JEE MAIN 4th Attempt

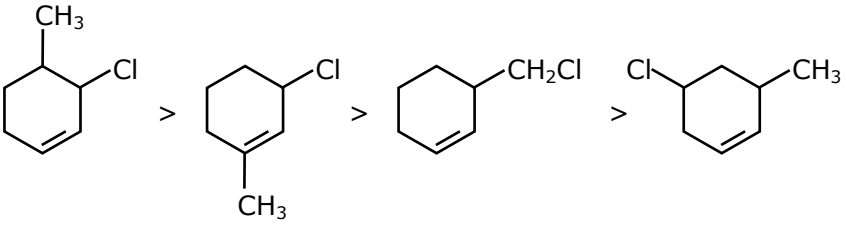
CHEMISTRY

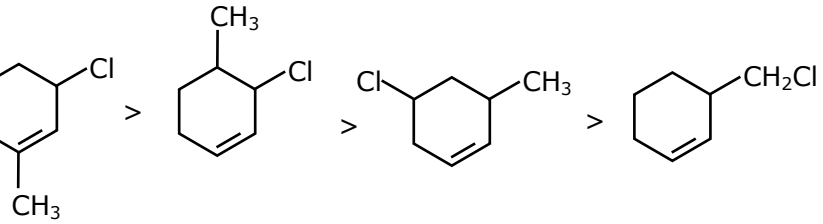
31st August 2021 [SHIFT – 1]

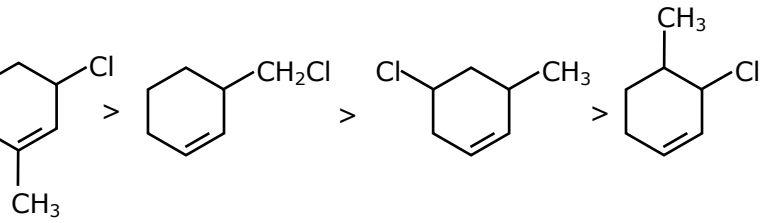
QUESTION WITH SOLUTION

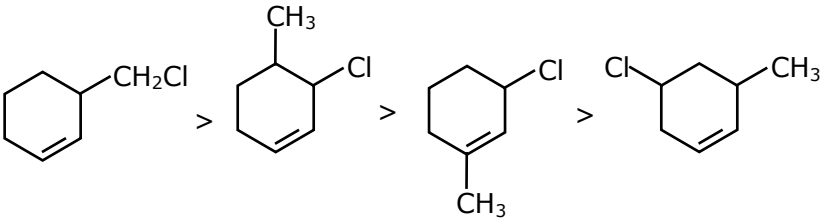
SECTION - A

Q.1 The correct of reactivity of the given chlorides with acetate in acetic acid is :

(1) 

(2) 

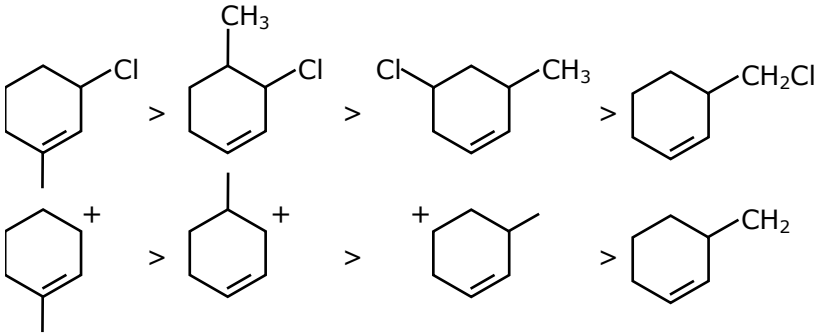
(3) 

(4) 

Sol. 2

Sol. As it is example of SN1.

