

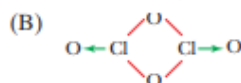
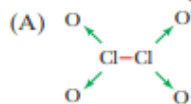
## Group-17 Elements: Halogens

### MULTIPLE CORRECT CHOICE TYPE QUESTIONS

1. The state of hybridization in anionic part of solid  $\text{Cl}_2\text{O}_6$  is

(A)  $sp^3d^2$  (B)  $sp^3d$  (C)  $sp^3$  (D)  $sp^2$

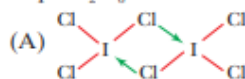
2. The structure of  $\text{Cl}_2\text{O}_4$  is



(C)  $\text{Cl}^+\text{ClO}_4^-$

(D) None of these

3. Liquid  $\text{I}_2\text{Cl}_6$  has the structure



(B)  $[\text{ICl}_2]^+[\text{ICl}_4]^-$

(C) monomeric T-shaped

(D) None of these.

4. Which of the following processes is not feasible spontaneously?

(A)  $\text{H}_2\text{O} + \text{F}_2 \rightarrow \text{HF} + \text{HOF}$

(B)  $\text{H}_2\text{O} + \text{Cl}_2 \rightarrow \text{HCl} + \text{HOCl}$

(C)  $\text{H}_2\text{O} + \text{Br}_2 \rightarrow 2\text{HBr} + [\text{O}]$

(D)  $\text{H}_2\text{O} + \text{I}_2 \rightarrow 2\text{HI} + [\text{O}]$

5. Etching action of HF does not involve

(A) formation of  $\text{SiF}_4$ .

(B) corrosion of vessel wall.

(C) formation of  $\text{H}_2\text{SiF}_6$ .

(D) white marking on laboratory ware.

6. In the following statements, which combination of **true (T)** and **false (F)** options is correct?

I. All oxoacids of chlorine undergo disproportionation on heating.

II.  $\text{ClO}_2$  does not dimerize but  $\text{Cl}_2\text{O}_4$  exists.

III. Six Cl-O bonds in  $\text{Cl}_2\text{O}_7$  are the same.

IV.  $\text{Rb}[\text{ICl}_2]$  on heating produces  $\text{RbI} + \text{Cl}_2$ .

(A) FTTF

(B) FTTT

(C) TTTF

(D) FFTF

7. Salicylic acid reacts with  $\text{ICI}$  vapour to produce

(A) iodinated product.

(B) chlorinated product.

(C) mixture of both.

(D) virtually no reaction.

8. In the following statements, which combination of **true (T)** and **false (F)** options is correct?

I. Ionic mobility is the highest for  $\text{I}^-$  in water as compared to other halides.

II. Stability order is:  $\text{Cl}_3^- > \text{Br}_3^- > \text{I}_3^-$

III. Reactivity order is:  $\text{F} < \text{Cl} < \text{Br} < \text{I}$

IV. Oxidizing power order is:  $\text{F}_2 < \text{Cl}_2 < \text{Br}_2 < \text{I}_2$

- (A) TFTF
  - (B) TFFF
  - (C) TTFT
  - (D) FTFT
9. Which of the following has the maximum vapour pressure?
- (A) HCl
  - (B) HBr
  - (C) HF
  - (D) HI
10. Halogens are coloured because
- (A) they are diamagnetic.
  - (B) they are paramagnetic.
  - (C) HOMO-LUMO transition takes place by absorption of visible light.
  - (D) HOMO-LUMO transition takes place by absorption of any kind of light.

