

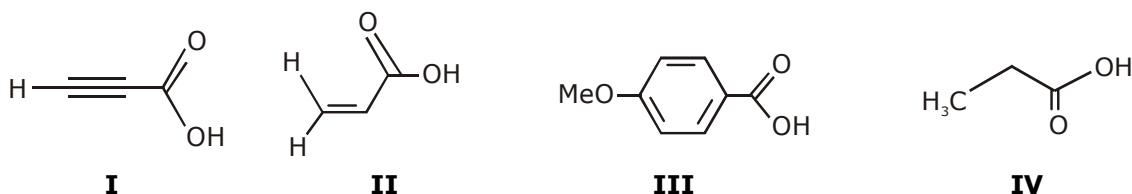
## CHEMISTRY [ JEE ADVANCED - 2019 ] PAPER - 1

### Section 1 (Maximum Marks : 12)

This section contains **FOUR (04)** questions.

- Each question has **FOUR** options. **ONLY ONE** of these four options is the correct answer.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated according to the following marking scheme :  
 Full Marks : +3 If **ONLY** the correct option is chosen ;  
 Zero Marks : 0 If none of the option is chosen (i.e. the question is unanswered) ;  
 Negative Marks : -1 in all other cases.

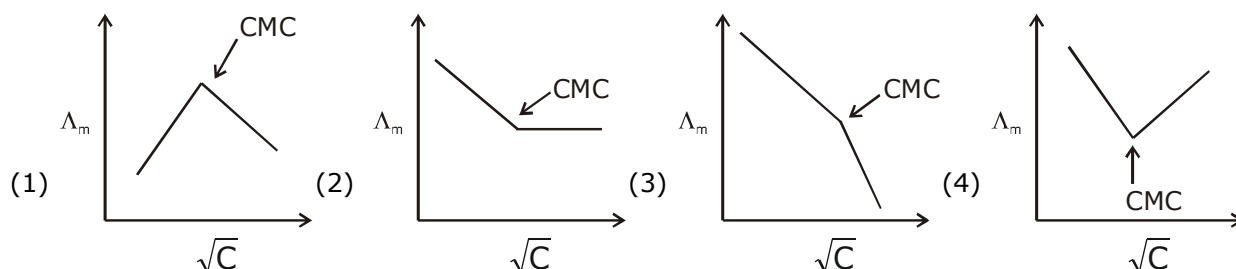
1. The correct order of acid strength of the following carboxylic acids is :



- (1) II > I > IV > III  
 (2) III > II > I > IV  
 (3) I > II > III > IV  
 (4) I > III > II > IV

Ans. 3

2. Molar conductivity ( $\Lambda_m$ ) of aqueous solution of sodium stearate, which behaves as a strong electrolyte, is recorded at varying concentrations (c) of sodium stearate. Which one of the following plots provides the correct representation of micelle formation in the solution ? (critical micelle concentration (CMC) is marked with an arrow in the figures)



Ans. 3

3. Calamine, malachite, magnetite and cryolite, respectively, are

- (1)  $\text{ZnCO}_3$ ,  $\text{CuCO}_3 \cdot \text{Cu(OH)}_2$ ,  $\text{Fe}_3\text{O}_4$ ,  $\text{Na}_3\text{AlF}_6$   
 (2)  $\text{ZnSO}_4$ ,  $\text{Cu(OH)}_2$ ,  $\text{Fe}_3\text{O}_4$ ,  $\text{Na}_3\text{AlF}_6$   
 (3)  $\text{ZnCO}_3$ ,  $\text{CuCO}_3$ ,  $\text{Fe}_2\text{O}_3$ ,  $\text{Na}_3\text{AlF}_6$   
 (4)  $\text{ZnSO}_4$ ,  $\text{CuCO}_3$ ,  $\text{Fe}_2\text{O}_3$ ,  $\text{AlF}_3$

Ans. 1

4. The green colour produced in the borax bead test of a chromium (III) salt is due to

- (1)  $\text{Cr(BO}_2)_3$  (2)  $\text{CrB}$   
 (3)  $\text{Cr}_2(\text{B}_4\text{O}_7)_3$  (4)  $\text{Cr}_2\text{O}_3$

Ans. 1

## Section 2 (Maximum Marks : 32)

This section contains **EIGHT (08)** questions.

