CHEMISTRY

SECTION-A

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

Assertion A: The first ionisation enthalpy decreases across a period.

Reason R: The increasing nuclear charge outweighs the shielding across the period.

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

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

(2) A is true but R is false

(3) A is false but R is true

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

Ans. **(3)**

Sol. First ionisation energy **increases** along the period.

Along the period Z increases which outweighs the shielding effect

62. Match List I with List II

	LIST-I (Substances)		**LIST-II (Element Present)**
A.	Ziegler catalyst	I.	Rhodium
B.	Blood Pigment	II.	Cobalt
C.	Wilkinson catalyst	III.	Iron
D.	Vitamin B_{12}	IV.	Titanium

Choose the correct answer from the options given below:

(1) A-II, B-IV, C-I, D-III (2) A-II, B-III, C-IV, D-I

(3) A-III, B-II, C-IV, D-I (4) A-IV, B-III, C-I, D-II

Ans. **(4)**

Sol. Ziegler catalyst $\rightarrow$ Titanium

Blood pigment $\rightarrow$ Iron

Wilkinson catalyst $\rightarrow$ Rhodium

Vitamin $B_{12} \rightarrow$ Cobalt

63. In chromyl chloride test for confirmation of Cl^- ion, a yellow solution is obtained. Acidification of the solution and addition of amyl alcohol and 10% H_2O_2 turns organic layer blue indicating formation of chromium pentoxide. The oxidation state of chromium in that is

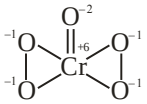
(1) +6 (2) +5 (3) +10 (4) +3

Ans. **(1)**

Sol.

$$Cl^- + K_2Cr_2O_7 + H_2SO_4 \rightarrow CrO_2Cl_2 \xrightarrow{\text{Basic medium}} \underset{\text{yellow solution}}{CrO_4^{2-}} + Cl^-$$

$$\underset{\text{yellow solution}}{CrO_4^{2-}} \xrightarrow[3.\,10\%\ H_2O_2]{\substack{1.\text{Acidification}\\2.\ \text{Amyl alcohol}}} \underset{\text{blue compound}}{CrO_5}$$



64. The difference in energy between the actual structure and the lowest energy resonance structure for the given compound is

(1) electromeric energy (2) resonance energy

(3) ionization energy (4) hyperconjugation energy

Ans. **(2)**

Sol. The difference in energy between the actual structure and the lowest energy resonance structure for the given compound is known as resonance energy.

65. Given below are two statements :

Statement I : The electronegativity of group 14 elements from Si to Pb gradually decreases.

Statement II : Group 14 contains non-metallic, metallic, as well as metalloid elements.

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

(1) Statement I is false but Statement II is true

(2) Statement I is true but Statement II is false

(3) Both Statement I and Statement II are true

(4) Both Statement I and Statement II are false

Ans. **(1)**

Sol.

Gr-14	EN
C	2.5
Si	1.8
Ge	1.8
Sn	1.8
Pb	1.9

The electronegativity values for elements from Si to Pb are almost same. So Statement I is false.

66. The correct set of four quantum numbers for the valence electron of rubidium atom (Z = 37) is:

(1) $5,0,0,+\frac{1}{2}$ (2) $5,0,1,+\frac{1}{2}$ (3) $5,1,0,+\frac{1}{2}$ (4) $5,1,1,+\frac{1}{2}$

Ans. **(1)**

Sol. Rb = $[Kr]5s^1$

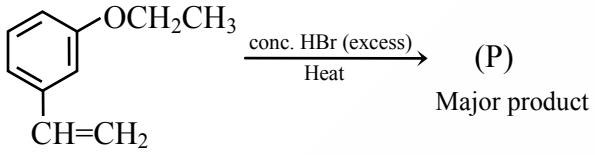
n = 5

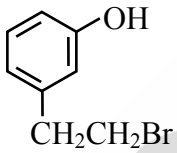
l = 0

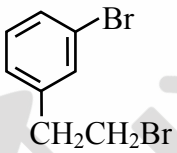
m = 0

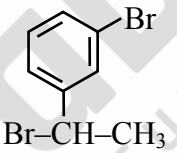
s = +½ or –½

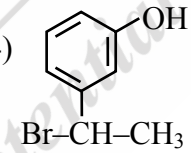
67. The major product(P) in the following reaction is



