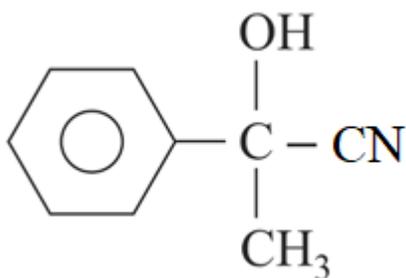
Ans. (D)

Sol. Clean water has BOD less than 5 ppm, where polluted water has BOD greater than 17 ppm

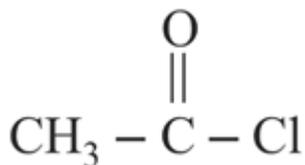
10. $\text{CH}_3\text{COOH} \xrightarrow{\text{SOCl}_2} \text{A} \xrightarrow[\text{AlCl}_3]{\text{Benzene}} \text{B} \xrightarrow{\text{HCN}} \text{C}$ Find 'C'



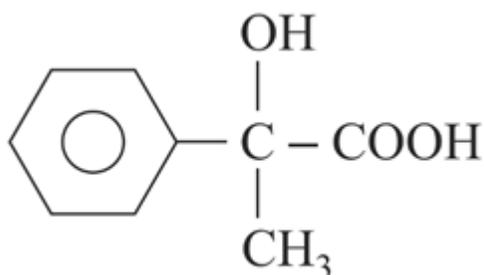
(A)



(B)



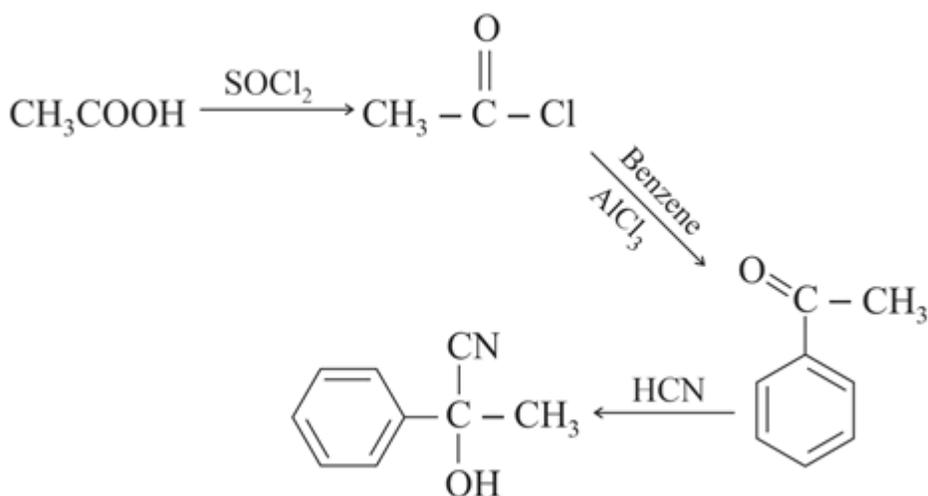
(C)



(D)

Ans. (B)

Thionyl chloride acts as a halogenating agent, it converts acetic acid to acetyl chloride. Acetyl chloride gives Friedel craft's acylation reaction with benzene in the presence of aluminium chloride, and acetophenone is formed as a product. Acetophenone in reaction with HCN, gives cyanohydrin.



Sol.

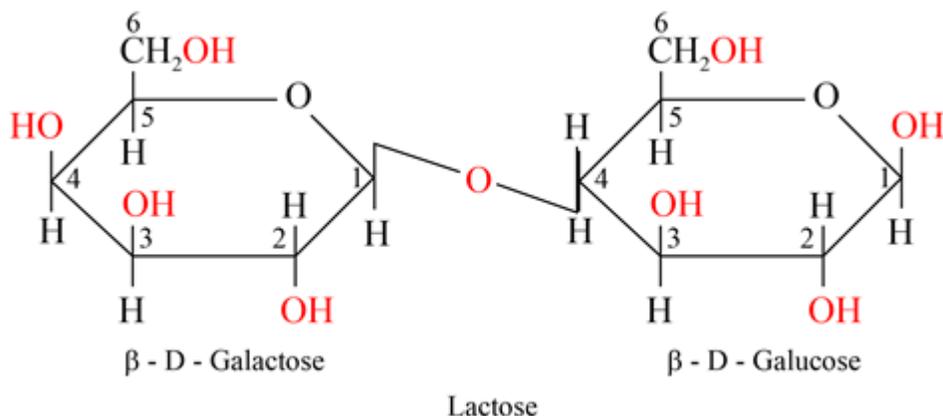
11. Which have $\beta\text{-C}_1 - \text{C}_4$ glycosidic linkage?

