

# FINAL JEE-MAIN EXAMINATION – JANUARY, 2024

(Held On Monday 29<sup>th</sup> January, 2024)

TIME : 9 : 00 AM to 12 : 00 NOON

## 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)

- A. Ziegler catalyst
- B. Blood Pigment
- C. Wilkinson catalyst
- D. Vitamin B<sub>12</sub>

#### LIST-II

(Element Present)

- I. Rhodium
- II. Cobalt
- III. Iron
- 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 → Titanium  
Blood pigment → Iron  
Wilkinson catalyst → Rhodium  
Vitamin B<sub>12</sub> → Cobalt

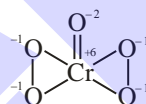
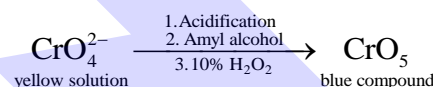
## TEST PAPER WITH SOLUTION

63. In chromyl chloride test for confirmation of Cl<sup>-</sup> ion, a yellow solution is obtained. Acidification of the solution and addition of amyl alcohol and 10% H<sub>2</sub>O<sub>2</sub> 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.**  $\text{Cl}^- + \text{K}_2\text{Cr}_2\text{O}_7 + \text{H}_2\text{SO}_4 \rightarrow \text{CrO}_2\text{Cl}_2 \xrightarrow{\text{Basic medium}} \text{CrO}_4^{2-} + \text{Cl}^-$   
yellow solution



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

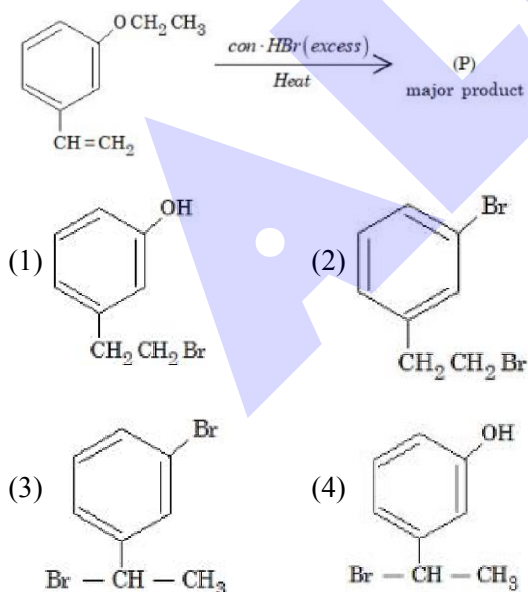
$$n = 5$$

$$l = 0$$

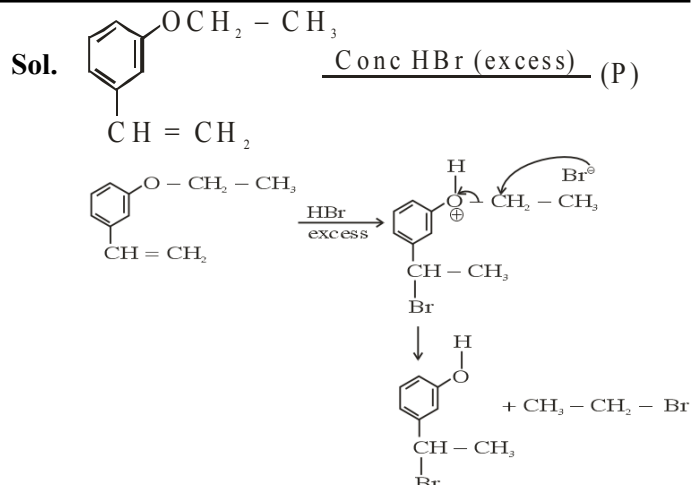
$$m = 0$$

$$s = +\frac{1}{2} \text{ or } -\frac{1}{2}$$

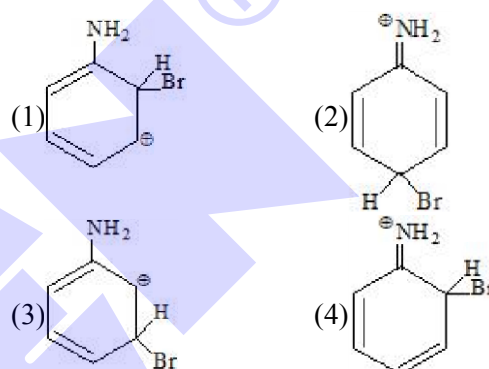
67. The major product(P) in the following reaction is



Ans. (4)

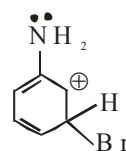


68. The arenium ion which is not involved in the bromination of Aniline is.



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.

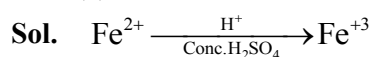


Hence Answer is (3)

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)



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.