Each question has **FOUR** options. **ONE MORE THAN ONE** of these four option(s) is (are) correct answer(s).

For each question, choose the option corresponding to (all) the correct answer(s).

Answer to each question will be evaluated according to the following marking scheme :

Full Marks : +4 If only (all) the correct option(s) is (are) chosen ;

Partial Marks : +3 If all the four options are correct but ONLY three options are chosen :

Partial Marks : +2 If three or more options are correct but ONLY two options are chosen and both of which are correct.

Partial Marks : +1 If two or more options are correct but ONLY one option is chosen and it is a correct option ;

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered) ;

Negative Marks : -1 in all other cases.

For example, in a question, If (A), (B) and (D) are the ONLY three options corresponding to correct answers, then

choosing ONLY (A), (B) and (D) will get +4 marks ;

choosing ONLY (A) and (B) will get +2 marks ;

choosing ONLY (A) and (D) will get +2 marks ;

choosing ONLY (B) and (D) will get +2 marks ;

choosing ONLY (A) will get +1 marks ;

choosing ONLY (B) will get +1 marks ;

choosing ONLY (D) will get +1 marks ;

choosing no option (i.e. the question is unanswered) will get 0 marks ; and

choosing any other combination of options will get -1 mark.

1. Fusion of  $\text{MnO}_2$  with  $\text{KOH}$  in presence of  $\text{O}_2$  produces a salt W. Alkaline solution of W upon electrolytic oxidation yields another salt X. The manganese containing ions present in W and X, respectively, are Y and Z. Correct statement(s) is (are)
- (1) In aqueous acidic solution, Y undergoes disproportionation reaction to give Z and  $\text{MnO}_2$
  - (2) In both Y and Z,  $\pi$ -bonding occurs between p-orbitals of oxygen and d-orbitals of manganese
  - (3) Y is diamagnetic in nature while Z is paramagnetic
  - (4) Both Y and Z are coloured and have tetrahedral shape

**Ans. 1, 2, 4**

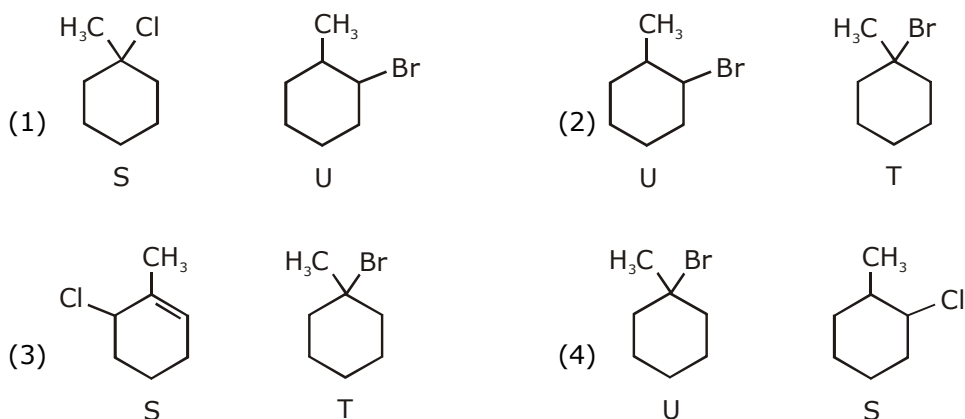
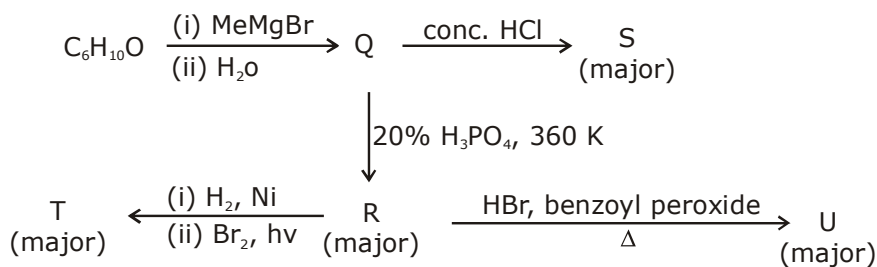
2. Which of the following statement(s) is (are) correct regarding the root mean square speed ( $u_{\text{rms}}$ ) and average translational kinetic energy ( $E_{\text{av}}$ ) of a molecule in a gas at equilibrium ?
- (1)  $E_{\text{av}}$  at a given temperature does not depend on its molecular mass
  - (2)  $u_{\text{rms}}$  is doubled when its temperature is increased four times
  - (3)  $E_{\text{av}}$  is doubled when its temperature is increased four times.
  - (4)  $u_{\text{rms}}$  is inversely proportional to the square root of its molecular mass

