CHEMISTRY
JEE-MAIN (July-Attempt)
27 July (Shift-2) Paper Solution

SECTION - A

1. The correct decreasing order of energy for the orbitals having, following set of quantum numbers:

(A) $n = 3, l = 0, m = 0$
(B) $n = 4, l = 0, m = 0$
(C) $n = 3, l = 1, m = 0$
(D) $n = 3, l = 2, m = 1$

(A) (D) > (B) > (C) > (A)
(B) (B) > (D) > (C) > (A)
(C) (C) > (B) > (D) > (A)
(D) (B) > (C) > (D) > (A)

Sol. **A**

Energy of Orbital α value of $(n + l)$
When same value of $(n + l)$ then
Energy of orbital α value of n

	n		*l*		*(n+l)*
(A)	*3*	*+*	*0*	*=*	*3*
(B)	*4*	*+*	*0*	*=*	*4*
(C)	*3*	*+*	*1*	*=*	*4*
(D)	*3*	*+*	*2*	*=*	*5*

Energy order : (D) > (B) > (C) > (A)
Correct option-A

2. Match List-I with List-II

List-I	**List-II**
(A) $\psi_{MO} = \psi_A - \psi_B$	(I) Dipole moment
(B) $\mu = Q \times r$	(II) Bonding molecular orbital
(C) $\frac{N_b - N_a}{2}$	(III) Anti-bonding molecular orbital
(D) $\psi_{MO} = \psi_A + \psi_B$	(IV) Bond order

Choose the correct answer from the options given below

(A) (A)-(II), (B)-(I), (C)-(IV), (D)-(III)
(B) (A)-(III), (B)-(IV), (C)-(I), (D)-(I)
(C) (A)-(III), (B)-(I), (C)-(IV), (D)-(II)
(D) (A)-(III), (B)-(IV), (C)-(II), (D)-(I)

Sol. **C**

(A) $\psi_{MO} = \psi_A - \psi_B$ → Anti-bonding molecular orbital
(B) $\mu = Q \times r$ → Dipole moment
(C) $\frac{N_b - N_a}{2}$ → Bond order
(D) $\psi_{MO} = \psi_A + \psi_B$ → Bonding molecular orbital

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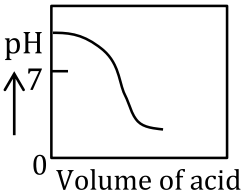
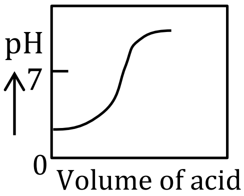
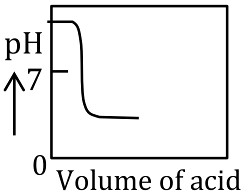
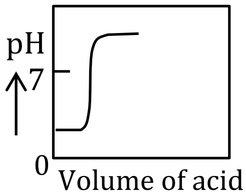
3. The plot of pH-Metric titration of weak base NH_4OH vs strong acid HCl looks like:

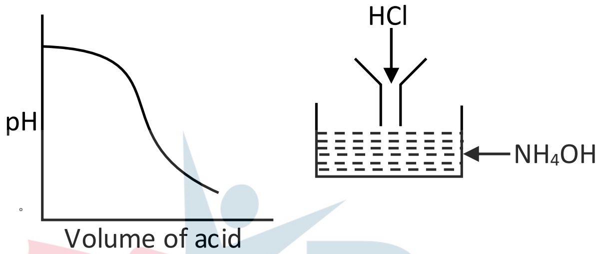
(A) 

(B) 

(C) 

(D) 

Sol. **A**



$HCl + NH_4OH \longrightarrow NH_4Cl + H_2O$

At end point

After end print $HCl \longrightarrow H^{\oplus} + Cl^{-}$

(P^H decrese slowly)

4. Given below are two statements:

Statement I : For KI, molar conductivity increases steeply with dilution

Statement II : For carbonic acid, molar conductivity increases slowly with dilution

In the light of the above statements, choose the correct answer from the option given below:

(A) Both statement I and Statement II are true:

(B) Both statement I and Statement II are false

(C) Statement I is true but Statement is false

(D) Statement I is false but statement II is true

Sol. **B**

$KI \longrightarrow K^{+} + I^{-}$

(Strong electrolyte)

On dilution. Molar conductivity Inc. steeply

$$H_2CO_3 \rightleftharpoons 2H^{\oplus} + CO_3^{-2}$$

(weak electrolyte)

On dilution molar conductivity inc steeply

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

Assertion (A) : Dissolved substance can be removed from a colloidal solution by diffusion through a parchment paper.