### MULTIPLE CORRECT CHOICE TYPE QUESTIONS

1. For purification of  $\text{Cl}_2$  obtained from  $\text{MnO}_2$ , it is passed through
- (A) water to remove HCl.
  - (B) HCl to remove water.
  - (C) conc.  $\text{H}_2\text{SO}_4$  to remove water.
  - (D)  $\text{CaO}$  or  $\text{P}_4\text{O}_{10}$  to remove water.
2. Which of following properties decrease(s) down the group from F to I?
- (A)  $\text{X}^-$  radius
  - (B) Hydration energy of  $\text{X}^-$
  - (C) Electron affinity magnitude of X
  - (D)  $\text{IE}_1$  of X
3. Which of the following orders is/are correct?
- (A) Thermal stability order:  $\text{HOX} < \text{HXO}_2 < \text{HXO}_3 < \text{HXO}_4$
  - (B) Oxidizing power order:  $\text{HOX} < \text{HXO}_2 < \text{HXO}_3 < \text{HXO}_4$
  - (C) Bond angle order:  $\text{ClO}_2 > \text{Cl}_2\text{O} > \text{H}_2\text{O} > \text{Cl}_2\text{S}$
  - (D) Intensity of colour order:  $\text{F}_2 < \text{Cl}_2 < \text{Br}_2 < \text{I}_2$
4. Which of the following reactions is/are the proof for the existence of ion pair in  $\text{Cl}_2\text{O}_6$  in solid state?
- (A)  $\text{Cl}_2\text{O}_6 + \text{H}_2\text{O} \rightarrow \text{HClO}_3 + \text{HClO}_4$
  - (B)  $\text{Cl}_2\text{O}_6 + \text{HF} \rightarrow \text{ClO}_2\text{F} + \text{HClO}_4$
  - (C)  $\text{Cl}_2\text{O}_6 + \text{NO}_2 \rightarrow \text{ClO}_2 + [\text{NO}_2]^+[\text{ClO}_4]^-$
  - (D) None of these
5. Which of the following processes can give  $\text{Cl}_2$  gas as a product?
- (A) Electrolysis of aq. NaCl.
  - (B) Oxidation of conc. HCl by  $\text{K}_2\text{CrO}_4$ .
  - (C) Electrolysis of very dilute aq. NaCl.
  - (D) Oxidation of conc. HCl by  $\text{MnO}_2$ .

## COMPREHENSION TYPE QUESTIONS

### Passage 1: For Questions 1 to 3

Preparation of  $F_2$  by Moissan's method faces a lot of difficulties of different kinds and one of the main reason for this is the high reactivity of  $F_2$ .

1. The purpose of addition of KF in the electrolyte is
  - (A) to lower down the melting temperature of the mixture.
  - (B) to increase the melting temperature of the mixture.
  - (C) to lower down the electrical conductivity of the mixture.
  - (D) to increase the electrical conductivity of the mixture.
2. Initially Moissan used the HF:KF in the ratio of 13 : 1. But there was a serious drawback with this due to high vapour pressure of HF which causes problems of toxicity and corrosion. To solve this problem, which of the following steps were followed?
  - (A) The temperature was decreased to  $-24^\circ\text{C}$ .
  - (B) Mole ratio is changed into 2 : 1
  - (C) (A) and (B) were both done together
  - (D) None of the above.
3. Which of the following precautions is/are taken for this process?
  - (A) Container of electrolysis must not be made of glass.
  - (B) HF produced must be free from water by which it is distilled to prepare anhydrous HF before putting into electrolyte.
  - (C) The liberated  $H_2$  at cathode must be separated from the fluorine liberated at the anode by a diaphragm.
  - (D) All of the above

### Passage 2: For Questions 4 and 5

All the halogens react with hydrogen to form hydrogen halides HX but in general this not the method of preparation.

4. Preparation of which HX is not associated with conc.  $H_2SO_4$ ?  
(A) HF      (B) HCl      (C) HBr      (D) HI
5. Which of the following statements is incorrect regarding HX?
  - (A) HCl and HBr are liquid at room temperature.
  - (B) HI is the most acidic among HX.
  - (C) HF is the only liquid at room temperature.
  - (D) HF shows hydrogen bonding in its vapour state also.

### Passage 3: For Questions 6 and 7

When  $Cl_2$  gas is heated with freshly precipitated  $HgO$  in the presence of dry air, a yellow-brown gas (A) is formed. Gas A explodes in presence of  $NH_3$  and it is highly soluble in  $H_2O$ .