- (A) Amylose
- (B) Maltose
- (C) Lactose
- (D) Sucrose

Ans. (C)

Sol.

Amylose and maltose contain alpha-1,4-glycosidic linkage. Sucrose contains alpha beta glycosidic linkage.



12. S1: Syngas is produced by gasification of coal.

S2: Syngas produces CO, CO_2, H_2 are in the ratio of 1: 1: 1

- (A) Both S1 and S2 are correct
 (B) Both S1 and S2 are incorrect
 (C) S1 is correct, S2 is incorrect
 (D) S1 is incorrect, S2 is correct

Ans. (C)

Sol. Syngas produced by coal gasification generally is a mixture of 30 – 60% CO , 25 – 30% H_2 , 5 – 15% of CO_2 , 0 – 5% CH_4

13. Assertion: On moving left to right along period in periodic table metallic nature decreases and non metallic nature increases.

Reason: On moving left to right, ionization energy increases, electron gain enthalpy decreases.

- (A) A and R are correct and R is the correct explanation of A
 (B) A and R are correct and R is not the correct explanation of A
 (C) A is incorrect, R is correct
 (D) A is correct, R is incorrect

Ans. (D)

Sol. Solution: On moving left to right along period in periodic table metallic nature decreases and non metallic nature increases, On moving left to right along period in periodic table, ionisation enthalpy and electron gain enthalpy both will increase (in general).

14. Question: Assertion: Propanol and propanone can be separated by simple distillation

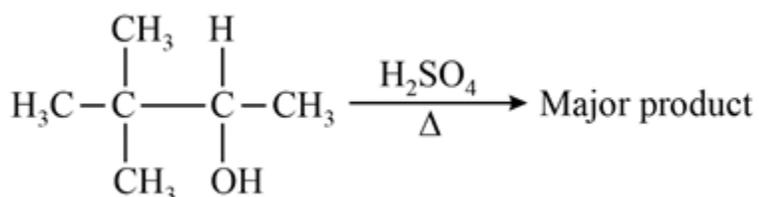
Reason: The boiling point difference between two liquids should be greater than 20 degree for simple distillation.

- (A) A and R are correct and R is the correct explanation of A
(B) A and R are correct and R is not the correct explanation of A
(C) A is correct, R is incorrect
(D) A is correct, R is incorrect

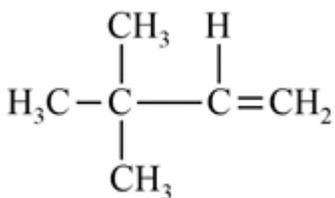
Ans. (A)

Sol. Propanol boiling point = 97°C

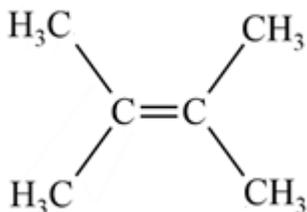
Propanone boiling point = 56°C



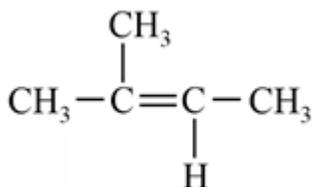
15.



