

## SECTION-I: Numerical Value Questions

- **Total Questions:** 08
- **Maximum Marks:** 24
- **Answer Format:** Enter the correct **Numerical Value** in the designated box.
- **Rounding Rule:** If the answer has more than two decimal places, **truncate or round off** to two decimal places.
  - *Example:* If the calculated answer is 11.36777, both **11.36** and **11.37** will be accepted as correct.

| Outcome        | Marks Awarded | Condition  |
|----------------|---------------|--|
| Full Marks     | +3            | If <b>ONLY</b> the correct numerical value is entered.           |
| Zero Marks     | 0             | If the answer is incorrect, left blank, or formatted improperly. |
| Negative Marks | 0             | There is <b>no negative marking</b> for this section.            |

- Amongst the following the number of species having the linear shape is \_\_\_\_\_.  
 $XeF_2, I_3^+, C_3O_2, I_3^-, CO_2, SO_2, BeCl_2$  and  $BCl_2^-$
- A soft drink was bottled with a partial pressure of  $CO_2$  of 3 bar over the liquid at room temperature. The partial pressure of  $CO_2$  over the solution approaches a value of 30 bar when 44g of  $CO_2$  is dissolved in 1kg of water at room temperature. The approximate pH of the soft drink is \_\_\_\_\_  $\times 10^{-1}$ .  
 (First dissociation constant of  $H_2CO_3 = 4 \times 10^{-7}$ ;  $\log 2 = 0.3$ ; density of the soft drink =  $1 \text{ gmL}^{-1}$ )
- The ratio of masses of Oxygen and Nitrogen in a particular gaseous mixture is 1:4. The ratio of number of their molecules is –  
 (a) 3:16                      (b) 1:4                      (c) 7:32                      (d) 1:8
- The observed magnetic moment of the complex  $[Mn(NCS)_6]^{x-}$  is 6.06BM. The numerical value of  $x$  is \_\_\_\_\_.
- Consider a complex reaction taking place in three steps with rate constants  $k_1, k_2$  and  $k_3$  respectively. The overall rate constants  $k$  is given by the expression  $k = \sqrt{\left(\frac{k_1 k_3}{k_2}\right)}$ . If the activation energies of the three steps are 60, 30 and  $10 \text{ kJmol}^{-1}$  respectively, then the overall energy of activation in  $\text{kJmol}^{-1}$  is \_\_\_\_\_. (Nearest integer)
- If the formula of Borax is  $Na_2B_4O_x(OH)_y \cdot zH_2O$ , then  $x + y + z =$  \_\_\_\_\_.
- The value of Rydberg constant ( $R_H$ ) is  $2.18 \times 10^{-18} \text{ J}$ . The velocity of electron having mass  $9.1 \times 10^{-31} \text{ kg}$  in Bohr's first orbit of hydrogen atom = \_\_\_\_\_  $\times 10^5 \text{ ms}^{-1}$ .
- The sum of sigma and pi bonds in hex-1,3-dien-5-yne is \_\_\_\_\_.

## Section II: Multiple Correct Options

- **Total Questions:** 06
- **Question Type:** Each question has four options. **One or more** option(s) may be correct.
- **Goal:** Select **all** the correct options to receive full marks.

| Category              | Marks     | Condition for Evaluation   |
|-----------------------|-----------|--|
| <b>Full Marks</b>     | <b>+4</b> | If only (all) the correct option(s) are chosen.  |
| <b>Partial Marks</b>  | <b>+3</b> | If all four options are correct but <b>ONLY</b> three options are chosen (all correct).      |
| <b>Partial Marks</b>  | <b>+2</b> | If three or more options are correct but <b>ONLY</b> two options are chosen (both correct).  |
| <b>Partial Marks</b>  | <b>+1</b> | If two or more options are correct but <b>ONLY</b> one option is chosen (and it is correct). |
| <b>Zero Marks</b>     | <b>0</b>  | If the question is left unanswered (none of the options are chosen).                         |
| <b>Negative Marks</b> | <b>-2</b> | <b>In all other cases</b> (e.g., if any incorrect option is selected).                       |

- I. **To get +4:** You must select **A, C, and D** only.
- II. **To get +2:** You select **A and C** (Two correct, zero incorrect).
- III. **To get +1:** You select only **A** (One correct, zero incorrect).
- IV. **To get -2:** You select **A and B**. Even though A is correct, choosing the incorrect option **B** results in a penalty.

