PHYSICAL / INORGANIC CHEMISTRY

DPP
DAILY PRACTICE PROBLEMS

DPP No. 40

Total Marks : 47

Max. Time : 52 min.

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

Type of Questions		M.M., Min.
Single choice Objective ('–1' negative marking) Q.1 to Q.5	(3 marks, 3 min.)	[15, 15]
Comprehension ('–1' negative marking) Q.6 to Q.8	(3 marks, 3 min.)	[9, 9]
Subjective Questions ('–1' negative marking) Q.9	(4 marks, 5 min.)	[4, 5]
Match the Following (no negative marking) Q.10 to Q.11	(8 marks, 10 min.)	[16, 20]
Short Subjective Questions ('–1' negative marking) Q.12	(3 marks, 3 min.)	[3, 3]

1. **(a)** F_2 is formed by reacting K_2MnF_6 with

(A) SbF_5 (B) MnF_3 (C) $KSbF_6$ (D) MnF_5

(b) Which of the following product is formed, when dilute alkali reacts with fluorine ?

(A) HOF (B) OF_2 (C) O_2F_2 (D) O_2

2. **(a)** Which one is the anhydride of $HClO_4$

(A) Cl_2O (B) ClO_2 (C) Cl_2O_6 (D) Cl_2O_7

(b) When dry chlorine is passed through silver chlorate heated to 90°C, then which of the oxide of chlorine is obtained ?

(A) ClO_2 (B) Cl_2O (C) Cl_2O_3 (D) Cl_2OS

3. Which one of the following statements regarding helium is incorrect :

(A) It is used to produce and sustain powerful superconducting magnets

(B) It is used as a cryogenic agent for carrying out experiments at low temperatures

(C) It is used to fill gas balloons instead of hydrogen becuase it is lighter and non-inflammable

(D) It is used in gas-cooled nuclear reactors

4. **(a)** **S_1 :** Argon is used in arc welding of metals or alloys to provide an inert atmosphere.

S_2 : XeF_2, XeF_4 and XeF_6 are colourless crystalline solids and sublime readily at 298K.

S_3 : XeF_2, XeF_4 and XeF_6 are readily hydrolysed.

S_4 : Xenon fluorides react with fluoride ion acceptor to form cationic species and fluoride ion donors to form fluoro anions.

(A) FFFF (B) TFTF (C) TTTT (D) FTFT

(b) **S_1 :** XeO_3 is a colourless explosive solid and has a pyramidal molecular structure.

S_2 : XeF_2 is not a better oxidising agent.

S_3 : Xe, Kr and Ne all form clatherate compounds.

S_4 : Fluorine in dilute solution of sodium hydroxide disproportionates in fluoride and hypofluorite.

(A) TFFF (B) TFTF (C) TTTT (D) FTFT

5. **(a)** **Statement-1 :** Finely divided iron does not form ferric chloride with hydrochloric acid.

Statement-2 : Hydrochloric acid produces hydrogen gas with iron.

(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 : XeF_6 reacts with small quantities of water to form $XeOF_4$.
Statement-2 : XeF_6 reacts with glass and form $XeOF_4$.
(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 : Noble gases have positive electron gain enthalpy.
Statement-2 : Noble gases have highest value of ionization enthalpy.
(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.

Comprehension # 1 (Q.6 to Q.8)

The chemical reactivity of noble gases involves the loss of electrons and hence it can form compounds with highly electronegative elements like F and O. Although Xe forms several fluorides, Xenon tetrafluoride is the most important among fluorides. The various compounds of xenon involve xenon in first second or third excited states.

6. The type of hybridisation and number of lone pair(s) of electrons of Xe in $XeOF_4$ respectively are :
(A) sp^3d and 1 (B) sp^3d and 2 (C) sp^3d^2 and 1 (D) sp^3d^2 and 2.

7. The type of hybridisation and shape of XeF_2 respectively are
(A) sp^3d and angular (B) sp^3d and pyramidal (C) sp^3d and linear (D) sp and linear

8. XeF_4 and XeF_6 are excepted to be
(A) oxidising (B) reducing (C) unreactive (D) strongly basic.

9. Complete the following reactions
(A) $SiO_2(s) + F_2(g) \longrightarrow$
(B) $Na_2S_2O_3 + H_2O + Cl_2 \longrightarrow$
(C) $I_2 + H_2O + Cl_2$ (excess) $\longrightarrow$
(D) $IO_3^- + HSO_3^- \longrightarrow$
(E) $KMnO_4 + HCl \longrightarrow$

10. **Match the following :**

Column-I	**Column-II**
(A) $XeF_4 + H_2O \longrightarrow$	(p) disproportionation
(B) $[HXeO_4]^- + 2OH^- \longrightarrow$	(q) one of the products is a gas which is paramagnetic
(C) $H_2O + F_2$ (2:2 by mole) $\longrightarrow$	(r) one of the products is used in light bulbs
(D) $NOCl + O_2 \longrightarrow$	(s) one of the products is corrosive to glass and is stored in wax-lined bottles.

