

Topic : p-block elements (Halogens and Noble gas)

Type of Questions

Type of Questions	M.M., Min.
Single choice Objective ('-1' negative marking) Q.1 to Q.2	(3 marks, 3 min.) [6, 6]
Multiple choice objective ('-1' negative marking) Q.3 to Q.4	(4 marks, 4 min.) [8, 8]
True or False (no negative marking) Q.5 & Q.9	(2 marks, 2 min.) [10, 10]
Comprehension ('-1' negative marking) Q.10 to Q.12	(3 marks, 3 min.) [9, 9]
Subjective Questions ('-1' negative marking) Q.13 to Q.14	(4 marks, 5 min.) [8, 10]

- (a) Which of the following is a mixed anhydride ?
 (A) Cl_2O_7 (B) Cl_2O_3 (C) ClO_2 (D) Cl_2O_5

(b) KClO_3 on heating disproportionates to :
 (A) $\text{KClO}_2, \text{KClO}_4$ (B) $\text{KClO}, \text{KClO}_4$ (C) $\text{Cl}_2, \text{KClO}_4$ (D) $\text{KClO}_4, \text{KCl}$
- (a) The correct order of the thermal stability of hydrogen halides (H - X) is
 (A) $\text{HI} > \text{HBr} > \text{HCl} > \text{HF}$ (B) $\text{HF} > \text{HCl} > \text{HBr} > \text{HI}$
 (C) $\text{HCl} < \text{HF} < \text{HBr} < \text{HI}$ (D) $\text{HI} > \text{HCl} < \text{HF} < \text{HBr}$

(b) $\text{H}_2\text{SO}_4 + \text{NaCl (s)} \longrightarrow \text{NaHSO}_4 + \text{HCl}$. Hydrochloric acid is liberated because
 (A) H_2SO_4 is a reducing agent. (B) HCl is a smaller molecule than H_2SO_4
 (C) HCl is more volatile than H_2SO_4 (D) (B) and (C) Both

(c) Concentrated HNO_3 reacts with I_2 to give :
 (A) HI (B) HOI (C) HIO_3 (D) HOIO_3
- Iodine (I_2) is soluble in :
 (A) KI solution (B) Water
 (C) Carbon tetrachloride (D) Alcohol
- ClO^- formed in the following reaction

$$\text{Cl}_2 + 2\text{OH}^- \longrightarrow \text{ClO}^- + \text{Cl}^- + \text{H}_2\text{O}$$
 In this reaction :
 (A) Cl_2 has undergone disproportionation
 (B) Cl_2 has been reduced to ClO^- and Cl^-
 (C) equivalent mass of Cl_2 is equal to its molar mass
 (D) equivalent mass of Cl_2 is half of its molar mass
- Consider the following statements
Statement-1 : Hydrofluoric acid can not be kept in glass vessel.
Statement-2 : Hydrochloric acid can be dried by passing it through concentrated H_2SO_4 .
Statement-3 : Chlorine monoxide is evolved when KClO_3 is treated with conc. H_2SO_4 .
Statement-4 : Chlorine reacts with hot and concentrated NaOH to form NaCl and NaClO_3 .
 and arrange in the order of true/false.
 (A) F T F T (B) F F F T (C) T T F T (D) F T T F
- Consider the following statements
Statement-1 : Fluorine oxidises water to oxygen.
Statement-2 : Bromine reacts with water to form HBr and HOBr .
Statement-3 : Iodide (I^-) can be oxidised by oxygen in acidic medium.
Statement-4 : Thermally stable oxide of fluorine at room temperature is OF_2 .
 and arrange in the order of true/false.
 (A) T T T T (B) F T F T (C) T F T F (D) T T F F