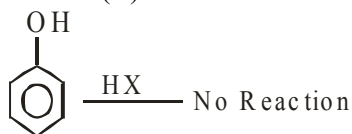
**Reason R :** Phenols react with halogen acids violently. In the light of the above statements, choose the most appropriate from the options given below:

- (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.

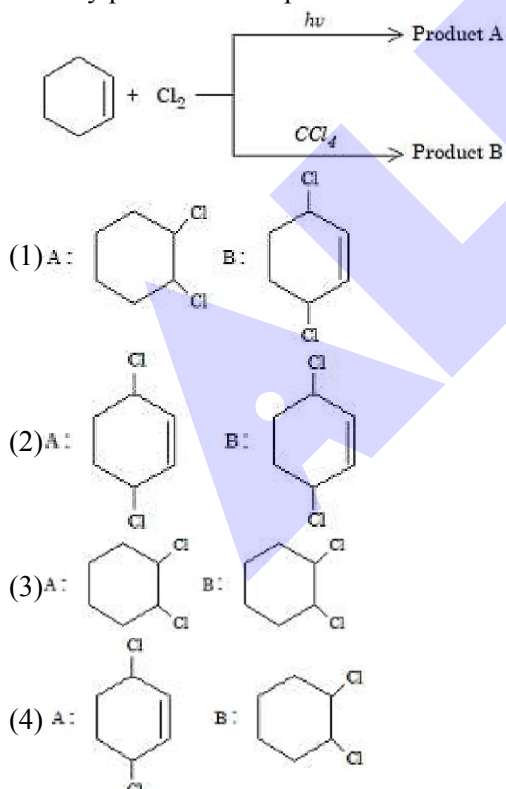
Reason (R) :



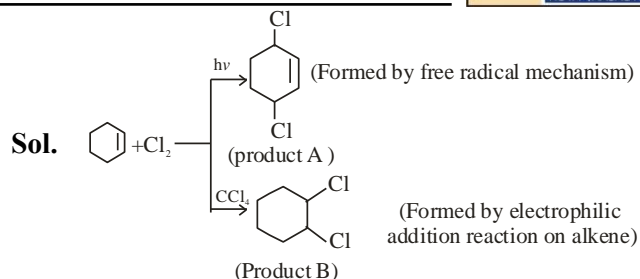
Given reason is false

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

71. Identify product A and product B :



Ans. (4)



Hence correct Ans. (4)

72. Identify the incorrect pair from the following :

- (1) Fluorspar-  $\text{BF}_3$
- (2) Cryolite- $\text{Na}_3\text{AlF}_6$
- (3) Fluoroapatite- $3\text{Ca}_3(\text{PO}_4)_2 \cdot \text{CaF}_2$
- (4) Carnallite- $\text{KCl} \cdot \text{MgCl}_2 \cdot 6\text{H}_2\text{O}$

Ans. (1)

**Sol.** (1) Fluorspar is  $\text{CaF}_2$

73. The interaction between  $\pi$  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.  $\text{KMnO}_4$  decomposes on heating at 513K to form

$\text{O}_2$  along with

- (1)  $\text{MnO}_2$  &  $\text{K}_2\text{O}_2$
- (2)  $\text{K}_2\text{MnO}_4$  & Mn
- (3) Mn &  $\text{KO}_2$
- (4)  $\text{K}_2\text{MnO}_4$  &  $\text{MnO}_2$

Ans. (4)

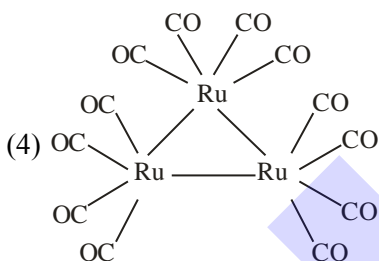
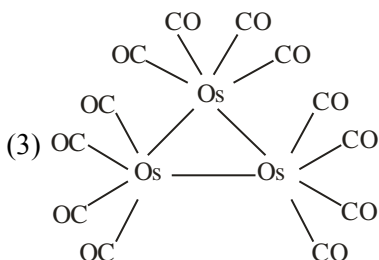
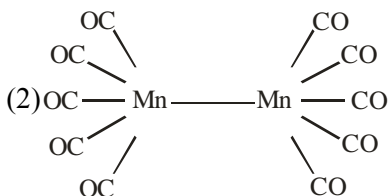
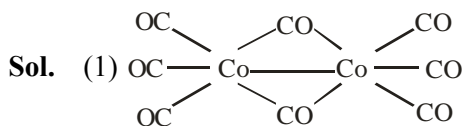
**Sol.**  $\text{KMnO}_4 \xrightarrow{\Delta} \text{K}_2\text{MnO}_4 + \text{MnO}_2 + \text{O}_2$



