

JEE-MAIN EXAMINATION – JANUARY 2025

(HELD ON WEDNESDAY 29th JANUARY 2025)

TIME : 3 : 00 PM TO 6 : 00 PM

CHEMISTRY

TEST PAPER WITH SOLUTION

SECTION-A

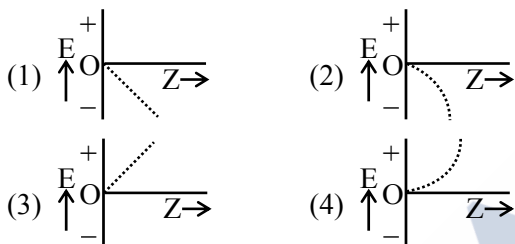
51. The calculated spin-only magnetic moments of $K_3[Fe(OH)_6]$ and $K_4[Fe(OH)_6]$ respectively are :
- (1) 4.90 and 4.90 B.M.
 - (2) 5.92 and 4.90 B.M.
 - (3) 3.87 and 4.90 B.M.
 - (4) 4.90 and 5.92 B.M.

Ans. (2)

52. For hydrogen like species, which of the following graphs provides the most appropriate representation of E vs Z plot for a constant n ?

[E : Energy of the stationary state,

Z : atomic number, n = principal quantum number]



Ans. (2)

53. Given below are two statements :

Statement (I) : In partition chromatography, stationary phase is thin film of liquid present in the inert support.

Statement (II) : In paper chromatography, the material of paper acts as a stationary phase.

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

- (1) Both **Statement I** and **Statement II** are false
- (2) **Statement I** is true but **Statement II** is false
- (3) Both **Statement I** and **Statement II** are true
- (4) **Statement I** is false but **Statement II** is true

Ans. (2)

Sol. **Statement I is true.**

In partition chromatography, stationary phase is thin liquid film present in the inert support.

Statement II is false.

Because stationary phase in paper chromatography is water.

54. Identify the essential amino acids from below :

- | | |
|--------------|---------------|
| (A) Valine | (B) Proline |
| (C) Lysine | (D) Threonine |
| (E) Tyrosine | |

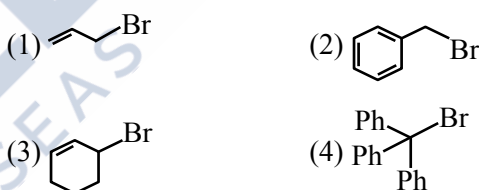
Choose the **correct** answer from the options given below :

- (1) (A),(C) and (D) only
- (2) (A),(C) and (E) only
- (3) (B),(C) and (E) only
- (4) (C),(D) and (E) only

Ans. (1)

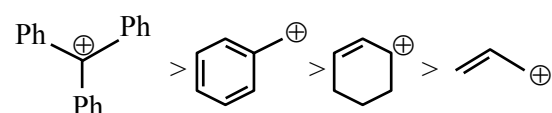
Sol. Valine, Lysine and Threonine are essential amino acids.

55. Which among the following halides will generate the most stable carbocation in Nucleophilic substitution reaction ?

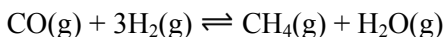


Ans. (4)

Sol. Stability order of carbocation



56. Consider the equilibrium



If the pressure applied over the system increases by two fold at constant temperature then

- (A) Concentration of reactants and products increases.
- (B) Equilibrium will shift in forward direction.
- (C) Equilibrium constant increases since concentration of products increases.
- (D) Equilibrium constant remains unchanged as concentration of reactants and products remain same.

Choose the **correct** answer from the options given below :

- (1) (A) and (B) only
- (2) (A), (B) and (D) only
- (3) (B) and (C) only
- (4) (A), (B) and (C) only

Ans. (1)

57. Given below are two statements :

Statement (I) : NaCl is added to the ice at 0°C, present in the ice cream box to prevent the melting of ice cream.

Statement (II) : On addition of NaCl to ice at 0°C, there is a depression in freezing point.

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

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

Ans. (2)

58. Given below are two statements :

Statement (I) : On nitration of m-xylene with HNO₃, H₂SO₄ followed by oxidation, 4-nitrobenzene-1, 3-dicarboxylic acid is obtained as the major product.