(A)



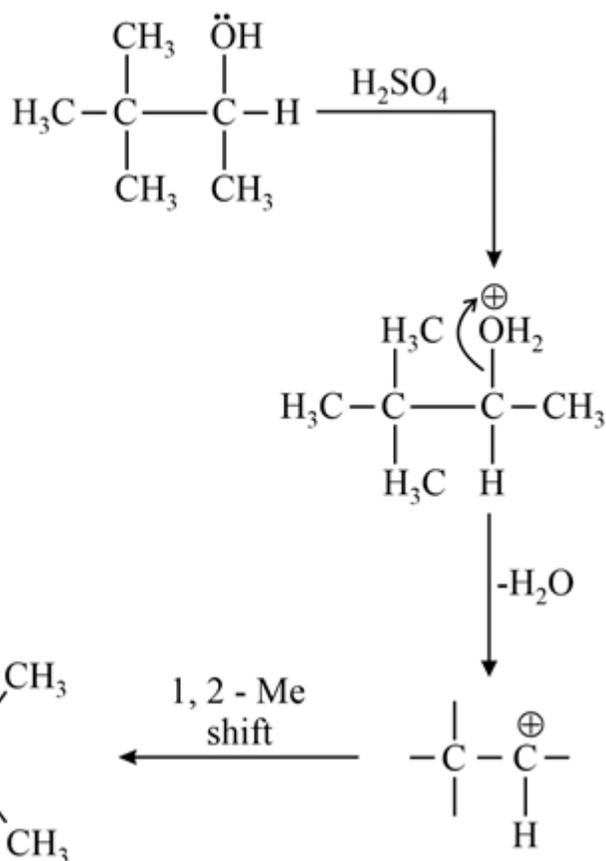
(B)



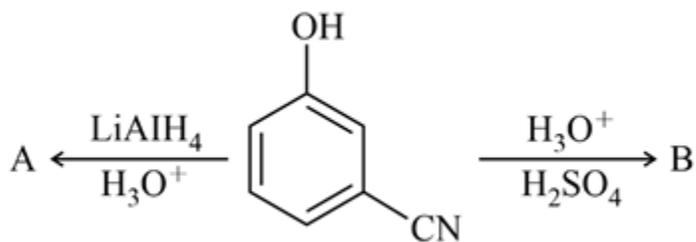
(C)

(D) None of these

Ans. (B)

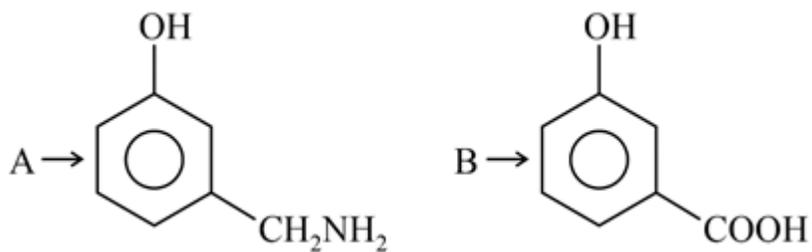


Sol.

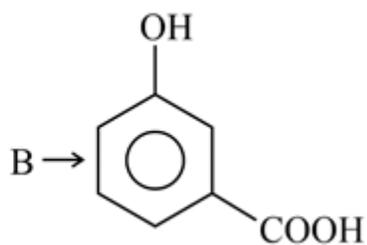
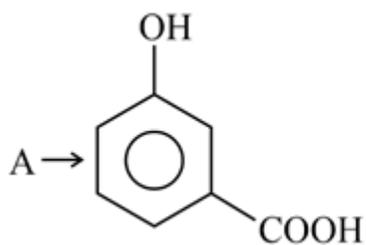


16.

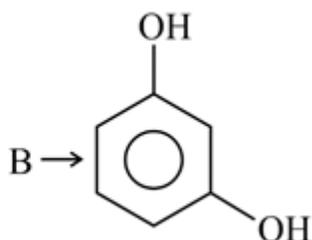
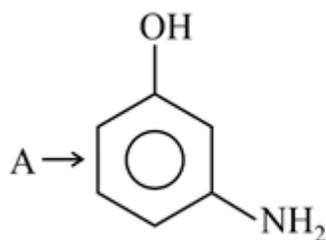
Major products A and B are:



(A)