(1) 

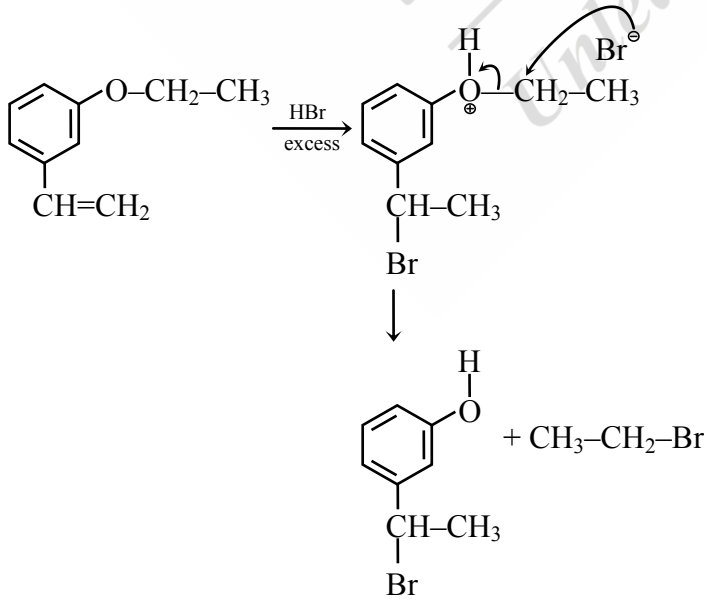
(2) 

(3) 

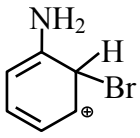
(4) 

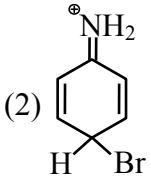
Ans. **(4)**

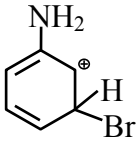
Sol. 

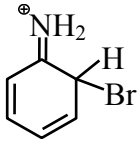


68. The arenium ion which is not involved in the bromination of Aniline is .

(1) 

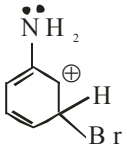
(2) 

(3) 

(4) 

Ans. **(3)**

Sol. Since $-\ddot{N}H_2$ group is o/p directing hence arenium ion will not be formed by attack at meta position i.e.



Hence Answer is (3)

69. Appearance of blood red colour, on treatment of the sodium fusion extract of an organic compound with $FeSO_4$ in presence of concentrated H_2SO_4 indicates the presence of element/s

(1) Br (2) N (3) N and S (4) S

Ans. **(3)**

Sol. $Fe^{2+} \xrightarrow[Conc.H_2SO_4]{H^+} Fe^{+3}$

$Fe^{+3} \xrightarrow{^-SCN} Fe(SCN)_3 (\text{blood red colour})$

Appearance of blood red colour indicates presence of both nitrogen and sulphur.

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

Assertion A : Aryl halides cannot be prepared by replacement of hydroxyl group of phenol by halogen atom.

Reason R : Phenols react with halogen acids violently.

In the light of the above statements, choose the most appropriate 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

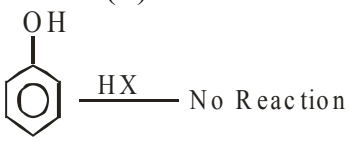
(3) A is true but R is false

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

Ans. **(3)**

Sol. Assertion (A): Given statement is correct because in phenol hydroxyl group cannot be replaced by halogen atom.

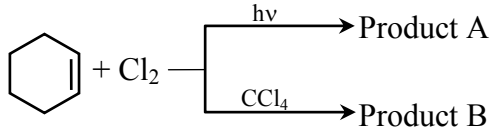
Reason (R) :

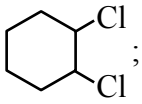
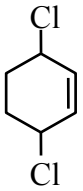


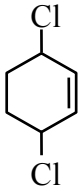
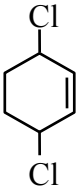
Given reason is false

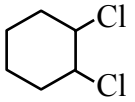
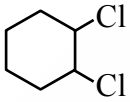
Hence Assertion (A) is correct but Reason (R) is false

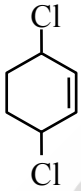
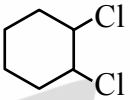
71. Identify product A and product B :