7. Consider the following statements
Statement-1 : HBr is a stronger acid than HI because of hydrogen bonding.
Statement-2 : F^- ion has higher hydration energy than Cl^- .
Statement-3 : O_3 is more powerful oxidising agent than F_2 because it contains three 'O'.
Statement-4 : fluorine does not form polyhalides.
 and arrange in the order of true/false.
 (A) T T T F (B) F T F T (C) T F T F (D) F F T T
8. **(a) Statement-1** : The red liquid bromine reacts with sodium carbonate solution and forms sodium bromide and sodium bromate.
Statement-2 : Sodium bromide reacts with conc. H_2SO_4 to form HBr.
 (A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
 (B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
 (C) Statement-1 is True, Statement-2 is False
 (D) Statement-1 is False, Statement-2 is True
(b) Statement-1 : All halogens except fluorine exhibit +1, +3, +5 and +7 oxidation states in addition to -1 oxidation state.
Statement-2 : Except fluorine all other halogens have d-orbitals and, therefore, can expand their octets.
 (A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
 (B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
 (C) Statement-1 is True, Statement-2 is False
 (D) Statement-1 is False, Statement-2 is True
(c) Statement-1 : Most of the reactions of fluorine, are exothermic.
Statement-2 : It forms small and strong bond with other elements.
 (A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
 (B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
 (C) Statement-1 is True, Statement-2 is False
 (D) Statement-1 is False, Statement-2 is True
9. **(a) Statement-1** : ClO_2 is anhydride of chloric acid.
Statement-2 : $2ClO_2 + H_2O \longrightarrow HClO_2 + HClO_3$.
 (A) If both statement-1 and statement-2 are true and statement-2 is a correct explanation of statement-1.
 (B) If both statement-1 and statement-2 are true and statement-3 is not a correct explanation of statement-1.
 (C) If statement-1 is true but statement-2 is false.
 (D) If statement-1 is false but statement-2 is true.
(b) Statement-1 : Bond energy of F_2 is greater than Cl_2 .
Statement-2 : F-atom is smaller in size than Cl-atom.
 (A) If both statement-1 and statement-2 are true and statement-2 is a correct explanation of statement-1.
 (B) If both statement-1 and statement-2 are true and statement-3 is not a correct explanation of statement-1.
 (C) If statement-1 is true but statement-2 is false.
 (D) If statement-1 is false but statement-2 is true.
(c) Statement-1 : Chlorine and sulphur dioxide both are bleaching agents.
Statement-2 : The bleaching action of chlorine is performed through the process of oxidation.
 (A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
 (B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
 (C) Statement-1 is True, Statement-2 is False
 (D) Statement-1 is False, Statement-2 is True
(d) Statement-1 : Iodine stains are removed with the help of sodium thiosulphate solution.
Statement-2 : Sodium thiosulphate solution reacts with iodine to form colourless sodium iodide and sodium tetrathionate ($Na_2S_4O_6$).
 (A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
 (B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
 (C) Statement-1 is True, Statement-2 is False
 (D) Statement-1 is False, Statement-2 is True

Comprehension # (Q.10 to Q.12)

When sodium chloride is treated with concentrated sulphuric acid, a colourless gas, X, which fumes in moist air, is formed. When sodium iodide is treated in the same way a coloured vapour, Y, is produced.

If 90% phosphoric (v) acid is used instead of sulphuric acid a colourless gas is produced in each reaction.

A number of oxoanions of chlorine are known ; examples include ClO^- , ClO_3^- and ClO_4^- , ClO^- is formed when chlorine reacts with aqueous alkali.

10. Gases X and Y are respectively :
(A) Cl_2 , I_2 (B) HCl , I_2 (C) HCl , HI (D) HClO , I_2
11. With 90% phosphoric acid (H_3PO_4), colourless gases formed are :
(A) HCl , HI (B) Cl_2 , I_2 (C) HCl , I_2 (D) Cl_2 , HI
12. Behaviour of H_2SO_4 and H_3PO_4 is different towards NaI because :
(A) H_2SO_4 is stronger acid than H_3PO_4
(B) H_2SO_4 is a strong oxidising agent and oxidises colourless gas to coloured vapour Y
(C) H_3PO_4 is tribasic acid
(D) H_2SO_4 is a dibasic acid
13. Give an example of oxidation of one halide by another halogen. Explain the feasibility of reaction.

14. **Integer Answer Type**

This section contains 2 questions. The answer to each of the questions is a single digit integer, ranging from 0 to 9.

(i) How many Si—O—Si bridge are present in wollastonite molecule ?

(ii) In Cl_2O_7 , the Cl—O bonds showing double bond character are.