9. In a multi electron atom, which of the following orbitals described by three quantum numbers will have same energy in absence of electric and magnetic fields?

- A.  $n=1, l=0, m_l=0$
- B.  $n=2, l=0, m_l=0$
- C.  $n=2, l=1, m_l=1$
- D.  $n=3, l=2, m_l=1$
- E.  $n=3, l=2, m_l=0$

Choose the correct answer from the options given below:

- a) A and B only
- b) B and C only
- c) C and D only
- d) D and E only

10. Consider 'n' is the number of lone pair of electrons present in the equatorial position of the most stable structure of  $\text{ClF}_3$ . The ions from the following with 'n' number of unpaired electrons are:

- A.  $\text{V}^{3+}$

- B.  $Ti^{3+}$
- C.  $Cu^{2+}$
- D.  $Ni^{2+}$
- E.  $Ti^{2+}$

Choose the correct answer from the options given below:

- a) A, D and E only
- b) B and C only
- c) A and C only
- d) B and D only

11. The correct orders among the following are:

- A. Atomic radius:  $B < Al < Ga < In < Tl$
- B. Electronegativity:  $Al < Ga < In < Tl < B$
- C. Density:  $Tl < In < Ga < Al < B$
- D. 1st Ionization Energy:  $In < Al < Ga < Tl < B$

Choose the correct answer from the options given below:

- a) A and C only
- b) C and D only
- c) A and B only
- d) B and D only

12. The correct statements from the following are :

- (A)  $Tl^{3+}$  is a powerful oxidising agent
- (B)  $Al^{3+}$  does not get reduced easily
- (C) Both  $Al^{3+}$  and  $Tl^{3+}$  are very stable in solution
- (D)  $Tl^+$  is more stable than  $Tl^{3+}$
- (E)  $Al^{3+}$  and  $Tl^+$  are highly stable

Choose the correct answer from the options given below :

- a) A, B, D and E only
- b) B, D and E only
- c) A, C and D only
- d) A, B, C, D and E

13. Given below are two statements :

Statement I :  $H_2Se$  is more acidic than  $H_2Te$ .

Statement II :  $H_2Se$  has higher bond enthalpy for dissociation than  $H_2Te$ .

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

- a) Both statement I and statement II are false.
- b) Statement I is false but Statement II is true.
- c) Statement I is true but Statement II is false.
- d) Both statement I and statement II are true.

14. Given two of the following are the two statements:

Statement I: One mole of propyne reacts with excess of sodium to half a mole of  $H_2$  Gas.

Statement II: Four g of propyne reacts with  $NaNH_2$  to be released  $NH_3$  Gas which occupies 224 ml at STP.

In the light of the above statements, choose the most answer to the most relevant answer from the options given below:

- a) I is the correct statement but II is incorrect.
- b) The statement I is incorrect but II is correct.
- c) The two statements I and II are correct.
- d) The two statements I and II are incorrect.

## SECTION-III: Matching Type Questions

- **Maximum Marks:** 12
- **Number of Questions:** 04
- **Question Format:** Each question contains two matching lists. You must identify the correct sequence of matches from the given choices (A), (B), (C), or (D).
- **Selection:** ONLY ONE option is correct.

| Outcome        | Marks Awarded | Condition   |
|----------------|---------------|---|
| Full Marks     | +3            | If ONLY the correct option is chosen.               |
| Zero Marks     | 0             | If the question is left unanswered.                 |
| Negative Marks | -1            | In all other cases (Selecting an incorrect option). |

15 . Match List I and List II.