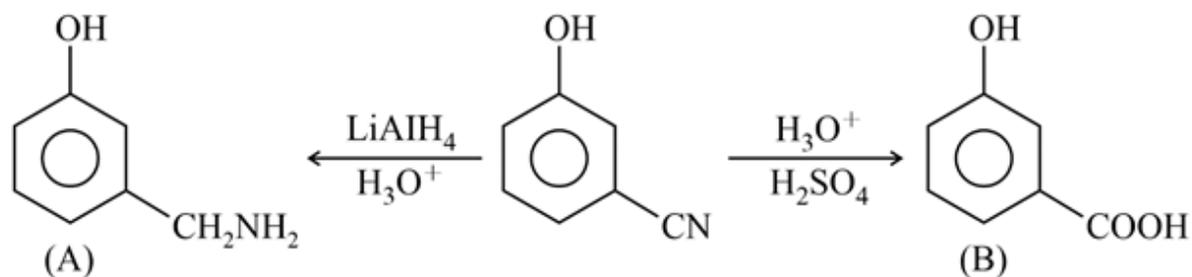
(B)



(C)

(D) None of these

Ans. (A)



Sol.

17. Solubility of a salt A_2B_3 is x , K_{sp} of salt is $k(x)^5$ Find k .

(A) 72

(B) 69

(C) 108

(D) 52

Ans. (C)

Sol. $A_2B_3 \rightarrow 2A^{3+} + 3B^{-2}$

$$K_{sp} = (2s)^2(3s)^3 = 108s^5$$

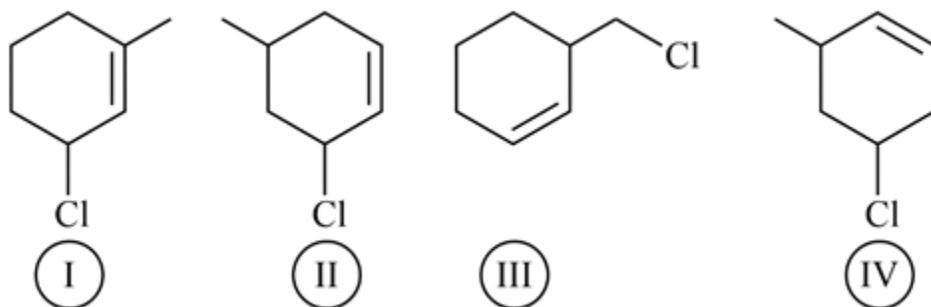
Solubility = x

$$108x^5$$

E

$k = 108$

18. Arrange the reactivity order of the following in acetone and KI



(A) $II > I > III > IV$

(B) $III > II > I > IV$

(C) $IV > III > I > II$

(D) $II > I > VI > III$

Ans. (A)

Sol. Acetone is a polar aprotic solvent, Hence, the reaction follows S_N2 mechanism. S_N2 reactivity : $II > I > III > IV$

19. Find the ratio of $t_{75\%}$ and $t_{50\%}$ of first order reaction.

(A) 1

(B) 2

(C) 1.5

(D) 2.5

Ans. (B)

Sol

For a first order reaction

$$t_{75\%} = 2 \times t_{50\%}$$

$$\frac{t_{75\%}}{t_{50\%}} = \frac{2}{1}$$

20. Which of the following aqueous solution of same concentration has highest depression in freezing point?

(A) Glycine

(B) Glycerol

(C) $KHSO_4$

(D) Glucose

Ans. (C)

Sol. $\Delta T_F = i \times K_F \times m$

For $KHSO_4$

$i = 2$, "for" K^+, HSO_4^-

So, $\Delta T_F \propto i$

21. Number of halogen atom in halic acid (V) is:

Ans. 1.00

Sol. Halic (v) acid (Halic acid) $HOClO_2$ (chloric acid), $HOBrO_2$ (bromic acid), $HOIO_2$ (iodic acid)