Reason (R) : Particles in a true solution cannot pass through parchment paper but the colloidal particles can pass through the parchment paper.

In the light to the above statements, choose the correct answer from the option given below:

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

(B) Both (A) and (R) are correct and (R) is not the correct explanation of (A)

(C) (A) is correct but (R) is not correct

(D) (A) is correct but (R) is correct

Sol. **C**

(A) Dissolved substances can be removed from a colloidal solution by diffusion through a parchment paper. Correct

(R) Parchment paper : true solution passed and colloided solution cannot passed.

Correct Ans. (C)

6. Outermost electronic configuration of four elements A, B, C, D are given below:

(A) $3s^2$ (B) $3s^2 3p^1$

(C) $3s^2 3p^3$ (D) $3s^2 3p^4$

The correct order of first ionization enthalpy for them is:

(A) (A) < (B) < (C) < (D) (B) < (A) < (D) < (C)

(B) (B) < (D) < (A) < (C) (B) < (A) < (C) < (D)

Sol. **B**

$3s^2 3p^1 < 3s^2 < 3s^2 3p^4 < 3s^2 3p^3$

7. An element A of group 1 shows similarity to an element B belonging to group 2. If A has maximum hydration enthalpy in group 1 then B is:

(A) Mg (B) Be (C) Ca (D) Sr

Sol. **A**

In group 1 Li has highest hydration enthalpy which has diagonal relationship with group II element Mg.

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

Assertion (A) : Boron is unable to form BF_6^{3-}

Reason (R) : Size of B is very small

In the light to the above statements, choose the correct answer from the option given below:

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

(B) Both (A) and (R) are correct and (R) is not the correct explanation of (A)

(C) (A) is correct but (R) is not correct

(D) (A) is correct but (R) is correct

Sol. **B**

Boron do not form BF_6^{-3} because. Boron does not have vacent d orbital.

So, it can not expand octect.

9. In neutral or alkaline solution, MnO_4^- oxidises thiosulphate to:

(A) $S_2O_7^{2-}$ (B) $S_2O_8^{2-}$ (C) SO_3^{2-} (D) SO_4^{2-}

Sol. **D**

$8KMnO_4 + 3S_2O_3^{-2} + H_2O \rightarrow 8MnO_2 + 6SO_4^{-2} + 2OH^-$

10. Low oxidation state of metals in their complexes are common when ligands:

(A) have good π-accepting character
(B) have good σ-donor character
(C) are having good π-donating ability
(D) are having poor σ- donating ability

Sol. **A**

When metal has low oxidation state, it has more density in d orbital.

So, it has more tendency to back donate electrons, thus compound must have good π acceptor ligand.

11. Given below are two statements :

Statement I : The non bio-degradable fly ash slag from steel industry can be used by cement industry.

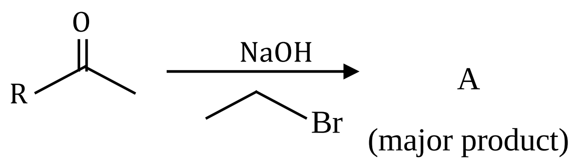
Statement II : The fuel obtained from plastic waste is lead free.

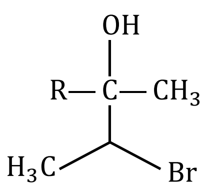
(A) Both statement I and Statement II are correct
(B) Both statement I and statement Ii are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but statement II is correct

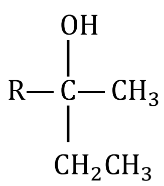
Sol. **A**

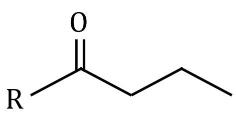
Plastic waste are called green fuel.