So carbocation stability ↑, reaction rate ↑



Q.2 Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).
Assertion (A) : A simple distillation can be used to separate a mixture of propanol and propanone.
Reason (R) : Two liquids with a difference of more than 20°C in their boiling points can be separated by simple distillations.
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 false but (R) is true.
(3) (A) is true but (R) is false
(4) Both (A) and (R) are correct and (R) is the correct explanation of (A).

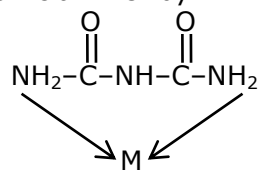
Sol. 1

Official Ans. by NTA (4)
Both assertion & reason are correct & (R) is the correct explanation of (A)

Q.3 The denticity of an organic ligand, biuret is :
(1) 6 (2) 3 (3) 2 (4) 4

Sol. 2

Official Ans. by NTA (1)



Biuret :- Bidentate ligand
The denticity of organic ligand is 2.

Q.4 Given below are two statements :
Statement I : The process of producing syn-gas is called gasification of coal.
Statement II : The composition of syn-gas is $CO+CO_2+H_2$ (1:1:1).
In the light of the above statements, choose the most appropriate answer from the options given below.
(1) Statements I is false but Statement II is trure.
(2) Both Statement I and Statement II are true.
(3) Both Statement I and Statement Ii are false.
(4) Statement I is true but Statement II is false.

Sol. 4

The process of producing syn-gas from coal is called gasification of coal.
Syn-gas having composition of CO & H2 in 1 : 1

Q.5 Which one of the following compounds contains β-C_1-C_4 glycosidic linkage ?
(1) Lactose (2) Sucrose
(3) Maltose (4) Amylose

Sol. 1

Official Ans. by NTA (1)
In Lactose it is β C_1 – C_4 glycosidic linkage.
In Maltose, Amylose α C_1 – C_4 glycosidic linkage is present

Q.6 Monomer of Novolac is :

(1) 1,3-Butadiene and styrene.

(2) Phenol and melamine.

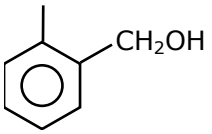
(3) o-Hydroxymethylphenol.

(4) 3-Hydroxybutanoic acid.

Sol. 3

Official Ans. by NTA (3)

Monomer of Novolac is



O-hydroxy methyl phenol

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

Assertion (A) : Aluminium is extracted from bauxite by the electrolysis of moltan mixture of Al_2O_3 with cryolite.

Reason (R) : The oxidation state of Al in cryolite is +3.

In the light of the above statements, choose the most appropriate answer from the option given below.

(1) (A) is false but (R) is true

(2) Both (A) (R) are correct and (R) is the correct explanation of (A).

(3) Both (A) and (R) are correct but (R) is not the correct explanation of (A).

(4) (A) is true but (R) is false.

Sol. 3

Official Ans. by NTA (4)

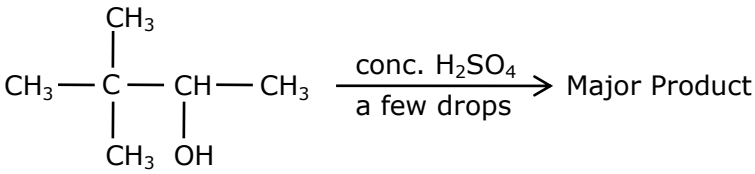
(A) Aluminium is reactive metal so Aluminium is extracted by electrolysis of Alumina with molten mixture of Cryolite

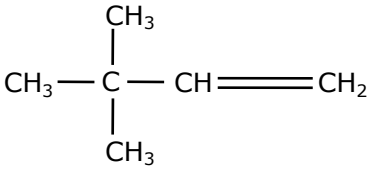
(B) Cryolite, Na_3AlF_6

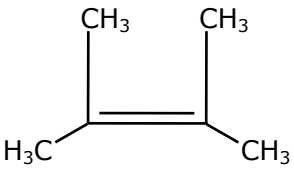
Here Al is in +3 O.S.