22. Which of the following can convert Nitrobenzene to aniline?

$Sn + HCl$

$Sn + NH_4OH$

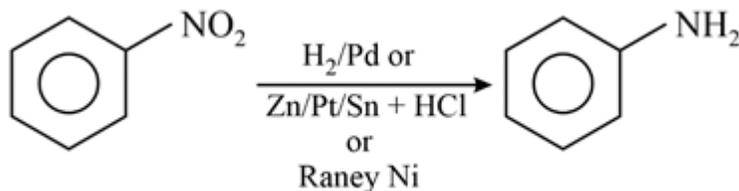
H_2/Pd

$H_2/Raney Ni$

Pt/HCl

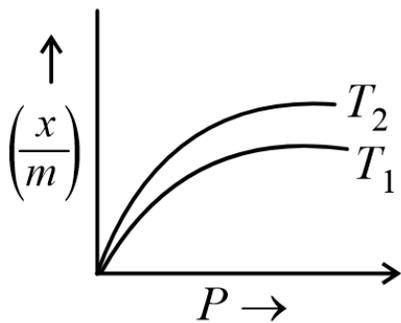
Zn/HCl

Ans. 5.00

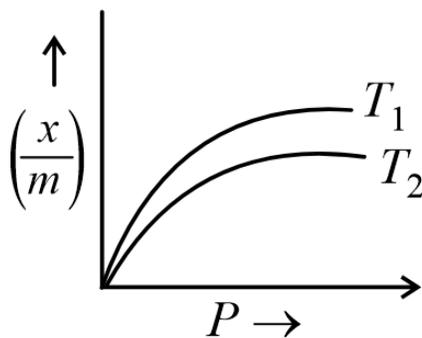


Sol.

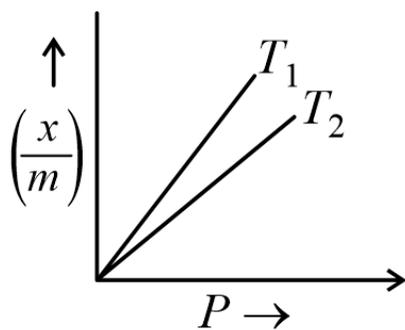
23. The graph of $\left(\frac{x}{m}\right)$ Vs P at two different temperature. T_1 and T_2 is [where $T_1 > T_2$]



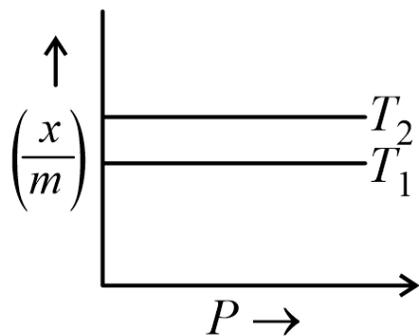
(A)



(B)



(C)



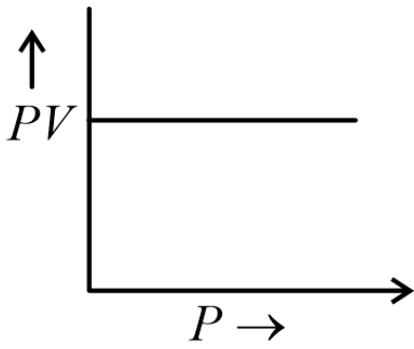
(D)

Ans. (A)

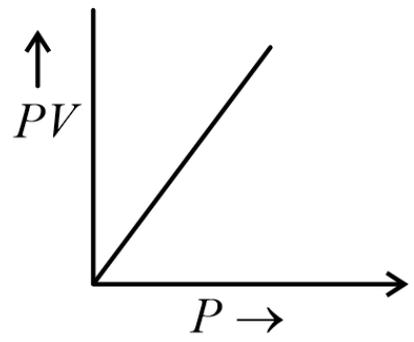
Sol. Adsorption is an exothermic process. Hence, on increase in temperature $\left(\frac{x}{m}\right)$ is decreases.

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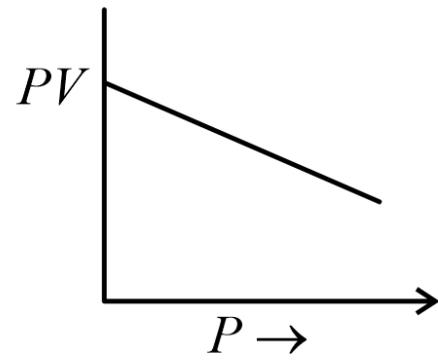
24. At constant temperature for given amount of an ideal gas the correct graph between PV Vs P is