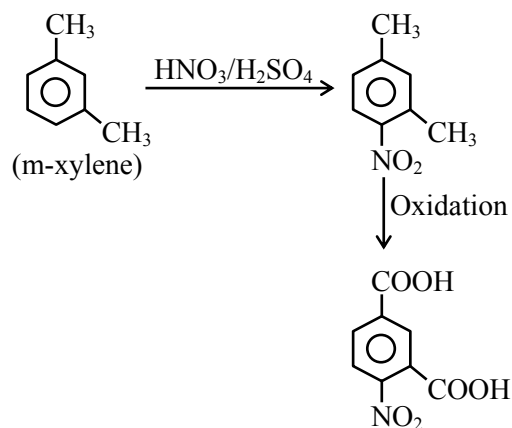
Statement (II) : CH₃ group is o/p-directing while-NO₂ group is m-directing group.

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

- (1) Both **Statement I** and **Statement II** are false
- (2) **Statement I** is false but **Statement II** is true
- (3) Both **Statement I** and **Statement II** are true
- (4) **Statement I** is true but **Statement II** is false

Ans. (3)

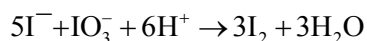
Sol. **Statement-I**



Statement-II

-CH₃ group is o/p directing while -NO₂ group is meta directing.

59. 0.1 M solution of KI reacts with excess of H₂SO₄ and KIO₃ solution. According to equation



Identify the **correct** statements :

- (A) 200 mL of KI solution reacts with 0.004 mol of KIO₃
- (B) 200 mL of KI solution reacts with 0.006 mol of H₂SO₄
- (3) 0.5 L of KI solution produced 0.005 mol of I₂
- (4) Equivalent weight of KIO₃ is equal to $\left(\frac{\text{Molecular weight}}{5}\right)$

Choose the **correct** answer from the options given below.

- (1) (A) and (D) only
- (2) (B) and (C) only
- (3) (A) and (B) only
- (4) (C) and (D) only

Ans. (1)

60. Match List-I with List-II :

List-I Applications		List-II Batteries/Cell	
(A)	Transistors	(I)	Anode - Zn/Hg ; Cathode - HgO + C
(B)	Hearing aids	(II)	Hydrogen fuel cell
(C)	Invertors	(III)	Anode - Zn; Cathode - Carbon
(D)	Apollo space ship	(IV)	Anode - Pb ; Cathode - Pb PbO ₂

Choose the **correct** answer from the options given below :

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

Ans. (1)

61. O₂ gas will be evolved as a product of electrolysis of :

- (A) an aqueous solution of AgNO₃ using silver electrodes.
- (B) an aqueous solution of AgNO₃ using platinum electrodes.
- (C) a dilute solution of H₂SO₄ using platinum electrodes.
- (D) a high concentration solution of H₂SO₄ using platinum electrodes.

Choose the **correct** answer from the options given below :

- (1) (B) and (C) only
- (2) (A) and (D) only
- (3) (B) and (D) only
- (4) (A) and (C) only

Ans. (1)

62. Identify the homoleptic complexes with odd number of d electrons in the central metal.

- (A) $[\text{FeO}_4]^{2-}$ (B) $[\text{Fe}(\text{CN})_6]^{3-}$
 (C) $[\text{Fe}(\text{CN})_5\text{NO}]^{2-}$ (D) $[\text{CoCl}_4]^{2-}$
 (E) $[\text{Co}(\text{H}_2\text{O})_3\text{F}_3]$

Choose the **correct** answer from the options given below :

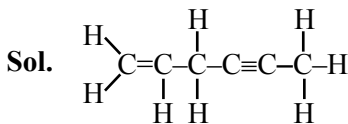
- (1) (B) and (D) only (2) (C) and (E) only
 (3) (A), (B) and (D) only (4) (A), (C) and (E) only

Ans. (1)

63. Total number of sigma (σ) _____ and pi (π) _____ bonds respectively present in hex-1-en-4-yne are :

- (1) 13 and 3 (2) 11 and 3
 (3) 3 and 13 (4) 14 and 3

Ans. (1)



σ bonds = 13

π bonds = 3

64. If $\text{C}(\text{diamond}) \rightarrow \text{C}(\text{graphite}) + X \text{ kJ mol}^{-1}$
 $\text{C}(\text{diamond}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + Y \text{ kJ mol}^{-1}$
 $\text{C}(\text{graphite}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + Z \text{ kJ mol}^{-1}$

At constant temperature. Then

- (1) $X = Y + Z$
 (2) $-X = Y + Z$
 (3) $X = -Y + Z$
 (4) $X = Y - Z$

Ans. (4)

65. Given below are two statements :

Statement (I): It is impossible to specify simultaneously with arbitrary precision, both the linear momentum and the position of a particle.