**Ans. 1,2,4**

3. Which of the following statement(s) is (are) true ?
- (1) Oxidation of glucose with bromine water gives glutamic acid
  - (2) The two six-membered cyclic hemiacetal forms of D-(+)-glucose are called anomers
  - (3) Monosaccharides cannot be hydrolysed to give polyhydroxy aldehydes and ketones
  - (4) Hydrolysis of sucrose gives dextrorotatory glucose and laevorotatory fructose

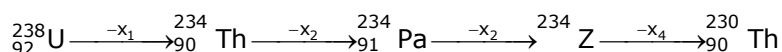
**Ans. 2,3,4**

4. Choose the correct option(s) for the following set of reactions



Ans. 1,2

5. In the decay sequence,

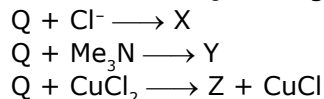


$x_1, x_2, x_3$  are  $x_4$  are particles/radiation emitted by the respective isotopes. The correct options is(are)

- (1)  $x_3$  is  $\gamma$ -ray
- (2)  $x_1$  will deflect towards negatively charged plate
- (3) Z is an isotope of uranium
- (4)  $x_2$  is  $\beta^-$

Ans. 2,3,4

6. A tin chloride 'Q' undergoes the following reactions (not balanced)

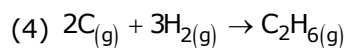
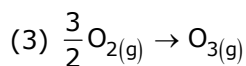
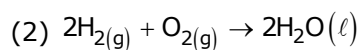
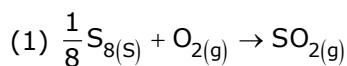


X is a monoanion having pyramidal geometry. Both Y and Z are neutral compounds, Choose the correct option(s)

- (1) There is a coordinate bond in Y
- (2) The oxidation state of the central atom in Z is +2
- (3) The central atom in Z has one lone pair of electrons
- (4) The central atom in X is  $sp^3$  hybridized

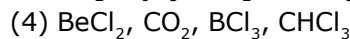
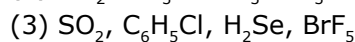
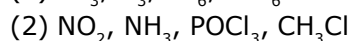
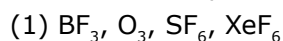
Ans. 1,4

7. Choose the reaction(s), from the following options, for which the standard enthalpy of reaction is equal to the standard enthalpy of formation



Ans. 1,3

8. Each of the following options contains a set of four molecules. Identify the option(s) where all four molecules possess permanent dipole moment at room temperature.



Ans. 2, 3

### Section 3 [Maximum Marks : 18]

- This section contains **SIX (06)** questions. The answer to each question is a **Numerical Value**.
- For each question, enter the correct numerical value of the answer using the mouse and the on-screen virtual numeric keypad in the palce designated to enter the answer. If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places.
- Answer the each question will be evaluated according to the following marking scheme :  
Full Marks : +3 If ONLY the correct numerical value is entered;  
Zero Marks : 0 In all other cases.