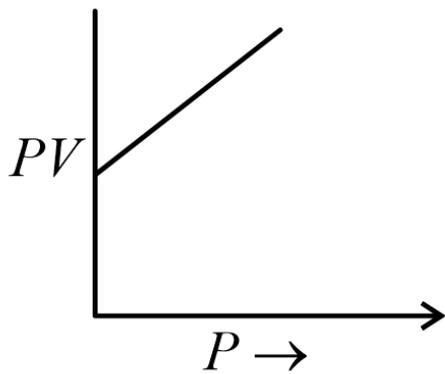
(A)



(B)



(C)



(D)

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Ans. (A)

Sol. From ideal gas equation

$$PV = nRT \text{ [At constant temperature for fixed amount of ideal gas]}$$

$$PV = \text{constant}$$

Hence, PV vs P curve is straight line parallel to pressure axis.

25. Assertion : In electrolytic reduction of Al_2O_3 we use Cryolyte.

Reason : Oxidation state of Al in cryolite is +3.

(A) Assertion is correct but Reason is not correct.

(B) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

(C) Assertion is not correct but Reason is correct.

(D) Both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

Ans. (D)

Sol. In electrolytic reduction of Al_2O_3 we use cryolite to increase conductivity and decrease melting point. Cryolyte is Na_3AlF_6 , Oxidation number of Al is +3

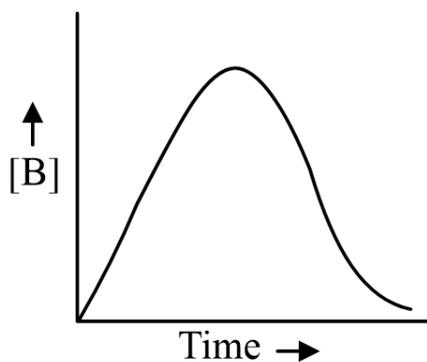
26. How many of the following is / are soluble in 50% HNO_3 solution

CdS , PbS , As_2S_3 , CuS , HgS , Bi_2S_3

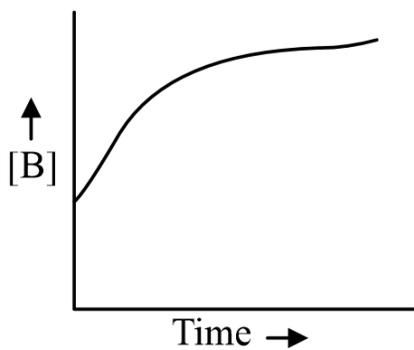
Ans. 5

Sol. CdS , PbS , As_2S_3 , Bi_2S_3 and CuS , are soluble in 50% HNO_3 while HgS is, insoluble in 50% HNO_3 but soluble in aqua regia.

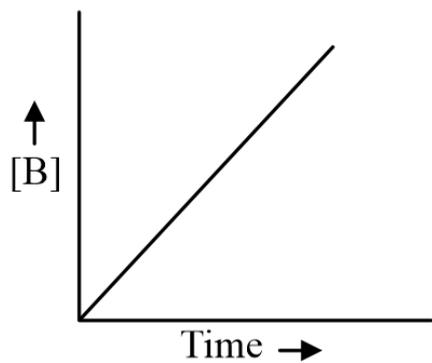
27. In a Radioactive decay $A \xrightarrow{k_1} B \xrightarrow{k_2} C (K_1 > K_2)$



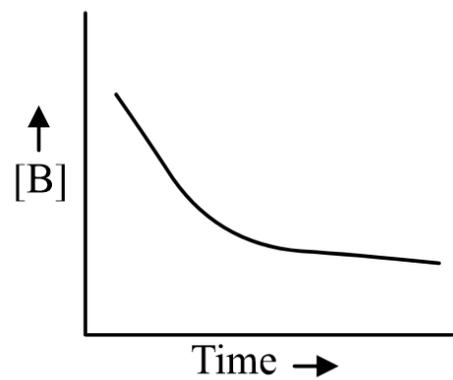
(A)



(B)

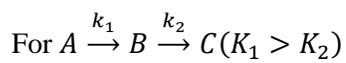


(C)