6. Gas A is  
 (A)  $\text{Cl}_2\text{O}$   
 (B)  $\text{ClO}_2$   
 (C)  $\text{ClO}_3$   
 (D)  $\text{Cl}_2\text{O}_7$
7. The product(s) on explosion of gas A with  $\text{NH}_3$  is/are  
 (A)  $\text{NH}_4\text{Cl}$   
 (B)  $\text{H}_2\text{O}$   
 (C)  $\text{N}_2$   
 (D) All of these

### ASSERTION-REASONING TYPE QUESTIONS

In the following set of questions, a Statement I is given and a corresponding Statement II is given below it. Mark the correct answer as:

- (A) If both Statement I and Statement II are true and Statement II is the correct explanation of Statement I.  
 (B) If both Statement I and Statement II are true but Statement II is not the correct explanation for Statement I.  
 (C) If Statement I is true but Statement II is false.  
 (D) If Statement I is false and Statement II is true.

1. **Statement I:** 1, 2-Dibromoethane is added to petrol to act as lead scavenger.

**Statement II:** 1, 2-Dibromoethane prevents the build-up of lead deposits on the sparking plug and in the engine.

2. **Statement I:**  $\text{Br}_2$  gas is passed through  $\text{Na}_2\text{CO}_3$  solution for its purification.

**Statement II:**  $\text{NaBr}$  and  $\text{NaOBr}$  produced are acidified to get back  $\text{Br}_2$ .

3. **Statement I:** Fluorine has highest oxidizing power.

**Statement II:** Electron affinity of chlorine is higher than that of fluorine.

4. **Statement I:**  $\text{I}_2 + \text{H}_2\text{O} \rightarrow 2\text{H}^+ + \text{I}^- + \frac{1}{2} \text{O}_2$  (Spontaneous)

**Statement II:** Atmospheric dioxygen oxidizes iodide ions to iodine.

5. **Statement I:**  $\text{F}_3^-$  is known.

**Statement II:**  $\text{F}^-$  ion donates its lone pair into the vacant  $\sigma_{2p_x}^*$  orbital of  $\text{F}_2$  molecule.

## INTEGER ANSWER TYPE QUESTIONS

The answer to each of the following is a non-negative integer.

- The number of oxides present in didymium oxide used for modified Deacon process as a catalyst is \_\_\_\_.
- Find the number of identical angles in  $\text{Cl}_2\text{O}_7$ .
- The sum of the oxidation states of Cl atoms in bleaching powder of formula  $\text{Ca}(\text{OCl})\text{Cl}$  is \_\_\_\_.
- Find the number of reactions where  $\text{CaCl}_2$  is the product from the following
  - $\text{Ca}(\text{OCl})\text{Cl} + \text{FeSO}_4 + \text{H}_2\text{SO}_4 \rightarrow$
  - $\text{Ca}(\text{OCl})\text{Cl} + \text{H}_2\text{SO}_4 \rightarrow$
  - $\text{Ca}(\text{OCl})\text{Cl} + \text{CaCO}_3 \rightarrow$
  - $\text{Ca}(\text{OCl})\text{Cl} + \text{Na}_3\text{AsO}_3 \rightarrow$
  - $\text{Ca}(\text{OCl})\text{Cl} + \text{NH}_3 \rightarrow$
- How many of the following oxides exist in ion pair form?  
 $\text{Cl}_2\text{O}_7$ ,  $\text{Cl}_2\text{O}$ ,  $\text{F}_2\text{O}$ ,  $\text{F}_2\text{O}_2$ ,  $\text{I}_2\text{O}_5$ ,  $\text{I}_2\text{O}_4$ ,  $\text{Br}_2\text{O}$ ,  $\text{I}_4\text{O}_9$
- How many of the following oxides have higher bond angle than  $\text{F}_2\text{O}$ ?  
 $\text{H}_2\text{O}$ ,  $\text{Cl}_2\text{O}$ ,  $\text{ClO}_2$ ,  $\text{Br}_2\text{O}$
- When  $\text{SiF}_4$  reacts with  $\text{HF}$ , in the product formed how many of the  $d$ -orbitals from its valence shell are not used?
- Find the number of H-bonds present in cyclic  $(\text{HF})_6$  molecule in its gas phase.
- Find the number of  $\pi$ -bonds in  $(\text{CN})_2$ .
- Find the number of pseudohalide ions from the following.  
 $\text{N}_3^-$ ,  $\text{Cl}_3^-$ ,  $\text{CN}_2^{2-}$ ,  $\text{OCN}^-$ ,  $\text{SCN}^-$ ,  $\text{I}_3^-$
- The number of equivalent Cl-O bonds in  $\text{Cl}_2\text{O}_7$  is \_\_\_\_.
- $\text{HF}$  is a weak acid but on addition of  $\text{AsF}_5$ , it becomes a very strong acid. The number of  $90^\circ$  angles in the anionic part of the product is \_\_\_\_.