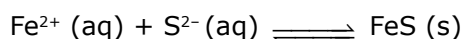
1. Among  $B_2H_6$ ,  $B_3N_3H_6$ ,  $N_2O$ ,  $N_2O_4$ ,  $H_2S_2O_3$  and  $H_2S_2O_8$ , the total number of molecules containing covalent bond between two atoms of the same kind is \_\_\_\_\_.

Ans. 4

2. At 143 K, the reaction of  $XeF_4$  with  $O_2F_2$  produces a xenon compound Y. The total number of lone pair(s) of electrons present on the whole molecule of Y is \_\_\_\_\_.

Ans. 19

3. For the following reaction, the equilibrium constant  $K_c$  at 298 K is  $1.6 \times 10^{17}$

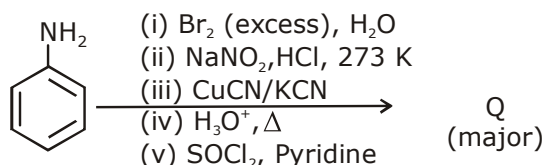


When equal volumes of 0.06 M  $Fe^{2+}(aq)$  and 0.2 M  $S^{2-} (aq)$  solutions are mixed, the equilibrium concentration of  $Fe^{2+} (aq)$  is found to be  $Y \times 10^{-17}$  M. the value of Y is \_\_\_\_\_.

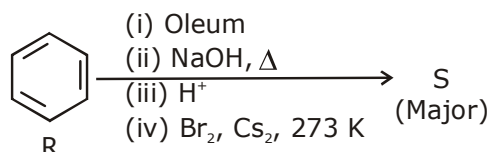
Ans. 8.93

4. Schemes 1 and 2 describe the conversion of P to Q and R to S, respectively. Scheme 3 describes the synthesis of T from Q and S. The total number of Br atoms in a molecule of T is \_\_\_\_\_.

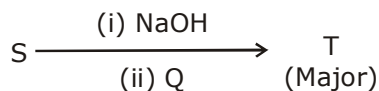
**Scheme 1 :**



**Scheme 2 :**



**Scheme 3:**



**Ans. 4**

5. Consider the kinetic data given in the following table for the reaction  $A + B + C \rightarrow \text{Product}$

| Experiment No. | [A]<br>(mol dm <sup>-3</sup> ) | [B]<br>(mol dm <sup>-3</sup> ) | [C]<br>(mol dm <sup>-3</sup> ) | Rate of reaction<br>(mol dm <sup>-3</sup> s <sup>-1</sup> ) |
|----------------|--------------------------------|--------------------------------|--------------------------------|---|
| 1              | 0.2                            | 0.1                            | 0.1                            | $6.0 \times 10^{-5}$  |
| 2              | 0.2                            | 0.2                            | 0.1                            | $6.0 \times 10^{-5}$  |
| 3              | 0.2                            | 0.1                            | 0.2                            | $1.2 \times 10^{-4}$  |
| 4              | 0.3                            | 0.1                            | 0.1                            | $9.0 \times 10^{-5}$  |

The rate of the reaction for  $[A] = 0.15 \text{ mol dm}^{-3}$ ,  $[B] = 0.25 \text{ mol dm}^{-3}$  and  $[C] = 0.15 \text{ mol dm}^{-3}$  is found to be  $Y \times 10^{-5} \text{ mol dm}^{-3}\text{s}^{-1}$ . The value of Y is \_\_\_\_\_.

**Ans. 6.75**

6. On dissolving 0.5 g of a non-volatile non-ionic solute to 39 g of benzene, its vapor pressure decreases from 650 mm Hg to 640 mm Hg. The depression of freezing point of benzene (in K) upon addition of the solute is \_\_\_\_\_.

(Given data : Molar mass and the molal freezing point depression constant of benzene are  $78 \text{ g mol}^{-1}$  and  $5.12 \text{ K kg mol}^{-1}$ , respectively)

**Ans. 1.02**