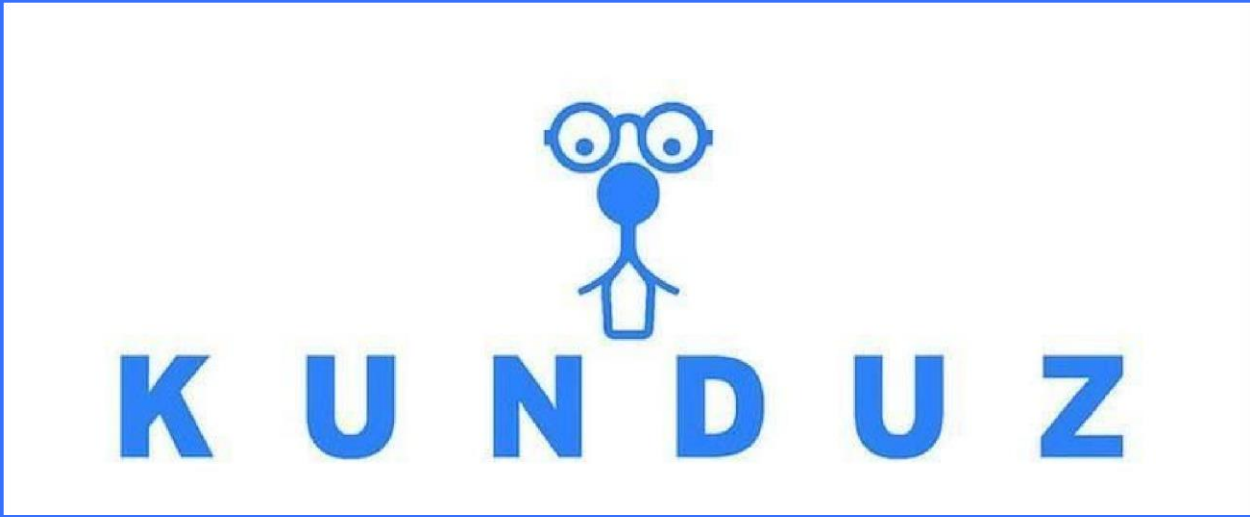


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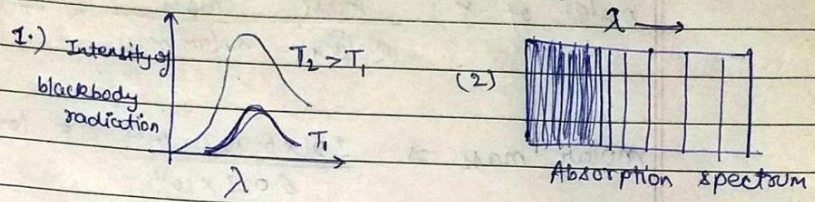
Question number

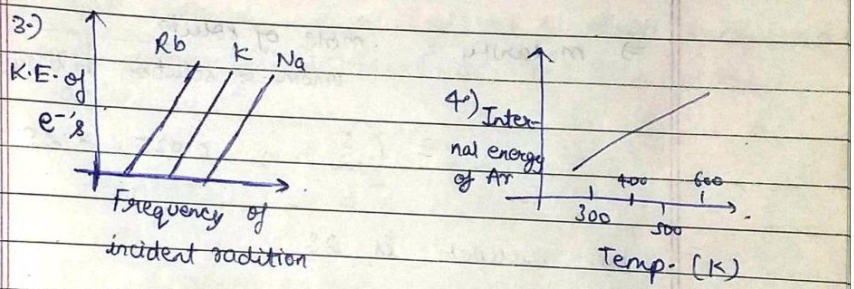
Question and Answers

1

JEE- MAIN 2nd September
1st shift.

Q.1. The figure that is not a direct manifestation of the quantum nature of atom is :





1 → is correct as when T increase area under curve increase and peak of graph shifts toward left.

2 → is correct as atoms absorb only some wavelengths not all.

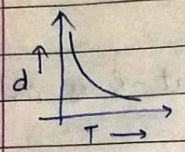
3 → correct as work function of Rb, K, Na follow order Na > K > Rb. also below certain frequency there is no electron emission.