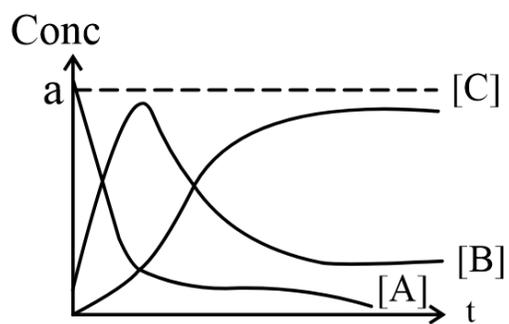
(D)

Ans. (A)



Curve for all species (A, B and C), with respect to time is:

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28. 6.3 gram of $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ is dissolve in 250 ml of water, then its molarity is $[x] \times 10^{-2}\text{M}$, then value of X is _____.

Ans. $M = \frac{W_{\text{solute}} \times 1000}{\text{molar mass of solute} \times V_{\text{ml}}}$

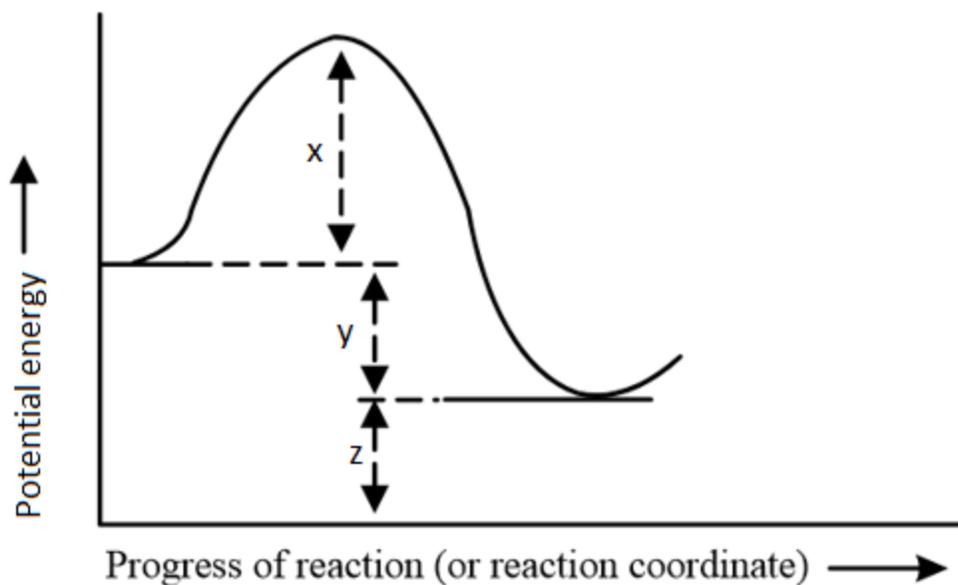
$= \frac{6.3 \times 1000}{126 \times 250} = 0.2 \text{ M}$

$= 20 \times 10^{-2}$

So $X = 20$

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29. For reaction $A + B \rightarrow M + N$, following energy diagram is obtained.

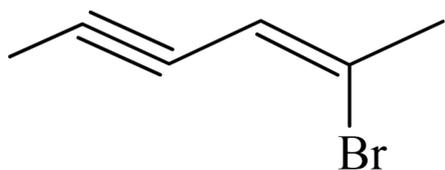


If $x = 50\text{kJ/mole}$, $y = 45\text{kJ/mole}$ and $z = 30\text{kJ/mole}$, then value of ΔH_{rxn} . (in kJ/mole) is

Ans. (45)

Here $\Delta H_{\text{rxn}} = \text{potential energy of products} - \text{potential energy of reactants} = y = 45\text{kJ/mole}$

30. The correct IUPAC name of given compound is-



- (A) 2-Bromohex-2-yn-3-ene
- (B) 2-Bromohex-4-yn-2-ene
- (C) 2-Bromohex-2-en-4-yne
- (D) 2-Bromohex-5-en-2-yne

Ans. (C)

If a molecule contains both a double and a triple bond, the carbon chain is numbered so that the first multiple bonds get a lower number. Here both double bond and triple bond are getting same numbers, hence, numbering is done according to alphabetical order.