(1) A =  ; B = 

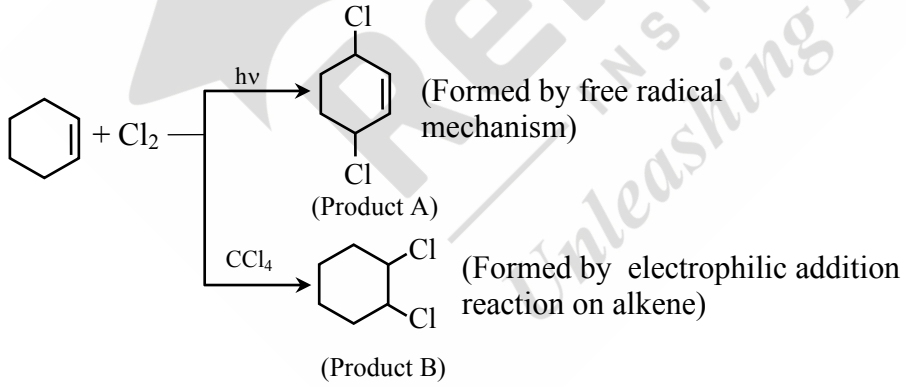
(2) A =  ; B = 

(3) A =  ; B = 

(4) A =  ; B = 

Ans. **(4)**

Sol.



Hence correct Ans. (4)

72. Identify the incorrect pair from the following :

(1) Fluorspar- BF_3 (2) Cryolite-Na_3AlF_6

(3) Fluoroapatite-$3Ca_3(PO_4)_2.CaF_2$ (4) Carnallite-$KCl.MgCl_2.6H_2O$

Ans. **(1)**

Sol. (1) Fluorspar is CaF_2

73. The interaction between π bond and lone pair of electrons present on an adjacent atom is responsible for

(1) Hyperconjugation (2) Inductive effect

(3) Electromeric effect (4) Resonance effect

Ans. **(4)**

Sol. It is a type of conjugation responsible for resonance.

74. $KMnO_4$ decomposes on heating at 513K to form O_2 along with

(1) MnO_2 & K_2O_2 (2) K_2MnO_4 & Mn

(3) Mn & KO_2 (4) K_2MnO_4 & MnO_2

Ans. **(4)**

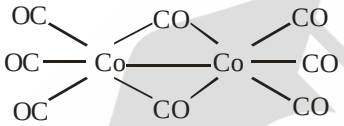
Sol. $KMnO_4 \xrightarrow{\Delta} K_2MnO_4 + MnO_2 + O_2$

75. In which one of the following metal carbonyls, CO forms a bridge between metal atoms?

(1) $[Co_2(CO)_8]$ (2) $[Mn_2(CO)_{10}]$ (3) $[Os_3(CO)_{12}]$ (4) $[Ru_3(CO)_{12}]$

Ans. **(1)**

Sol. (1)



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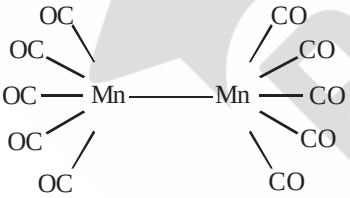

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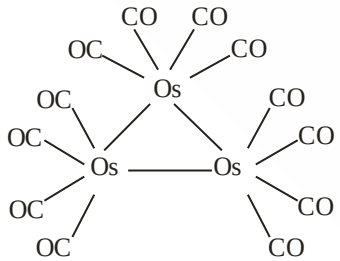
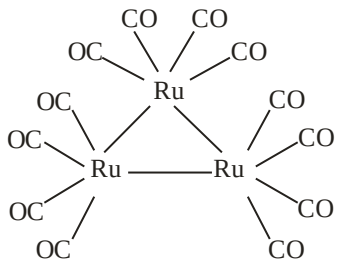


(4)



76. Type of amino acids obtained by hydrolysis of proteins is :

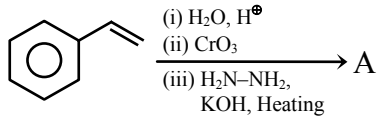
(1) β (2) α (3) δ (4) γ

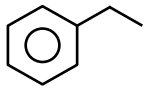
Ans. **(2)**

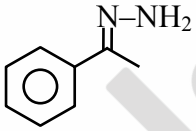
Sol. Proteins are natural polymers composed of α-amino acids which are connected by peptide linkages.