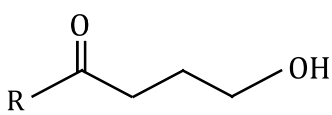
12. The structure of A in the given reaction is:



(A) 

(B) 

(C) 

(D) 

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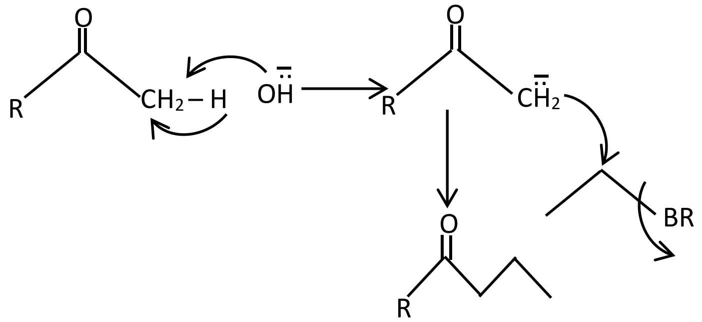
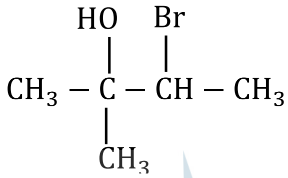
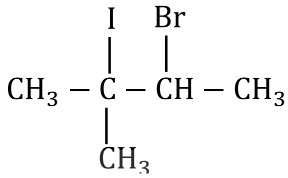
Sol **C**

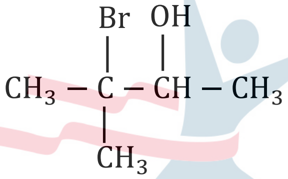


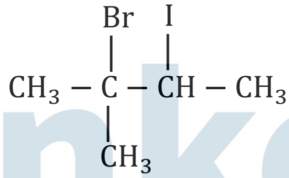
13. Major product 'B' of the following reaction sequence is

$$CH_3-\underset{\displaystyle CH_3}{\underset{|}{C}}=CH-CH_3 \xrightarrow[CH_3OH]{Br_2} A \xrightarrow{HI} \underset{\text{(major product)}}{B}$$

(A) 

(B) 

(C) 

(D) 

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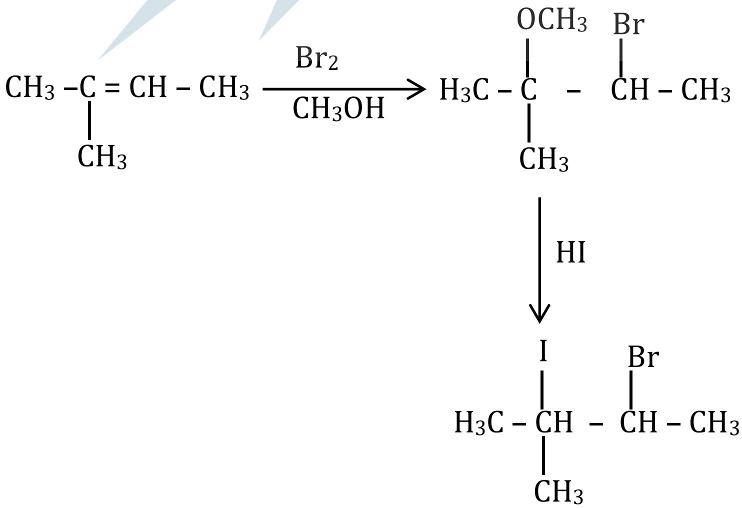
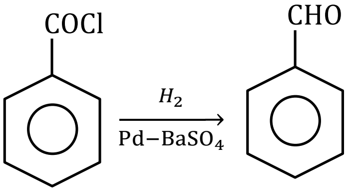
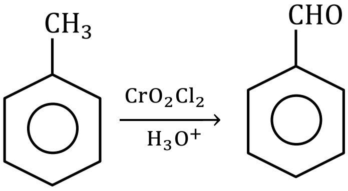
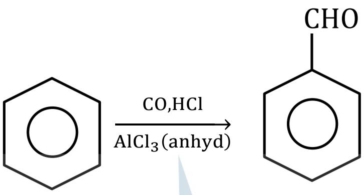
Sol. **B**