## MATRIX MATCH TYPE QUESTIONS

In each of the following questions, statements are given in two columns, which have to be matched. The statements in Column I are labelled as (A), (B), (C) and (D), while those in Column II are labelled as (P), (Q), (R), (S) and (T). Any given statement in Column I can have correct matching with *one or more* statements in Column II.

1. Match the compounds with the characteristics..

Column I	Column II
(A) $F_2$	(P) Diamagnetic in nature.
(B) $Cl_2$	(Q) Coloured substance but not gaseous at room temperature.
(C) $Br_2$	(R) Reacts with water and produces acid.
(D) $I_2$	(S) $X_2$ which cannot oxidize any of the halide ions.

2. Match the reactions with the compounds which are prepared by these.

Column I	Column II
(A) $Ba(ClO_2)_2 + H_2SO_4 \rightarrow$	(P) $ClO_2$
(B) $F_2 + H_2O \xrightarrow{-40^\circ C}$	(Q) $ClO_3$
(C) $HClO_4 \xrightarrow[-10^\circ C]{P_2O_5}$	(R) $Cl_2O_7$
(D) $NaClO_5 + SO_2 + H_2SO_4 \xrightarrow{\text{trace of NaCl}}$	(S) $HOCl$
	(T) $HClO_2$

3. Match the hydrogen halides with their properties.

Column I	Column II
(A) $HF$	(P) Most volatile compound.
(B) $HCl$	(Q) Strongest reducing agent.
(C) $HBr$	(R) Compound shows H-bonding.
(D) $HI$	(S) On reaction with conc. $H_2SO_4$ produces $X_2$ type of molecule.

## ANSWERS

### Single Correct Choice Type Questions

- |        |        |        |        |         |
|--------|--------|--------|--------|---------|
| 1. (C) | 3. (B) | 5. (A) | 7. (B) | 9. (A)  |
| 2. (C) | 4. (D) | 6. (A) | 8. (B) | 10. (C) |

### Multiple Correct Choice Type Questions

- |                  |             |                  |                  |                  |
|------------------|-------------|------------------|------------------|------------------|
| 1. (A), (C), (D) | 2. (B), (D) | 3. (A), (C), (D) | 4. (A), (B), (C) | 5. (A), (B), (D) |
|------------------|-------------|------------------|------------------|------------------|

### Comprehension Type Questions

- |        |             |                  |        |
|--------|-------------|------------------|--------|
| 1. (D) | 3. (D)      | 5. (B), (C), (D) | 7. (D) |
| 2. (B) | 4. (C), (D) | 6. (A)           |        |

### Assertion–Reasoning Type Questions

- |        |        |        |        |        |
|--------|--------|--------|--------|--------|
| 1. (A) | 2. (C) | 3. (B) | 4. (D) | 5. (A) |
|--------|--------|--------|--------|--------|

### Integer Answer Type Questions

- |      |      |      |      |       |        |
|------|------|------|------|-------|--------|
| 1. 2 | 3. 0 | 5. 2 | 7. 3 | 9. 4  | 11. 6  |
| 2. 6 | 4. 3 | 6. 4 | 8. 6 | 10. 4 | 12. 12 |

### Matrix–Match Type Questions

- |  |   |  |
|--|---|--|
| 1. (A) $\rightarrow$ (P) (R)<br>(B) $\rightarrow$ (P), (R)<br>(C) $\rightarrow$ (P), (Q), (R)<br>(D) $\rightarrow$ (P), (Q), (T) | 2. (A) $\rightarrow$ (T)<br>(B) $\rightarrow$ (S)<br>(C) $\rightarrow$ (R)<br>(D) $\rightarrow$ (P) | 3. (A) $\rightarrow$ (R)<br>(B) $\rightarrow$ (P)<br>(C) $\rightarrow$ (S)<br>(D) $\rightarrow$ (Q), (S) |
|--|---|--|