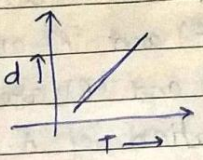
4 → is incorrect as below 300 K also Ar atoms posses K.E.

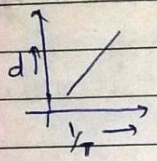
option 4 is correct

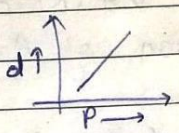
2

2. Which of the following graph is not correct for ideal gas?

(1) 

(2) 

(3) 

(4) 

d is density P- Pressure T- temperature.

Solution $PV = nRT$ now density $\propto \frac{n}{V}$

so $P = \frac{n}{V}RT \Rightarrow P = dRT$

$\Rightarrow P \propto d$ and $\frac{1}{T} \propto d$.

so graph b/w d and T can't be straight line. hence option 2 is correct.

3

3. For the following Assertion and Reason, the correct option is

Assertion (A): When Cu(II) and sulphide ions are mixed, they react together extremely quickly to give a solid.

Reason (R): The equillibrium constant of $Cu^{2+}(aq) + S^{2-}(aq) \rightleftharpoons CuS(s)$ is high because the solubility product is low

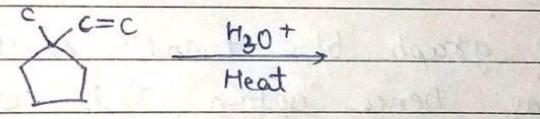
1) (A) is false R is true
2) Both (A) and (R) are false
3) Both (A) and (R) are true but R is not the explanation of A.
4) Both (A) and (R) are true and R is correct explanation of A.

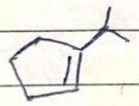
Solution :-

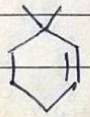
Both A and R are true but A is kinetic factor and R is thermodynamic parameter and both are independent of each other so R is not explanation of A. option 3.

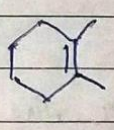
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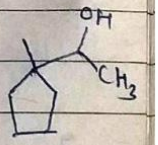
4. The major product of following reaction is :

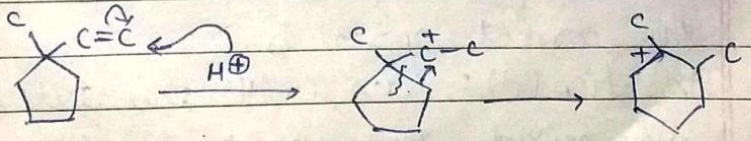


1.) 

2) 

3.) 

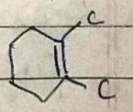
4.) 



Ring expansion

$-H^+$

option 3 is correct



5

8. While titration dilute HCl solution with aqueous NaOH, which of the following will not be required?

1.) clamp and phenolphthacin 2.) Burette & porcline
3.) Bunsen Burner and measuring cylinder
4.) Pipette and distilled water.

This question's answer is from lab manual of class 11th. option 3 is correct.

6

6. On heating compound A gives a gas B which is a constituent of air. This gas when treated with H_2 in presence of catalyst gives another gas C which is basic in nature. (A) should not be :

1) $(NH_4)_2Cr_2O_7$ 2) NH_4NO_2 3) $Pb(NO_3)_2$ 4) NaN_3

Solution as C is prepared with B and H_2 and C is basic so C must be NH_3, B must be N_2 so compound A must give N_2 on heating.