14. **Match List-I with List-II**

List-I	**List-II**
(A) 	**(I) Gatterman Koch reaction**
(B) $CH_3-CN \xrightarrow[H_3O^+]{SnCl_2HCl} CH_3-CHO$	**(II) Etard reaction**
(C) 	**(III) Stephen reaction**
(D) 	**(IV) Rosenmund reaction**

Choose the correct answer from the options given below:

(A) (A)-(IV), (B)-(III), (C)-(II), (D)-(I)
(B) (A)-(I), (B)-(II), (C)-(III), (D)-(IV)
(C) (A)-(II), (B)-(III), (C)-(IV), (D)-(I)
(D) (A)-(III), (B)-(II), (C)-(I), (D)-(IV)

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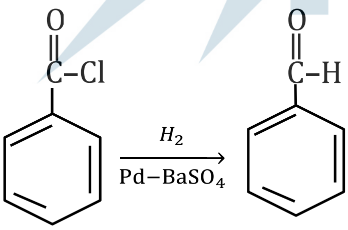
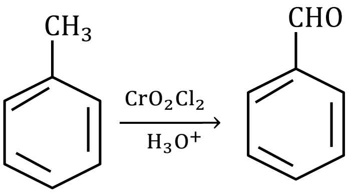
Sol. **A**

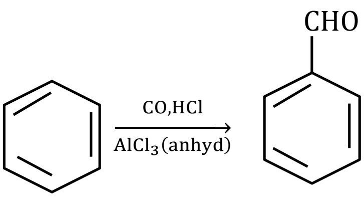
(A) 

Rosenmund reaction

(B) $CH_3-CN \xrightarrow[H_3O^+]{SnCl_2HCl} CH_3-CHO$ **Stephen reaction**

(C) 

Etard reaction

(D) 

Gatterman Koch reaction

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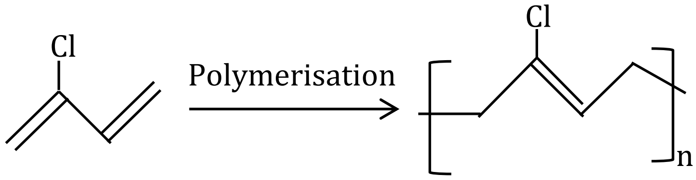
15. **Match List-I with List-II**

List-I	**List-II**
(Polymer)	(Monomer)
(A) Neoprene	(I) Acrylontrile
(B) Teflon	(II) Chloroprene
(C) Acrilan	(III) Tetrafluoroethene
(D) Natural rubber	(IV) Isoprene

Choose the correct answer from the options given below:

(A) (A)-(II), (B)-(III), (C)-(I), (D)-(IV)
(B)-(II), (B)-(I), (C)-(III), (D)-(IV)
(C) (A)-(II), (B)-(I), (C)-(IV), (D)-(III)
(D)-(I), (B)-(II), (C)-(III), (D)-(IV)

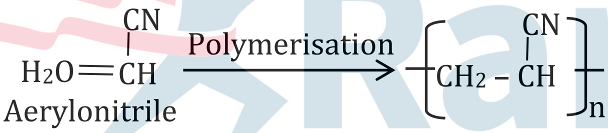
Sol. **A**

(A) 

(Chloroprene)

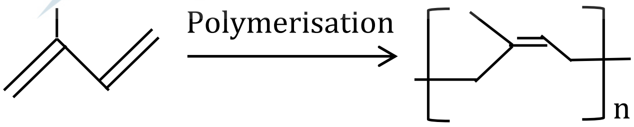
(B) Tetrofluoro ethene

Teflon



(C) Aerylonitrile

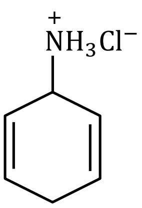
acrilon

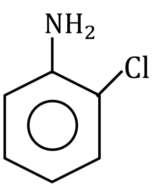
(D) 