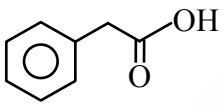
Hence proteins upon acidic hydrolysis produce α-amino acids.

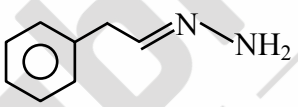
77. The final product A formed in the following multistep reaction sequence is



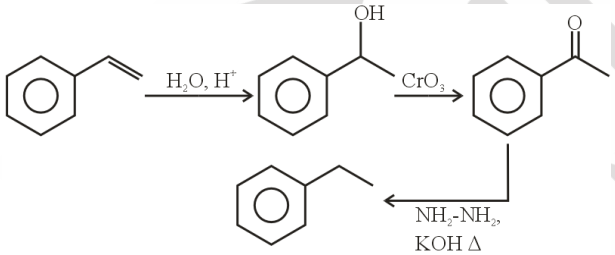
(1) 

(2) 

(3) 

(4) 

Ans. **(1)**

Sol. 

78. Which of the following is **not** correct?

(1) ΔG is negative for a spontaneous reaction

(2) ΔG is positive for a spontaneous reaction

(3) ΔG is zero for a reversible reaction

(4) ΔG is positive for a non-spontaneous reaction

Ans. **(2)**

Sol. $(\Delta G)_{P,T} = (+)$ve for non-spontaneous process

79. Chlorine undergoes disproportionation in alkaline medium as shown below :

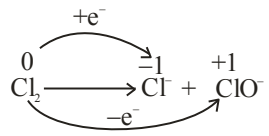
$a\ Cl_2(g) + b\ OH^-(aq) \rightarrow c\ ClO^-(aq) + d\ Cl^-(aq) + e\ H_2O(l)$

The values of a, b, c and d in a balanced redox reaction are respectively :

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

Ans. **(1)**

Sol.



$$\Rightarrow Cl_2 + 2\bar{O}H \longrightarrow Cl^- + ClO^- + H_2O$$

80. In alkaline medium. MnO_4^- oxidises I^- to

(1) IO_4^- (2) IO^- (3) I_2 (4) IO_3^-

Ans. **(4)**

Sol. $2MnO_4^- + H_2O + I^- \xrightarrow{\text{alkaline medium}} 2MnO_2 + 2OH^- + IO_3^-$

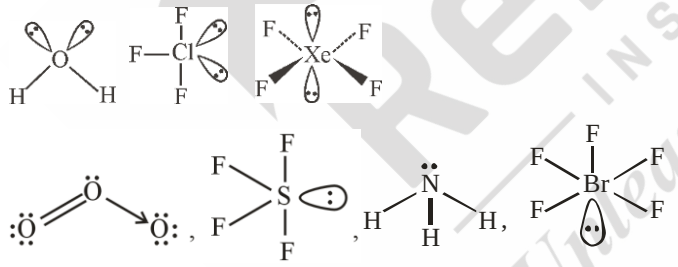
SECTION-B

81. Number of compounds with one lone pair of electrons on central atom amongst following is _

O_3, H_2O, SF_4, ClF_3, NH_3, BrF_5, XeF_4

Ans. **(4)**

Sol.



82. The mass of zinc produced by the electrolysis of zinc sulphate solution with a steady current of 0.015 A for 15 minutes is ____ $\times 10^{-4}$ g. (Atomic mass of zinc = 65.4 amu)

Ans. **(45.75) or (46)**

Sol. $Zn^{+2} + 2e^- \longrightarrow Zn$

$W = Z \times i \times t$

$$= \frac{65.4}{2 \times 96500} \times 0.015 \times 15 \times 60$$

$$= 45 \cdot 75 \times 10^{-4} \text{gm}$$

83. For a reaction taking place in three steps at same temperature, overall rate constant $K = \frac{K_1 K_2}{K_3}$.

If Ea_1, Ea_2 and Ea_3 are 40, 50 and 60 kJ/mol respectively, the overall Ea is____kJ/mol.