| List I |                 | List II |  |
|--------|-----------------|---------|--|
| A      | Osmosis         | I       | Solvent molecules pass through semi permeable membrane towards solvent side.   |
| B      | Reverse osmosis | II      | Movement of charged colloidal particles under the influence of applied electric potential towards oppositely charged electrodes. |
| C      | Electro osmosis | III     | Solvent molecules pass through semi permeable membrane towards solution side.  |
| D      | Electrophoresis | IV      | Dispersion medium moves in an electric field.  |

Choose the correct answer from the options given below:

- (a) A-I, B-III, C-IV, D-II  
 (b) A-III, B-I, C-IV, D-II  
 (c) A-I, B-III, C-II, D-IV  
 (d) A-III, B-I, C-II, D-IV

16. Match List I with List II.

| List I |                              | List II |               |
|--------|------------------------------|---------|---------------|
| A      | Melting point [K]            | I       | Tl>In>Ga>Al>B |
| B      | Ionic radius [ $M^{+3}/pm$ ] | II      | B>Tl>Al≈Ga>In |
| C      | $\Delta_f H_1 [kJmol^{-1}]$  | III     | Tl>In>Al>Ga>B |
| D      | Atomic radius [pm]           | IV      | B>Al>Tl>In>Ga |

Choose the correct answer from the options given below:

- (a) A-III, B-IV, C-I, D-II
- (b) A-IV, B-I, C-II, D-III
- (c) A-II, B-III, C-IV, D-I
- (d) A-I, B-II, C-III, D-IV

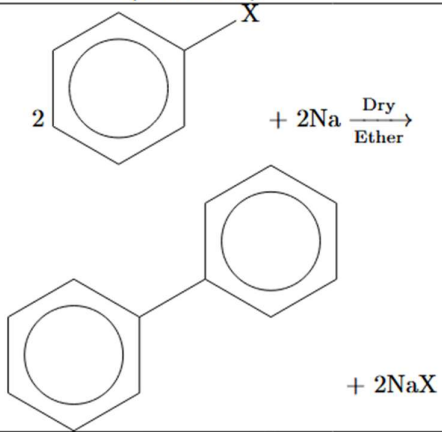
17. Match List-I with List-II.

| 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 <sub>2</sub> |

Choose the correct answer from the options given below:

- (a) (A)-(III), (B)-(I), (C)-(IV), (D)-(II)
- (b) (A)-(II), (B)-(III), (C)-(IV), (D)-(I)
- (c) (A)-(III), (B)-(II), (C)-(IV), (D)-(I)
- (d) (A)-(IV), (B)-(III), (C)-(II), (D)-(I)

18. Match the List-I with List-II

| List-I<br>(Reaction) |   | List-II<br>(Name of reaction) |                      |
|----------------------|---|-------------------------------|----------------------|
| A.                   |  $2 \text{C}_6\text{H}_5\text{X} + 2\text{Na} \xrightarrow[\text{Ether}]{\text{Dry}} \text{C}_6\text{H}_5\text{C}_6\text{H}_5 + 2\text{NaX}$ | I.                            | Lucas reaction       |
| B.                   | $\text{ArN}_2^+\text{X}^- \xrightarrow[\text{HCl}]{\text{Cu}} \text{ArCl} + \text{N}_2 \uparrow + \text{CuX}$   | II.                           | Finkelstein reaction |
| C.                   | $\text{C}_2\text{H}_5\text{Br} + \text{NaI} \xrightarrow[\text{Acetone}]{\text{Dry}} \text{C}_2\text{H}_5\text{I} + \text{NaBr}$  | III.                          | Fittig reaction      |
| D.                   | $\text{CH}_3\text{C}(\text{OH})(\text{CH}_3)\text{CH}_3 \xrightarrow[\text{ZnCl}_2]{\text{HCl}} \text{CH}_3\text{C}(\text{Cl})(\text{CH}_3)\text{CH}_3$   | IV.                           | Gatterman reaction   |

Choose the correct answer from the options given below:

- (a) A-III, B-II, C-IV, D-I  
 (b) A-IV, B-III, C-I, D-II  
 (c) A-IV, B-I, C-II, D-III  
 (d) A-III, B-IV, C-II, D-I