Answer Key

DPP No. # 39

1. (a) (C) (b) (D) 2. (a) (B) (b) (C) (c) (C) 3. (A,C,D) 4. (A,C)
5. (C) 6. (A) 7. (B) 8. (a) (C) (b) (A) (c) (A)
9. (a) (D) (b) (D) (c) (B) (d) (A) 10. (B) 11. (A) 12. (B)
13. $2\text{KI}(\text{aq.}) + \text{Cl}_2 \longrightarrow 2\text{KCl}(\text{aq.}) + \text{I}_2$
In the reaction Cl_2 oxidises iodide ion (–1 oxidation state) to I_2 (0 oxidation state). Cl_2 has higher reduction potential than I_2 and thus oxidises iodide to iodine getting itself reduced to chloride ion. Similarly,
 $2\text{KI} + \text{X}_2 \longrightarrow 2\text{KX} + \text{I}_2$; (X = Cl, Br, F)
14. (i) 3 (ii) 6

Hints & Solutions

PHYSICAL / INORGANIC CHEMISTRY

DPP No. # 39

- (a) $\text{Cl}_2\text{O}_7 + \text{H}_2\text{O} \longrightarrow 2\text{HClO}_4$; $\text{Cl}_2\text{O}_3 + \text{H}_2\text{O} \longrightarrow 2\text{HClO}_2$
 $2\text{ClO}_2 + \text{H}_2\text{O} \longrightarrow \text{HClO}_2 + \text{HClO}_3$
 $\text{Cl}_2\text{O}_5 + 2\text{H}_2\text{O} \longrightarrow 2\text{HClO}_3$
- (b) In H_2SO_4 , intense H-bonding makes it less volatile than HCl. HCl is more volatile as there is no H-bonding. So H_2SO_4 displaces HCl from its salt.
(c) $\text{I}_2 + \text{HNO}_3 \longrightarrow 2\text{HIO}_3 + 4\text{H}_2\text{O} + 10\text{NO}_2$
- (A) $\text{KI} + \text{I}_2 \longrightarrow \text{KI}_3$
 I_2 is non-polar covalent compound. So soluble in (C) & (D)
- Statement-1 : $\text{SiO}_2 + \text{HF} \longrightarrow \text{SiF}_4 + 2\text{H}_2\text{O}$; $\text{SiF}_4 + 2\text{HF} \longrightarrow \text{H}_2\text{SiF}_6$
Statement-2 : True.
Statement-3 : $3\text{KClO}_3 + 3\text{H}_2\text{SO}_4 \longrightarrow 3\text{KHSO}_4 + \text{HClO}_4 + 2\text{ClO}_2 + \text{H}_2\text{O}$
Statement-4 : $6\text{NaOH} + 3\text{Cl}_2 \longrightarrow 5\text{NaCl} + \text{NaClO}_3 + 3\text{H}_2\text{O}$
- Statement-3 : $4\text{I}^- + 4\text{H}^+ + \text{O}_2 \longrightarrow 2\text{I}_2 + 2\text{H}_2\text{O}$
- Statement-1 : $\text{HI} > \text{HBr}$ due to low bond dissociation enthalpy.
Statement-2 : Due to small size
Statement-3 : $\text{F}_2 > \text{O}_3$ oxidising agent. Highest SRP of fluorine
Statement-4 : Fluorine does not have empty d-orbital.
- (a) $3\text{Br}_2 + 3\text{Na}_2\text{CO}_3 \longrightarrow 5\text{NaBr} + \text{NaBrO}_3 + 3\text{CO}_2$
 $\text{NaBr} + \text{H}_2\text{SO}_4 \longrightarrow \text{Na}_2\text{SO}_4 + \text{SO}_2 + \text{Br}_2 + \text{H}_2\text{O}$
- (b) Bond energy of F_2 is less than Cl_2 because lp-lp repulsion.
(c) $\text{H}_2\text{O} + \text{Cl}_2 \longrightarrow 2\text{HCl} + [\text{O}]$
 $\text{SO}_2 + 2\text{H}_2\text{O} \longrightarrow \text{H}_2\text{SO}_4 + 2[\text{H}]$
(d) $\text{I}_2 + 2\text{Na}_2\text{S}_2\text{O}_3 \longrightarrow 2\text{NaI} + (\text{colourless}) + \text{Na}_2\text{S}_4\text{O}_6$