Ans. **(30)**

Sol. $K = \frac{K_1 \cdot K_2}{K_3} = \frac{A_1 \cdot A_2}{A_3} \cdot e^{-\frac{\left(E_{a_1}+E_{a_2}-E_{a_3}\right)}{RT}}$

$A \cdot e^{-E_a/RT} = \frac{A_1 A_2}{A_3} \cdot e^{-\frac{\left(E_{a_1}+E_{a_2}-E_{a_3}\right)}{RT}}$

$E_a = E_{a_1} + E_{a_2} - E_{a_3} = 40 + 50 - 60 = 30 \text{ kJ / mole.}$

84. For the reaction $N_2O_4(g) \rightleftharpoons 2NO_2(g)$, K_p= 0.492 atm at 300K. K_c for the reaction at same temperature is___ $\times 10^{-2}$.(Given : R = 0.082 L atm mol^{-1} K^{-1})

Ans. **(2)**

Sol. $K_P = K_C \cdot (RT)^{\Delta n_g}$

$\Delta n_g = 1$

$\Rightarrow K_c = \frac{K_P}{RT} = \frac{0.492}{0.082 \times 300} = 2 \times 10^{-2}$

85. A solution of H_2SO_4 is 31.4% H_2SO_4 by mass and has a density of 1.25g/mL.The molarity of the H_2SO_4 solution is____M (nearest integer)

[Given molar mass of H_2SO_4 = 98g mol^{-1}]

Ans. **(4)**

Sol. $M = \frac{n_{solute}}{V} \times 1000$

$= \frac{\left(\frac{31.4}{98}\right)}{\left(\frac{100}{1.25}\right)} \times 1000$

$= 4.005 \approx 4$

86. The osmotic pressure of a dilute solution is 7×10^5 Pa at 273K. Osmotic pressure of the same solution at 283K is____$\times 10^4$ Nm^{-2}.

Ans. **(72.56) or (73)**

Sol. $\pi = CRT$

$$\Rightarrow \frac{\pi_1}{\pi_2} = \frac{T_1}{T_2}$$

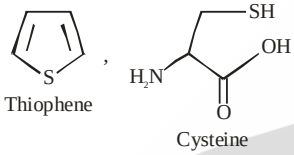
$$\Rightarrow \pi_2 = \frac{\pi_1 T_2}{T_1} = \frac{7\times10^5 \times 283}{273}$$

$$= 72.56 \times 10^4 \text{ Nm}^{-2}$$

87. Number of compounds among the following which contain sulphur as heteroatom is____.

Furan, Thiophene, Pyridine, Pyrrole, Cysteine, Tyrosine

Ans. **(2)**

Sol. 

Thiophene , Cysteine

88. The number of species from the following which are paramagnetic and with bond order equal to one is____.

$H_2, He_2^+, O_2^+, N_2^{2-}, O_2^{2-}, F_2, Ne_2^+, B_2$

Ans. **(1)**

Sol.

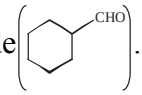
	Magnetic behaviour	**Bond order**
H_2	Diamagnetic	1
He_2^+	Paramagnetic	0.5
O_2^+	Paramagnetic	2.5
N_2^{2-}	Paramagnetic	2
O_2^{2-}	Diamagnetic	1
F_2	Diamagnetic	1
Ne_2^+	Paramagnetic	0.5
B_2	Paramagnetic	1

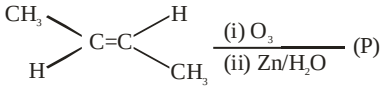
89. From the compounds given below, number of compounds which give positive Fehling's test is____.

Benzaldehyde, Acetaldehyde, Acetone,

Acetophenone, Methanal, 4-nitrobenzaldehyde, cyclohexane carbaldehyde.

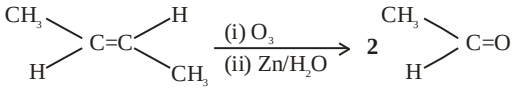
Ans. **(3)**

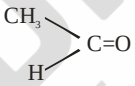
Sol. Acetaldehyde (CH_3CHO), Methanal (HCHO), and cyclohexane carbaldehyde  .

90. 

Consider the given reaction. The total number of oxygen atoms present per molecule of the product (P) is____.

Ans. **(1)**

Sol. 

Hence total number of oxygen atom present per molecule  is 1.