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

- (1)  $[\text{Co}_2(\text{CO})_8]$  (2)  $[\text{Mn}_2(\text{CO})_{10}]$   
(3)  $[\text{Os}_3(\text{CO})_{12}]$  (4)  $[\text{Ru}_3(\text{CO})_{12}]$

Ans. (1)



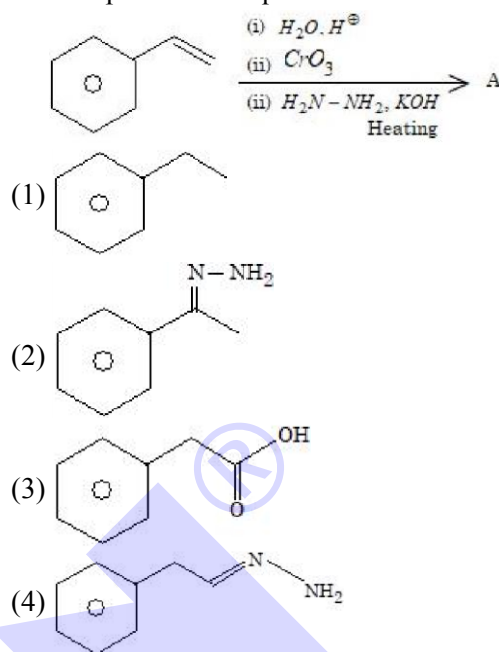
76. Type of amino acids obtained by hydrolysis of proteins is :

- (1)  $\beta$  (2)  $\alpha$   
(3)  $\delta$  (4)  $\gamma$

Ans. (2)

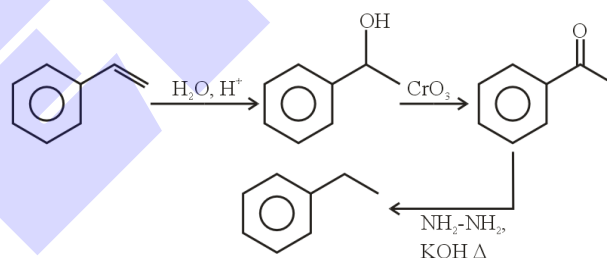
Sol. Proteins are natural polymers composed of  $\alpha$ -amino acids which are connected by peptide linkages. Hence proteins upon acidic hydrolysis produce  $\alpha$ -amino acids.

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



Ans. (1)

Sol.



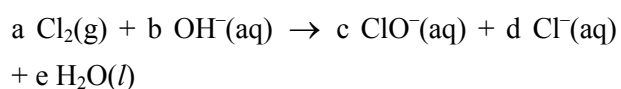
78. Which of the following is **not** correct?

- (1)  $\Delta G$  is negative for a spontaneous reaction  
(2)  $\Delta G$  is positive for a spontaneous reaction  
(3)  $\Delta G$  is zero for a reversible reaction  
(4)  $\Delta G$  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 :



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)

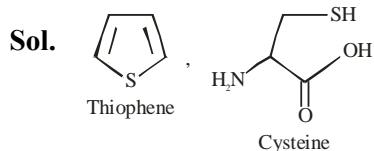




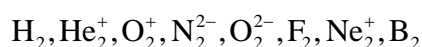
87. Number of compounds among the following which contain sulphur as heteroatom is \_\_\_\_.

Furan, Thiophene, Pyridine, Pyrrole, Cysteine, Tyrosine

Ans. (2)



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



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 \_\_\_\_.

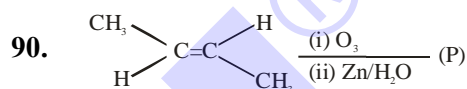
Benzaldehyde, Acetaldehyde, Acetone,

Acetophenone, Methanal, 4-nitrobenzaldehyde, cyclohexane carbaldehyde.

Ans. (3)

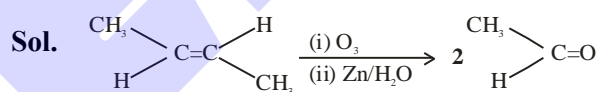
Sol. Acetaldehyde ( $CH_3CHO$ ), Methanal ( $HCHO$ ), and

cyclohexane carbaldehyde .

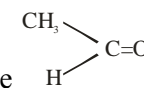


Consider the given reaction. The total number of oxygen atoms present per molecule of the product (P) is \_\_\_\_.

Ans. (1)



Hence total number of oxygen atom present per

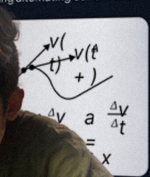
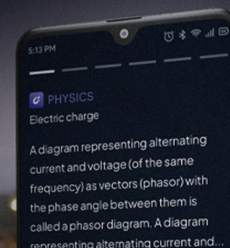
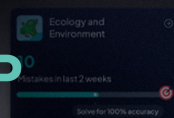
molecule  is 1.

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