$(NH_4)_2Cr_2O_7 \rightarrow N_2 + Cr_2O_3 + H_2O$

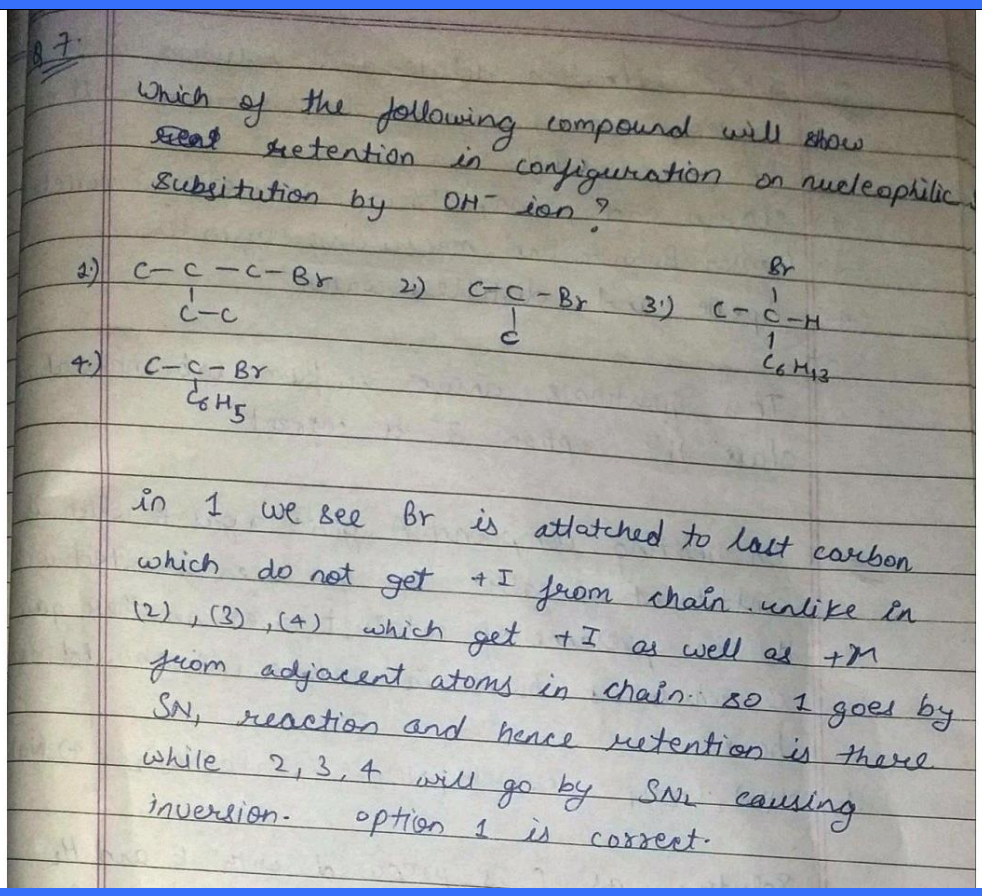
$Pb(NO_3) \rightarrow PbO + NO_2 + O_2$

$NH_4NO_2 \rightarrow N_2 + H_2O$

$NaN_3 \rightarrow NO + N_2$

so as $Pb(NO_3)_2$ do not give N_2 correct option is 3.

7



8.7.

Which of the following compound will show retention in configuration on nucleophilic Substitution by OH^- ion?

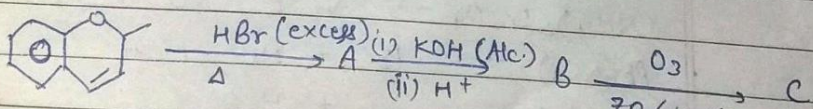
1.) $C-C(C-C)-C-Br$ 2.) $C-C(C)-Br$ 3.) $C-C(Br)(C_6H_{13})-H$

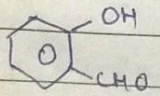
4.) $C-C(C_6H_5)-Br$

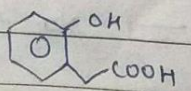
in 1 we see Br is attached to last carbon which do not get +I from chain unlike in (2), (3), (4) which get +I as well as +M from adjacent atoms in chain. so 1 goes by S_N1 reaction and hence retention is there while 2, 3, 4 will go by S_N2 causing inversion. option 1 is correct.

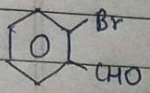
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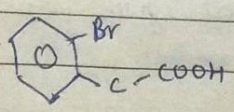
Q.8. The major aromatic product 'C' in the following reaction sequence will be :



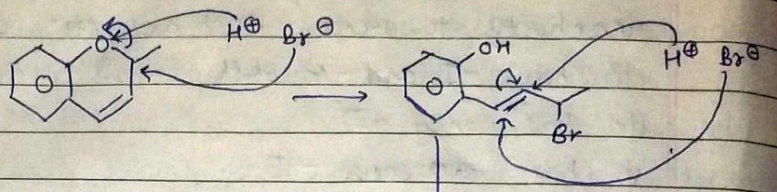
1.) 