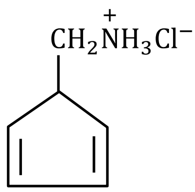
Natural rubber

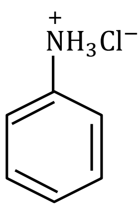
Isoprene

16. An organic compound ‘A’ contains nitrogen and chlorine. It dissolves readily in water to give a solution that turns litmus red. Titration of compound ‘A’ with standard base indicates that the molecular weight of ‘A’ is 131 ±2. When a sample of ‘A’ is treated with aq. NaOH, a liquid separates which contains N but not Cl. Treatment of the obtained liquid with nitrous acid followed by phenol gives orange precipitate. The compound ‘A’ is:

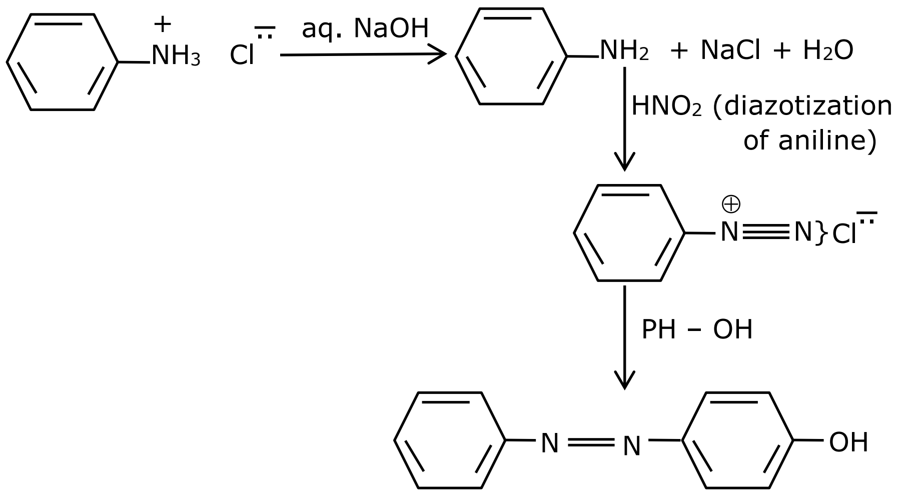
(A) 

(B) 

(C) 

(D) 

Sol. **D**



p-hydroxy azobenzene
(orange –dye)

17. Match List-I with List-II

List-I	List-II
(A) Glucose + HI	(I) Gluconic acid
(B) Glucose + Br_2 water	(II) Glucose pentacetate
(C) Glucose + acetic anhydride	(III) Saccharic acid
(D) Glucose + HNO_3	(IV) Hexane

Choose the correct answer from the options given below:

(A) (A)-(IV), (B)-(I), (C)-(II), (D)-(III)
(B) (A)-(IV), (B)-(III), (C)-(II), (D)-(I)
(C) (A)-(III), (B)-(I), (C)-(IV), (D)-(II)
(D) (A)-(I), (B)-(III), (C)-(IV), (D)-(II)

Sol. **A**

(A) Glucose $\xrightarrow{HI}$ n-hexane

(B) Glucose $\xrightarrow[H_2O]{Br_2}$ COOH–$(CH-OH)_4$–CH_2OH

Gluconic acids

(C) Glucose $\xrightarrow{\text{5 acetic anhydride}}$ Glucose pentacetate

(D) Glucose $\xrightarrow{HNO_3}$ COOH–$(CH-OH)_4$–CHOH

Saccharic acid

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18. Which of the following enhances the lathering property of soap?

(A) Sodium stearate
(B) Sodium carbonate
(C) Sodium rosinate
(D) Trisodium phosphate

Sol. **C**

Sodium rosinate enhances the lathering properties of soap

Sodium rosinate help to lather form.

19. **Match List-I with List-II**

List-I (Mixture)	**List-II (Purification Process)**
(A) Chloroform & Aniline	(I) Steam distillation
(B) Benzoic acid & Naphthalene	(II) Sublimation
(C) Water & Aniline	(III) Distillation
(D) Naphthalene & Sodium chloride	(IV) Crystallisation

Choose the correct answer from the options given below:

(A) (A)-(IV), (B)-(III), (C)-(I), (D)-(II)
(B) (A)-(III), (B)-(I), (C)-(IV), (D)-(II)
(C) (A)-(III), (B)-(IV), (C)-(II), (D)-(I)
(D) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