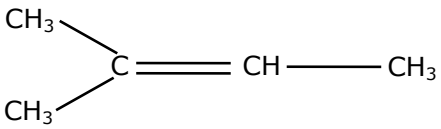
So Answer is 4

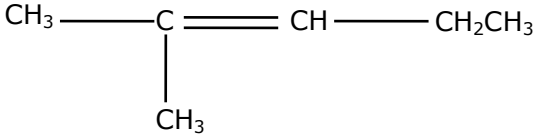
Q.8 The major product formed in the following reactions is :



(1) 

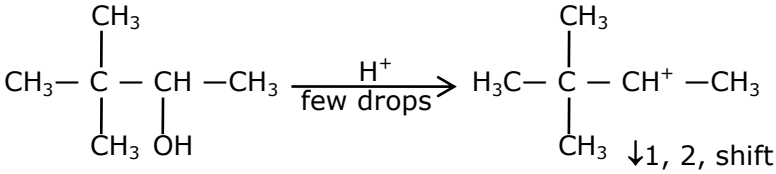
(2) 

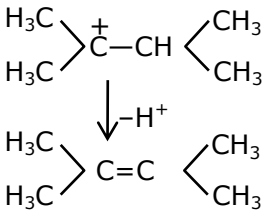
(3) 

(4) 

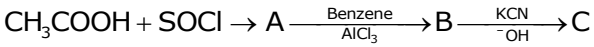
Sol. 2

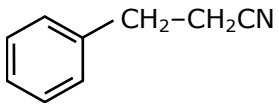
Official Ans. by NTA (2)

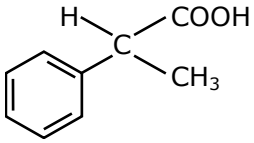


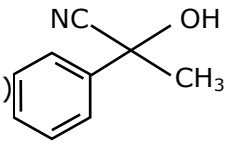


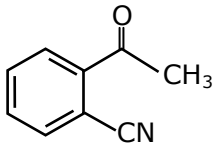
Q.9 The structure of product C, formed by the following sequence of reactions is :



(1) 

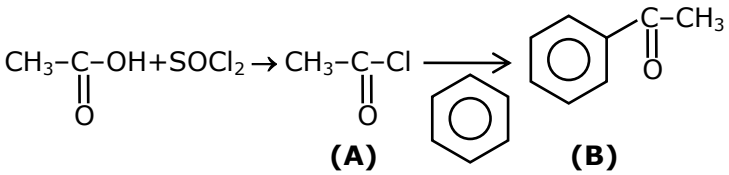
(2) 

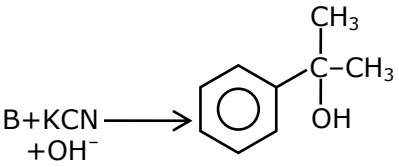
(3) 

(4) 

Sol. 3

Official Ans. by NTA (1)





Q.10 Which one of the following 0.10 M aqueous solutions will exhibit the largest freezing point depression ?

(1) glucose (2) hydrazine

(3) $KHSO_4$ (4) glycine

Sol. **3**

Official Ans. by NTA (4)

$\because$ Van't Hoff factor is highest for KHSO4

$\therefore$ colligative property (ΔT_f) will be highest for $KHSO_4$

Q.11 In the structure of the dichromate ion, there is a :

(1) non-linear unsymmetrical Cr-O-Cr bond.

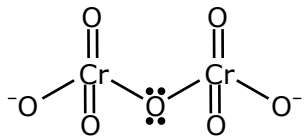
(2) linear symmetrical Cr-O-Cr bond.

(3) linear unsymmetrical Cr-O-Cr bond.

(4) non-linear symmetrical Cr-O-Cr bond.