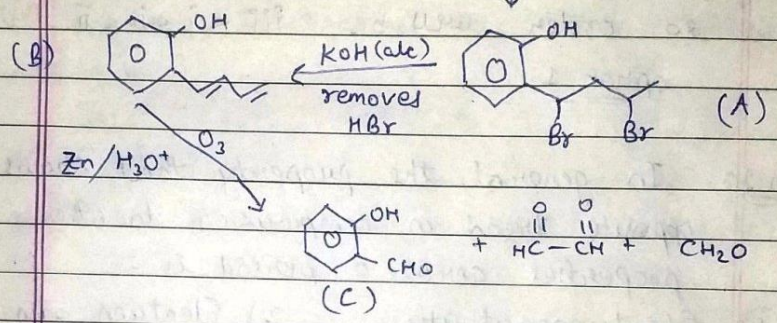
2.) 

3.) 

4.) 

Solution ⇒ as HBr is in excess so

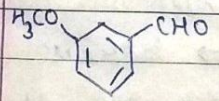


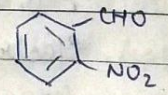


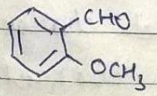
So option 1 is correct.

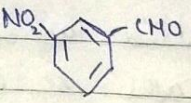
9

Ques.9 The increasing order of following compounds towards HCN addition is :

(i) 

(ii) 

(iii) 

(iv) 

1.) iii < i < iv < ii 2.) i < iii < iv < ii 3.) iii < iv < ii < i

4.) iii < iv < i < ii

Greater -I, -M effect on CHO greater is reactivity towards HCN as CN^- is anionic.

(ii) has -I and -M both

(iv) has only -I.

(i) has ~~-M~~ -I

(iii) has +M and -I

so order will be iii < i < iv < ii

option 1.

10

Ques 10. In general, the property that shows an opposite trend in comparision to other properties across a period is :

1.) Electronegativity
2.) Electron gain enthalpy
3.) Ionization enthalpy
4.) Atomic radius

Solution Its an easy question. across a period atomic mass → increase

I.E → Increase

E.G.A → increase

Electronegativity ⇒ increase

atomic radius = decrease as no shell is added across period and charge on nucleus increases. so option 4 is correct.

11

Ques 11. For octahedral Mn(II) and tetrahedral Ni(II) complexes, consider the following statements:

(i) both the complexes can be high spin

(ii) Ni (II) complex can very rarely be of low spin

(iii) with strong field ligands, Mn (II) complexes can be low spin.

(iv) aqueous solutions of Mn (II) ions is yellow in colour.

The correct statements are:

1.) i and ii only 2.) i, ii and iii only

3.) i and iii and iv only 4.) ii, iii and iv only

Solution This is advanced level problem requires much memorising.

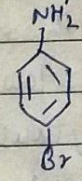
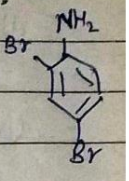
Under weak field both complexes will be high spin. Tetrahedral Ni(II) complex is very rarely low spin because Sq. planar (in presence of strong ligand) complexes of Ni^{2+} are low spin complexes. With strong field ligands Mn^{2+} complexes can be low spin because they have less no. of upe⁻. While with weak field ligands Mn^{2+} complexes can be high spin because they have more no. of upe⁻. Aq. solution of Mn^{2+} is pink in colour.

From abv. information one can deduce that i, ii, & iii are correct.

option 2.

12

Ques 12 In Carius method of estimation of halogen, 0.172 g of an organic compound showed presence of 0.08 g of bromine. Which of these is correct structure of the compound ?

1.) H_3C-Br 2.) CH_3-CH_2-Br 3.)  4.) 

Solution. 0.08 → mass of bromine

0.172 g → total mass of compound as given by carius method. So % bromine is

$$\frac{0.08}{0.172} \times 100 = 46.51\%$$

now compound 3 has 46.51 % of Br if one calculates so option 3.) is correct.