Sol. **D**

(A) Chloroform + Aniline $\longrightarrow$ (III) Distillation

(B) Benzoic acid + Naphthalene $\longrightarrow$(IV) Crystallisation

(C) Water + Aniline $\longrightarrow$(I) Steam distillation

(D) Naphthalene + Sodium chloride $\longrightarrow$ (II) Sublimation

Rankers

20. Fe^{3+} cation gives a prussian blue precipitate addition of potassium ferrocyanide solution due to the formation of:

(A) $[Fe(H_2O)_6]_2[Fe(CN)_6]$
(B) $Fe_2[Fe(CN)_6]_2$
(C) $Fe_3[Fe(OH)_2(CN)_4]_2$
(D) $Fe_4[Fe(CN)_6]_3$

Sol. **D**

$4Fe^{+3} + 3[Fe(CN)_6]^{-4} \rightarrow Fe_4[Fe(CN)_6]_3$

Prussian blue PPT

21. The normality of H_2SO_4 in the solution obtained on mixing 100 mL of 0.1 M H_2SO_4 with 50 mL of 0.1 M $NaOH$ is _______ $\times\ 10^{-1}N$. (Nearest Integer)

Sol. **1**

Normality of Acid-Base mixture solution.

$N_{mix} = \left|\frac{N_AV_A - N_BV_B}{VA+VB}\right| = \left|\frac{M_An_Av_A - M_Bn_Bv_B}{V_A+V_B}\right|$

$= \left|\frac{0.1\times2\times100 - 0.1\times1\times50}{100+50}\right|$

$= \frac{20-5}{150} = \frac{15}{150} = 0.1N$

Ans. : 1×10^{-1}, Ans. (1)

22. For a real gas at $25°C$ temperature and high pressure (99 bar) the value of compressibility factor is 2, so the value of Vander Waal's constant 'b' should be______ $\times 10^{-2} L\ mol^{-1}\ K^{-1} mol^{-1}$)

Sol. **25**

P = 99 bar z = 2 b = ?

= 99 × 0.987 atm

Vander wall equation—

$$(P + \frac{a}{V^2})(v - b) \ \text{= RT for 1 mole}$$

At high P $\rightarrow \frac{a}{v^2} \rightarrow$ can be neglect

But b $\rightarrow$ can not be neglected

$$P(V - b) = RT$$

$$PV - Pb = RT$$

$$\frac{PV}{RT} = \frac{Pb}{RT} = \frac{RT}{RT}$$

$\downarrow$

$$Z = \frac{Pb}{RT} + 1$$

$$2 = \frac{Pb}{RT} + 1$$

$$\frac{Pb}{RT} = 2 - 1 = 1$$

$$99 \times 0.987 \times b = 8.3 \times 298$$

$$b = 0.253 = 25.3 \times 10^{-2}$$

Ans. : 25 (nearest integer)

23. A gas (Molar mass = $280\ g\ mol^{-1}$) was burnt in excess O_2 in a constant volume calorimeter and during combustion the temperature of calorimeter increaed from $298.0\ K$ to $298.45\ K$. If the capacity of calorimeter is $2.5\ kJ\ K^{-1}$ and enthalpy of combustion of gas is $9\ kJ\ mol^{-1}$ then amount of gas burnt is________g. (Nearest Integer)

Sol. **35**

At constant volume $\rightarrow \Delta$U

$$\Delta u\ (\text{KJ/mol}) = \frac{Heat\ capacity \times change\ in\ temp.}{No.\ of\ moles\ of\ gas}$$

$$\Delta T = 298.5 - 298 = 0.45\ K$$

Heat capacity (c_v) = 2.5 kJ/K

$$\Delta u = 9\ KJ$$

$$9KJ = \frac{2.5 kj/K \times 0.45K}{no.\ of\ moles\ of\ gase}$$

No. of moles of gas = 0.125 mol.

Mass of gas = 280 × 0.125 = 33 gram

Ans. : 35

24. When a certain amount of solid A is dissolved in $100g$ of water at $25°C$ to make a dilute solution, the vapour pressure of the solution is reduced to one-half of that of pure water. The vapour pressure of pure water is 23.76 $mm\ Hg$. The number of moles of solute A added is _______. (Nearest Integer)

Sol. **6**

Mass of water solvent = 100 g

$P^0 = 23.76$ mm Hg.