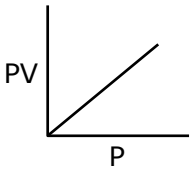
Sol. **1**

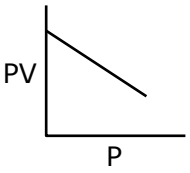
Official Ans. by NTA (2)

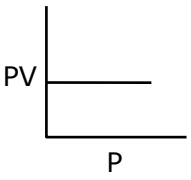


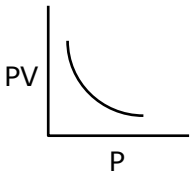
dichromate ion contain non-linear symmetrical Cr–O–Cr Bond

Q.12 Which one of the following is the correct PV vs P plot at constant temperature for an ideal gas ? (P and V and for pressure and volume of the gas respectively)

(1) 

(2) 

(3) 

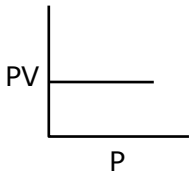
(4) 

Sol. **3**

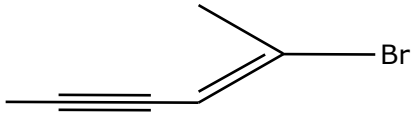
Official Ans. by NTA (1)

PV = nRT (n,T constant)

PV = constant



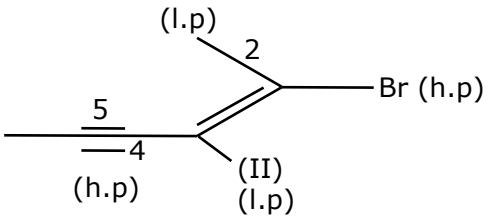
Q.13 Choose the correct name for compound given below :



(1) (4E)–5–Bromo-hex–4–en–2–yne
(2) (2E)–2–Bromo-hex–4–en–2–yne
(3) (4E)–5–Bromo-hex–2–en–2–yne
(4) (2E)–2–Bromo-hex–2–en–4–yne

Sol. **4**

Official Ans. by NTA (3)



h.p ⇒ higherpriority

l.p. ⇒ lowerpriority

2E –2- bromo hex –2- en–4-yne

Q.14 BOD values (in ppm) for clean water (A) and polluted water (B) are expected respectively as :

(1) A > 15, B > 47 (2) A < 5, B > 17
(3) A > 25, B < 17 (4) A > 50, B < 27

Sol. 2

Official Ans. by NTA (3)
BOD values of clean water (A) is less than 5 ppm
So A < 5
BOD values of polluted water (B is greater than 17 ppm
So B > 17
So Ans. is 3

Q.15 Which one of the following lanthanides exhibits +2 oxidation state with diamagnetic nature ? (Given Z for Nd=60, Yb=70, La=57, Ce=58)

(1) La (2) Ce (3) Nd (4) Yb

Sol. 4

Official Ans. by NTA (2)
Ytterbium shows +2 oxidation state with diamagnetic nature

Q.16 Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A) : Metallic character decreases and non-metallic character increases on moving from left to right in a period.

Reason (R) : It is due to increase in ionization enthalpy and decrease in electron gain enthalpy, when one moves from left to right in a period.

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) Both (A) and (R) are correct and (R) is the correct explanation of (A).
(3) (A) is false but (R) is true.
(4) (A) is true but (R) is false.

Sol. 4

Official Ans. by NTA (2)
From left to right in periodic table :-
Metallic character decreases
Non-metallic character increases
$\Rightarrow$ It is due to increase in ionization enthalpy and increase in electron gain enthalpy.

Q.17 Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A) : Treatment of bromine water propene vields 1-bromopropan-2-ol.

Reason (R) : Attack of water on bromonium ion follows Markovnikov rule and results in 1-bromopropan-2-ol.

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

(1) Both (A) and (R) are true but (R) is NOT the correct explanation of (A).