11.

Column I	**Column II**
(A) XeF_6	(p) sp^3d hybridisation
(B) $XeOF_2$	(q) one lone pair
(C) $XeOF_4$	(r) sp^3d^2 hybridisation
(D) XeO_2F_2	(s) sp^3d^3 hybridisation
	(t) See-saw shape

12. Find the sum of average oxidation number of S in H_2SO_5 (peroxy monosulphuric acid) and $Na_2S_2O_3$ (sodium thiosulphate).

Answer Key

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1. **(a)** (A) **(b)** (B) **2.** **(a)** (D) **(b)** (A) **3.** (C) **4.** **(a)** (C) **(b)** (A)

5. **(a)** (A) **(b)** (B) **(c)** (B) **6.** (C) **7.** (C) **8.** (A)

9. (A) $SiO_2 + 2F_2 \longrightarrow SiF_4 + O_2$.

(B) $Na_2S_2O_3 + H_2O + Cl_2 \longrightarrow Na_2SO_4 + 2HCl + \downarrow$

(C) $I_2 + 6H_2O + 5Cl_2 \longrightarrow 2HIO_3 + 10\,HCl$

(D) $2\,IO_3^- + 5\,HSO_3^- \longrightarrow 3HSO_4^- + 2SO_4^{2-} + I_2 + H_2O$

(E) $2KMnO_4 + 16HCl \longrightarrow 2KCl + 2MnCl_2 + 5Cl_2 + SH_2O$.

10. (A-p,q,r,s) ; (B-p,q,r) ; (C-q,s) ; (D-q) **11.** (A-q, s) ; (B-p) ; (C-q, r) ; (D-p, q, t) **12.** 8

Hints & Solutions

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1. **(b)** $2F_2 + 2NaOH\,(dil) \longrightarrow OF_2\,(s) + 2NaF + H_2O$

2. $2AgClO_3 + Cl_2 \longrightarrow 2AgCl \downarrow + 3ClO_2$.

4. **(a)** S_1 and S_2 are correct statements.

S_3 : $2XeF_2(s) + H_2O(\ell) \longrightarrow 2Xe(g) + 4HF(aq) + O_2(g)$

$6XeF_4 + 12H_2O \longrightarrow 4Xe + XeO_3 + 24HF + 3O_2$

$XeF_6 + 3H_2O \longrightarrow XeO_3 + 6HF$

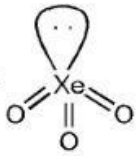
} Complete hydrolysis

S_4 : $XeF_2 + PF_5 \longrightarrow [XeF]^+\,[PF_6]^-$

$XeF_4 + SbF_5 \longrightarrow [XeF_3]^+\,[SbF_6]^-$

$XeF_6 + MF \longrightarrow M^+[XeF_7]^-$

M = Na, K, Rb or Cs

(b) S_1 : Statement is correct 

S_2 : Statement is false

$$2e^- + 2H^+ + XeF_2 \longrightarrow Xe + 2HF$$

SRP = +2.64V.

S_3:Statement is false as He atoms being smaller do not trapp in the cavities formed by water molecules (ice).

S_4 : Statement is false $2F_2 + 2NaOH \longrightarrow OF_2(g) + 2NaF + H_2O$

5. **(a)** $Fe + 2HCl \longrightarrow FeCl_2 + H_2$

Liberation of hydrogen prevents the formation of ferric chloride.

(b) $XeF_6 + H_2O \longrightarrow XeOF_4 + 2HF$

$2XeF_6 + SiO_2$ (from glass) $\longrightarrow 2XeOF_4 + SiF_4$

10. (A) $XeF_4 + 6H_2O \longrightarrow 2Xe + XeO_3 + 3/2O_2 + 12HF$

(B) $2[HXeO_4]^- + 2OH^- \longrightarrow [XeO_6]^{4-} + Xe + O_2 + 2H_2O$

(C) $3H_2O + 3F_2 \longrightarrow 6HF^- + O_3$

$2H_2O + 2F_2 \longrightarrow 4HF + O_2$

(D) $2NOCl + O_2 \longrightarrow 2NO_2 + Cl_2$

12. $\underset{(+6)}{H_2SO_5}$ and $\underset{(+2)}{Na_2S_2O_3}$