13

Ques 13: An open beaker of water in equillibrium with water vapour is in a sealed container. When a few grams of glucose are added to beaker of water, the rate of which water molecules :

1.) leaves the vapour decrease
2.) leaves the solution decrease
3.) leaves the vapour increase
4.) leaves the solution increases.

Solution :-

We know with increase of solute content (here glucose) pressure of water decreases as given by $P = P^{\circ} \times_{solvent}$.

so after adding glucose Pressure of water vapour must decrease i.e. water molecules leave the vapour to come into liquid state to establish new equillibrium

option 3 is correct.

14

Ques 14. The statement that is not true about Ozone is :

1.) in the stratosphere, CFC's release chlorine free radicals which react with O_3 to give chlorine dioxide radicals.

2.) in stratosphere, it forms protective shield against UV radiations

3.) it is a toxic gas and its reaction with NO gives NO_2

4.) in the atmosphere, it is depleted by CFC's

Solution $CF_2Cl_2 \xrightarrow{UV} \dot{Cl} + \dot{C}F_2Cl$

now this $\dot{Cl}$ react with O_3 to give $\dot{Cl}O$ not $\dot{Cl}O_2$ so option 2 is incorrect rest are correct. option 1.)

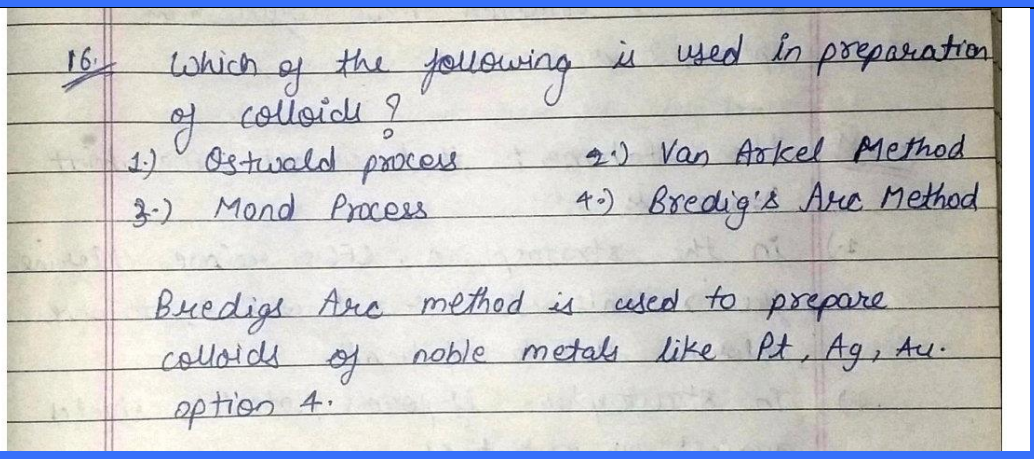
15

15 The metal mainly used in devising photoelectric cell is :

1.) Li 2.) Rb 3.) Cs 4.) Na

Cs has lowest work-function among Group 1 elements due to low I.E. so it is used in photoelectric cells. option 3.

16



16. Which of the following is used in preparation of colloids?

1.) Ostwald process
2.) Van Arkel Method
3.) Mond Process
4.) Bredig's Arc Method

Bredigs Arc method is used to prepare colloids of noble metals like Pt, Ag, Au.

option 4.

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17

17. Consider that d^6 metal ion (M^{2+}) forms a complex with aqua ligands, and the spin only magnetic moment of complex is 4.90 BM. The geometery and CFSE of the complex is :

1.) tetrahedral and $-1.6\Delta_t + 1P$
2.) octahedral and $-2.4\Delta_o + 2P$
3.) tetrahedral and $-0.6\Delta_t$
4.) octahedral and $-1.6\Delta_o$

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$4.9 = \sqrt{n(n+2)}$ so $n = 4$ i.e. 4 upe-.

now if let say complex is octahedral H_2O being weak field ligand configuration will be d^6 → ↑↑↑ e_g $0.6\Delta_o$