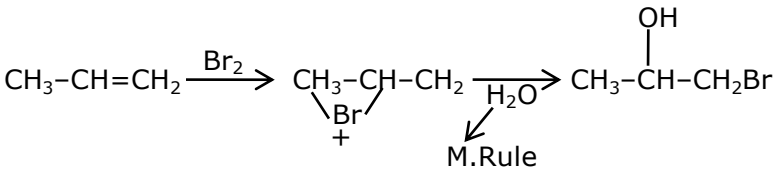
(2) (A) is false but (R) is true.

(3) (A) is true but (R) is false.

(4) Both (A) and (R) are true and (R) is the correct explanation of (A).

Sol. 4

Official Ans. by NTA (3)



Its IUPAC name 1-bromopropan–2-ol

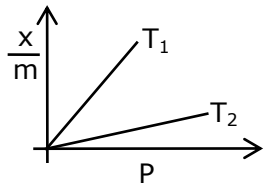
A and R are true and (R) is the correct explanation of (A)

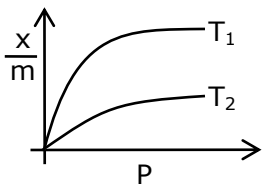
Q.18 Select the graph that correctly describes the adsorption isotherms at two temperature T_1 and T_2 ($T_1 > T_2$) for a gas :

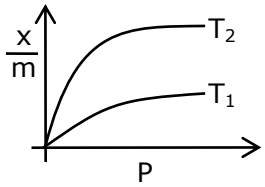
(x – mass of the gas adsorbed)

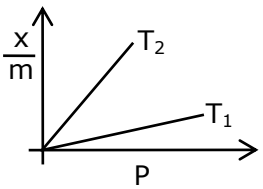
m– mass of adsorbent

P – pressure

(1) 

(2) 

(3) 

(4) 

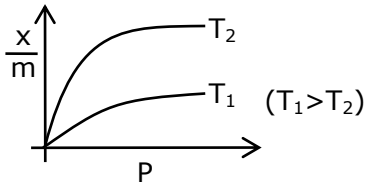
Sol. **3**

Official Ans. by NTA (4)

$\frac{x}{m}\alpha P^{1/n}\left(0<\frac{1}{n}<1\right)$

On Increasing temperature $\frac{x}{m}$ decreases.

$\because$ adsorption is generally exothermic



Q.19 The major component/ingredient of Portland Cement is :

(1) tricalcium aluminate (2) tricalcium silicate

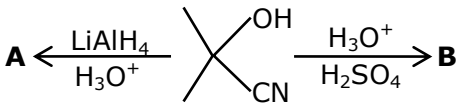
(3) dicalcium silicate (4) dicalcium aluminate

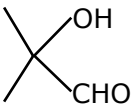
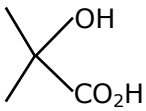
Sol. **2**

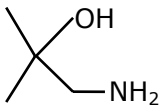
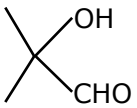
Official Ans. by NTA (2)

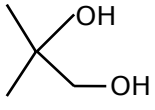
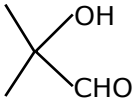
Major component of portland cement is "Tricalcium silicate (51% , $3CaO.SiO_2$)

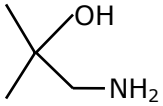
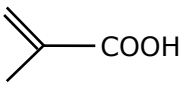
Q.20 The major products A and B in the following set of reactions are :



(1) **A =**  , **B =** 

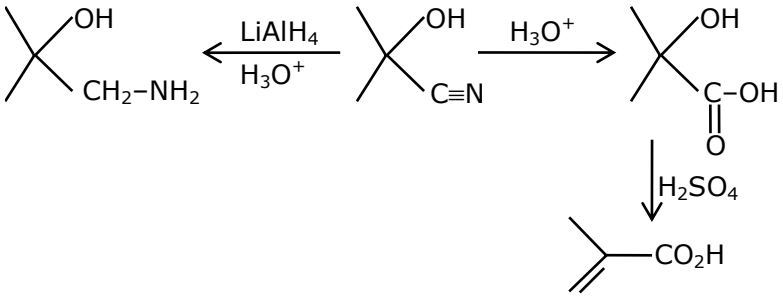
(2) **A =**  , **B =** 

(3) **A =**  , **B =** 

(4) **A =**  , **B =** 

Sol. **4**

Official Ans. by NTA (3)



Section B

Q.1 Consider the sulphides HgS,PbS, CuS, Sb_2S_3, As_2S_3 and CdS. Numer of these sulphides solube in 50% HNO_3 is _____.