Statement (II) : If the uncertainty in the measurement of position and uncertainty in measurement of momentum are equal for an electron, then the uncertainty in the measurement

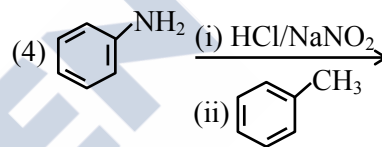
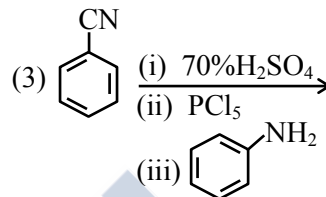
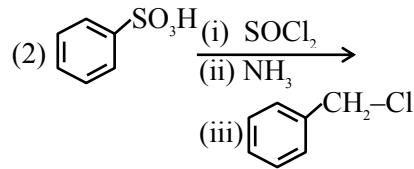
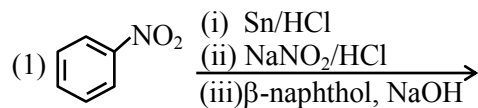
of velocity is $\geq \sqrt{\frac{h}{\pi}} \times \frac{1}{2m}$.

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

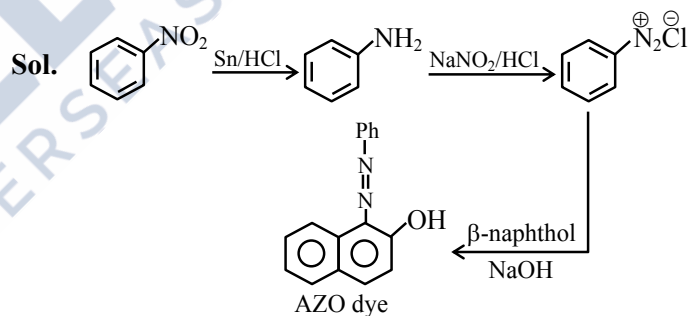
- (1) **Statement I** is true but **Statement II** is false.
 (2) Both **Statement I** and **Statement II** are true.
 (3) **Statement I** is false but **Statement II** is true.
 (4) Both **Statement I** and **Statement II** are false.

Ans. (2)

66. Which one of the following reaction sequences will give an azo dye ?



Ans. (1)



67. Drug X becomes ineffective after 50% decomposition. The original concentration of drug in a bottle was 16 mg/mL which becomes 4 mg/mL in 12 months. The expiry time of the drug in months is _____.

Assume that the decomposition of the drug follows first order kinetics.

- (1) 12 (2) 2
 (3) 3 (4) 6

Ans. (4)

68. The type of oxide formed by the element among Li, Na, Be, Mg, B and Al that has the least atomic radius is :

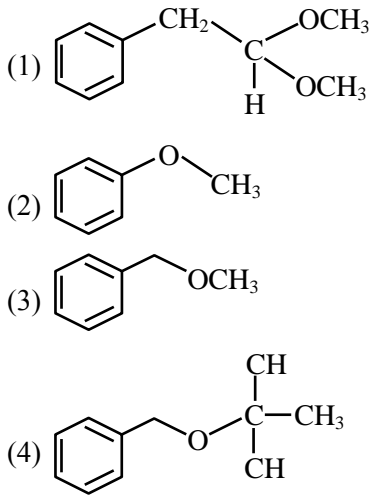
- (1) A_2O_3 (2) AO_2
 (3) AO (4) A_2O

Ans. (1)