↑↓↑↑ t_{2g} $0.4\Delta_o$

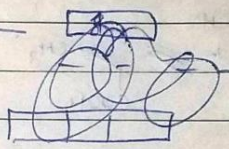
so $C.F.S.E = (-0.4 \times \Delta_o) \times 4 + 0.6\Delta_o \times 2 + 0 \times P$

$= -0.4\Delta_o$

if it is tetrahedral then configuration will be d^6

↑↑↑ $0.4\Delta_t$

↑↓↑ $-0.6\Delta_t$



$C.F.S.E = (-0.6\Delta_t \times 3) + (0.4 \times \Delta_t \times 3) + 0 \times P$

$= -0.6\Delta_t$

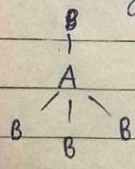
so correct option is 3.

18

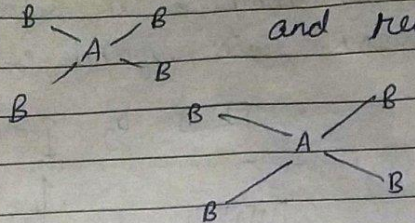
Q.18 If AB_4 molecule is polar molecule, a possible geometry of AB_4 is :

1.) Square pyramidal 2.) Rectangular planar
3.) Square planar 4.) Tetrahedral

Sol ⇒ Out of above 4 options tetrahedral is non-polar due to perfect symmetery.



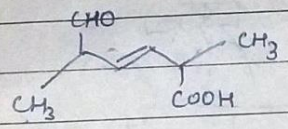
Same is case with square planar and rectangular planar



so only 1 be left out is correct.

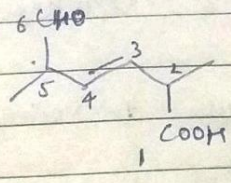
19

19. The IUPAC name for compound is



1.) 2,5- dimethyl-6- carboxy-hex-3 enal
2.) 2,5-dimethyl-5-carboxy-hex-3-enal
3.) 6-formyl-2-methyl-hex-3enoic acid
4.) 2,5-dimethyl-6- oxo-hex-3-enoic acid

chosing chain with max functional group and giving priority to COOH than to CHO numbering is like



correct choice is 4.

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20

Q.20. Consider following reactions :

(i) Glucose + ROH $\xrightarrow{\text{dry HCl}}$ Acetal $\xrightarrow[(CH_3CO_2)O]{x \cdot eq \cdot of}$ acetyl derivative

(ii) Glucose $\xrightarrow{Ni/H_2}$ A $\xrightarrow[(CH_3CO)_2O]{y \cdot eq \cdot of}$ acetyl derivative

(iii) Glucose $\xrightarrow[(CH_3CO)_2O]{z \cdot eq \cdot of}$ acetyl derivative.

x, y, z in these reactions respectively.

1.) 5, 6, 5 2.) 4, 5, 5 3.) 4, 6, 5 4.) 5, 4, 5

no of eq. of $(CH_3CO)_2O$ are equal to no of OH groups presents as they they form acetyl derivatives

(i) Glucose $\xrightarrow[HCl]{ROH}$ $\begin{matrix} COOH \\ | \\ (CHOH)_4 \\ | \\ COOH \end{matrix}$ so $x = 4$

(ii) Glucose $\xrightarrow{Ni/H_2}$ $\begin{matrix} CH_2-OH \\ | \\ (CHOH)_4 \\ | \\ CH_2OH \end{matrix}$ so $y = 6$

(iii) Glucose $\xrightarrow{(CH_3CO)_2O}$ as glucose has 5 OH groups so $z = 5$

so option 3 is correct.

21

21. The mass of gas absorbed, x, per unit mass of absorbate, m, was measured at various pressures, p. A graph between $\log \frac{x}{m}$ and $\log p$ gives a straight line with slope equal to 2 and intercept equal to 0.4771. The value of $\frac{x}{m}$ at a pressure of 4 atm is :

given ($\log 3 = 0.4771$)

Solutions. all lines are of form

$y = mx + c$ i.e. $\log \frac{x}{m} = s \log p + \log K$

where s is slope $\log K$ is constant (intercept)

Given intercept $= 0.4771 = \log K$

$\Rightarrow K = 3$ slope $s = 2$.

so

$$\log \frac{x}{m} = \log 3 + 2 \log p$$

$$\Rightarrow \log \frac{x}{m} = \log 3p^2 \Rightarrow 3p^2 = \frac{x}{m}$$

at $p = 4$ atm $\frac{x}{m} = 3 \times 16 = 48$.

so answer is 48.