Sol. **4**

Official Ans. by NTA (4)

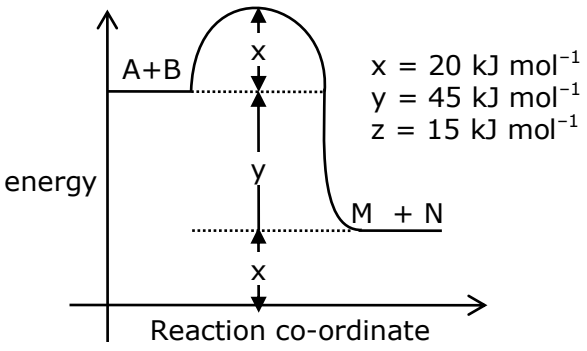
Pbs, CuS, As_2S_3, CdS are soluble in 50% HNO_3 HgS, Sb_2S_3 are insoluble in 50% HNO3

So Answer is 4.

4. The total number

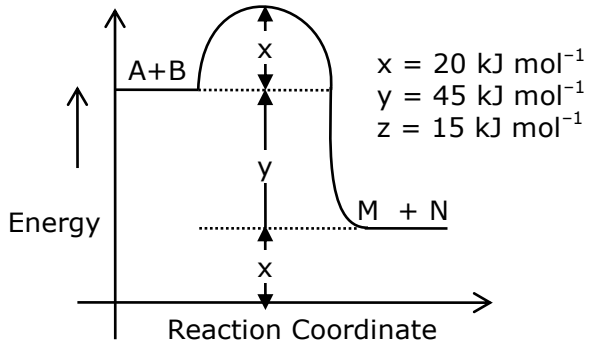
Q.2 According to the following figure, the magnitude of the enthalpy change of the reation A+B $\rightarrow$ M + N in kJ mol^{-1}

is equal to _____. (Integer answer)



Sol. **45**

Official Ans. by NTA (45)



$\Delta H = E_{a_f} - E_{a_b}$

= 20 – 65

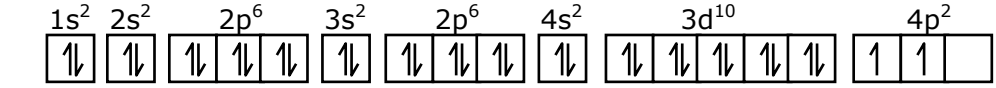
= – 45 KJ/ mol

$|\Delta H|$ = 45 KJ/mol

Q.3 Ge (Z =32) in its ground state electronic configuration has x completely filled orbitals with m_l = 0. The value of x is _____

Sol. **7**

Official Ans. by NTA (7)



Completely filled orbital with m_ℓ = 0 are

= 1+1+1+1+1+1+1

= 7

So Answer is 7

Q.4 The total number of regents from those given below, that can convert nitrobenzene into aniline is _____. (Integer answer)

I. Sn – HCl

II. Sn – NH_4OH

III. Fe – HCl

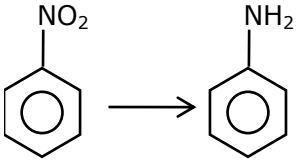
IV. Zn – HCl

V. H_2 – Pd

VI. H_2 – Raney Nickel

Sol. **5**

Official Ans. by NTA (5)