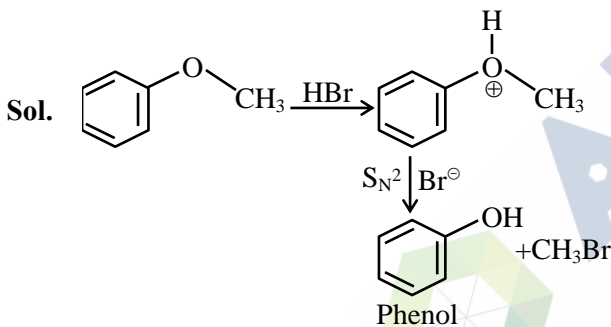
69. First ionisation enthalpy values of first four group 15 elements are given below. Choose the correct value for the element that is a main component of apatite family :
- (1) 1012 kJ mol⁻¹ (2) 1402 kJ mol⁻¹
 (3) 834 kJ mol⁻¹ (4) 947 kJ mol⁻¹

Ans. (1)

70. Which one of the following, with HBr will give a phenol?



Ans. (2)



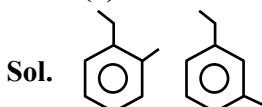
SECTION-B

71. Consider the following low-spin complexes K₃[Co(NO₂)₆], K₄[Fe(CN)₆], K₃[Fe(CN)₆], Cu₂[Fe(CN)₆] and Zn₂[Fe(CN)₆]. The sum of the spin-only magnetic moment values of complexes having yellow colour is _____ B.M. (answer is nearest integer)

Ans. (0)

72. Isomeric hydrocarbons → negative Baeyer's test (Molecular formula C₉H₁₂) The total number of isomers from above with four different non-aliphatic substitution sites is -

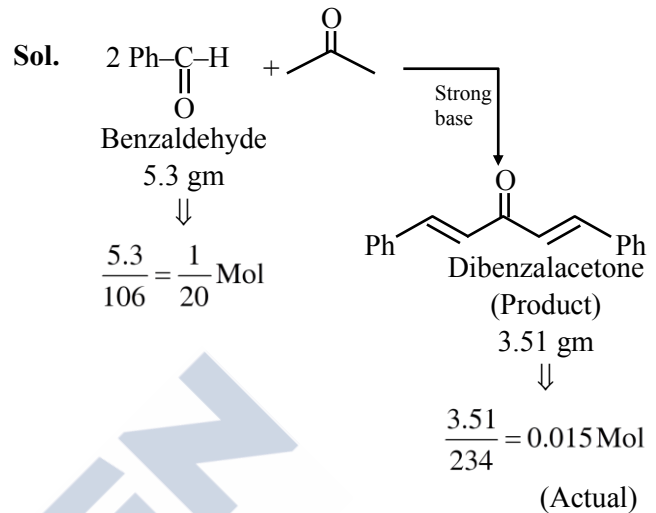
Ans. (2)



Above two isomers of C₉H₁₂ have four different sites for aromatic electrophilic substitution reaction.

73. In the Claisen-Schmidt reaction to prepare, dibenzalacetone from 5.3 g benzaldehyde, a total of 3.51 g of product was obtained. The percentage yield in this reaction was _____ %.

Ans. (60)



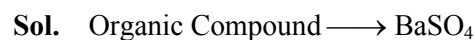
$$\text{Theoretical} = \frac{1}{40} \text{ Mol}$$

$$\% \text{ yield} = \frac{0.015}{1/40} \times 100$$

$$\Rightarrow 60\%$$

74. In the sulphur estimation, 0.20 g of a pure organic compound gave 0.40 g of barium sulphate. The percentage of sulphur in the compound is _____ × 10⁻¹ %.
- (Molar mass : O = 16, S = 32, Ba = 137 in g mol⁻¹)

Ans. (275)



$$0.20 \text{ gm} \qquad \qquad \qquad 0.40 \text{ gm}$$

$$\frac{0.40}{233} \text{ mol}(\text{BaSO}_4)$$

$$\frac{0.40}{233} \text{ mol} (\text{Sulphur})$$

$$\frac{0.40}{233} \times 32 \text{ gm} (\text{sulphur})$$

$$\% \text{S} = \frac{0.40 \times 32}{233} \times 100 = 27.5\% \text{ or } 275 \times 10^{-1} \%$$

75. Total number of non bonded electrons present in NO₂⁻ ion based on Lewis theory is _____ .

Ans. (12)