$P_S = \frac{P^0}{2} = \frac{23.76}{2}$ mm Hg

No. of Moles of solute = ?

$\frac{P^0 - P_S}{P_S} = \frac{n}{N}$ → for all type solution

$\frac{23.76 - \frac{23.76}{2}}{\frac{23.76}{2}} = \frac{n}{N} = \frac{n}{\frac{100}{18}}$

$1 = \frac{n}{5.55}$

N = 5.55

Ans. : 6

25. $[A]$ → [B]

Reactant Product

If formation of compound [B] follows the first order of kinetic and after 70 minutes the concentration of [A] was found to be half of its initial concentration. Then the rate constant of the reaction is $x \times 10^{-6} s^{-1}$. The value of x is _______. (Nearest Integer)

Sol. ***165***

First order reaction

$T_{1/2} = 70$ min

$= 70 \times 60$ sec.

$K = \frac{0.693}{t_{1/2}} = \frac{0.693}{70 \times 60} = 0.000165$

$K = 165 \times 10^{-6}\ sec^{-1}$

Ans. : 165

26. Among the following ores Bauxite, Siderite, Cuprite, Calamine, Haematite, Kaolinite, Malachite, Magnetite, Sphalerite, Limonite, Cryolite, The number of principal ores if iron is______.

Sol. 4

Haematite → Fe_2O_3

Magnetite → Fe_3O_4

Siderite → $FeCO_3$

Limonite → $Fe_2O_3.3H_2O$

27. The oxidation state of manganese in the product obtained in a reaction of potassium permanganate and hydrogen peroxide in basic medium is______.

Sol. **4**

$2KMnO_4 + 3H_2O_2 \longrightarrow 2MnO_2 + 3O_2 + 2KOH + 4H_2O$

0.5 of Mn in $MnO_2 \longrightarrow 4$

Ans. : 4

28. The number of molecules(s) or ion(s) from the following having non-planar structure is _______

$NO_3^-, H_2O_2, BF_3, PCl_3, XeF_4, SF_4, XeO_3, PH_4^+, SO_3, [Al(OH)_4]^-$

Sol. **6**

Molecules	**Planar/non planar**
NO_3^-	Planar
H_2O_2	non planar
BF_3	Planar
PCl_3	non planar
XeF_4	Planar
SF_4	non planar
XeO_3	non planar
PH_4^+	non planar
SO_3	Planar
$[Al(OH)_4]^-$	non planar

29. The spin only magnetic moment of the complex present in Fehling's reagent is_____ B.M. (Nearest Integer)

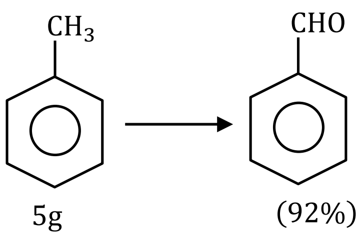
Sol. **2**

Fehling solution is a complex of Cu^{++}

$Cu^{++} = 3d^9$

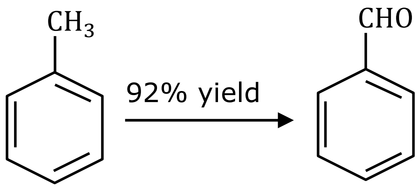
No. of unpaired e^- = 1

M.M. = $\sqrt{1(1+2)} = \sqrt{3} = 1.73$ BM

30. 

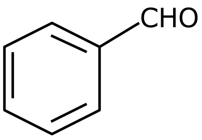
In the above reaction, 5g of toluene is converted into benzaldehyde with 92% yield. The amount of benzaldehyde produced is ________$\times 10^{-2} g$. (Nearest integer)

Sol. **530**



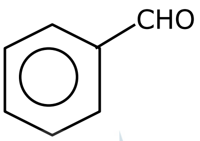
5g

moles = $\frac{5}{92}$

Moles of 

produced = $\frac{5}{92} \times \frac{92}{100}$

$= 5 \times 10^{-2}$ moles

mass of 

produced = 5×10^{-2} moles × 106 g / mols

$= 530 \times 10^{-2}$g

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