Reagents used can be

(i) Sn + HCl
(ii) Fe + HCl
(iii) Zn + HCl
(iv) H_2 – Pd
(v) H_2 (Raney Ni)

Q.5 The molarity of the solution prepared by dissolving 6.3 g of oxalic acid ($H_2C_2O_4\ 2H_2O$) in 250 mL of water in mol L^{-1} is x $\times 10^{-2}$. The value of x is _____.
(Nearest integer)
[Atomic mass : H : 1.0,C : 12.0,O : 16.0]

Sol. **20**

Official Ans. by NTA (20)

$$[H_2C_2O_4\,2H_2O] = \frac{\text{weight}/M_w}{V(L)}$$

$$\Rightarrow x \times 10^{-2} = \frac{6.3/126}{250/1000}$$

x = 20

Q.6 For a first order reaction the ratio of the time for 75% completion of a reaction to the time for 50% completion is_____(integer answer)

Sol. **2**

Official Ans. by NTA (2)

$$k = \frac{2.303}{t}\log\frac{a}{a-x}$$

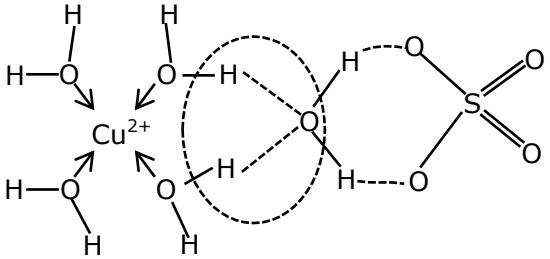
$$\frac{2.303}{t_{50\%}}\log\frac{100}{100-50} = \frac{2.303}{t_{50\%}}\log\frac{100}{100-75}$$

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

Q.7 The number of hydrogen bonded water molecule(s) associated with stoichiometry $CuSO_4\ 5H_2O$ is _____

Sol. **3**

Official Ans. by NTA (1)



Q.8 The number of halogen/(s) forming halic (V) acid is_____

Sol. **3**

Official Ans. by NTA (3)

The number of halogen forming halic (V) acid

$HClO_3$

$HBrO_3$

HIO_3

So Answer is 3

Q.9 A_3B_2 is a sparingly soluble salt of molar mass M(g mol^{-1}) and solution x gL^{-1}. The solution product satisfies $K_{sp} = a\left(\frac{x}{M}\right)^5$. The value of a is _____.(Integer answer)

Sol. **108**

Official Ans. by NTA (108)

$A_3B_2 \rightleftharpoons 3A^{+2}_{(aq)} + 2B^{-3}_{(aq)}$

3s 2s

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

K_{sp} = 108 S5 & s = (X/M)

$K_{sp} = 108\left(\frac{x}{m}\right)^5$

given $K_{sp} = a\left(\frac{x}{m}\right)^5$

comparing a = 108

Q.10 Consider the following cell reaction

$$Cd_{(s)} + Hg_2SO_{4(s)} + \frac{9}{5}H_2O_{(l)} \rightleftharpoons CdSO_4\frac{9}{5}H_2O_{(s)} + 2Hg_{(l)}$$

The value of E^0_{cell} is 4.315 V at 25^0C. If ΔH^0= - 825.2 kJ mol^{-1}, the standard entropy change ΔS^0 in J K^{-1} is_____(Nearest integer)

[Given : Faraday constant = 96487 C mol^{-1}]

Sol. **25**

Official Ans. by NTA (25)

$\Delta G^o = -nFE^o = \Delta H^o - T\Delta S^o$

$= \frac{\Delta^o + nFE^o}{T}$

$= \frac{(-825.2 \times 10^3) + (2 \times 96487 \times 4.315)}{298}$

$= \frac{-825.2 \times 10^3 + 832.682 \times 10^3}{298}$

$= \frac{7.483 \times 10^3}{298} = 25.11\ JK^{-1}mol^{-1}$

$\therefore$ Nearest integer answer is 25