22

Q 22 The oxidation states of iron atoms in compounds A, B, and C are x, y, z. The sum of x, y, z is _____

(A) – $Na_4[Fe(CN)_5(NOS)]$

(B) – $Na_4[FeO_4]$ (C) – $[Fe_2(CO)_9]$

in (A) $+4 + x - 5 - 1 = 0$

$\Rightarrow x = 2$ as $Na = 1$ $Fe = x$

$CN = -1$ $NOS = -1$

in (B) $+4 + y - 8 = 0 \Rightarrow y = 4$.

in (C) $2z + 9 \times 0 = 0 \Rightarrow z = 0$

so $x + y + z = 6$.

Answer is 6.

23

Q.23. The internal energy change (in J) when 90 g of water undergoes complete evaporation at 100°C is _____

(Given : ΔH_{vap} for water at 373K = 41 KJ/mol , R = 8.314 J K^{-1} mol^{-1})

moles of water in 90 g = 90/18 = 5.

by eq. $\Delta H = \Delta U + \Delta n_g RT$

$\Rightarrow 41000 \times 5 = \Delta U + 5 \times 8.314 \times 373$

$\Rightarrow \Delta U = 189494$ J.

$\Delta n = 5$ as water changes from liquid to gas so Δn for gas is $5 - 0 = 5$.

so answer is 189494.

24

24. The gibbs energy change (in J) for the given reaction at $[Cu^{2+}] = [Sn^{2+}] = 1M$ and 298 K is :

$$Cu(s) + Sn^{2+}(aq.) \longrightarrow Cu^{2+}(aq.) + Sn(s)$$

($E^\circ_{Sn^{2+}/Sn} = -0.16V$, $E^\circ_{Cu^{2+}/Cu} = 0.34V$

Take $F = 96500\ (C\ mol^{-1})$

We know $E^\circ_{cell} = E^\circ_{Sn^{2+}/Sn} - E^\circ_{Cu^{2+}/Cu}$

$E^\circ_{cell} = -0.16 - 0.34 = -0.5V$

now $\Delta G^\circ = -nFE^\circ_{cell}$

so $\Delta G^\circ = -2 \times 96500 \times -0.5$

$= 96500\ J.$

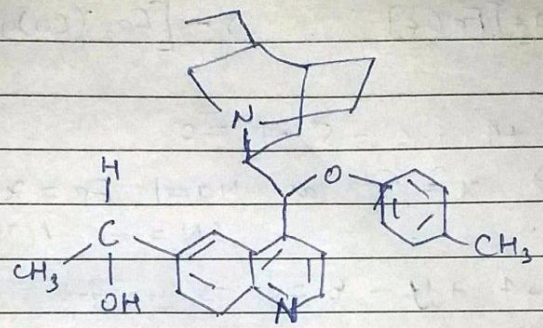
so answer is 96500 J.

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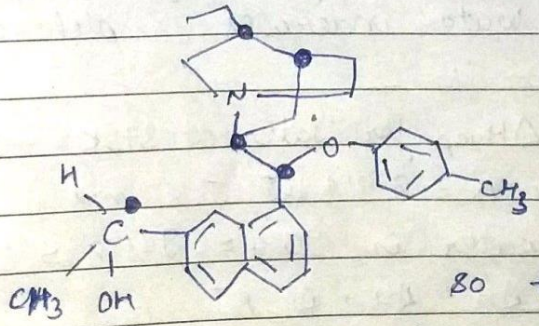
25

Q.25

The no. of chiral carbons present in the molecule given below:-



Solution :- Chiral carbon is carbon where all four groups attached to it are different by inspection at each carbon chiral carbons can be found as



So total 5 carbons are chiral. Hence answer is 5.

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