Additional Problems for Self Practice (APSP)

This Section is not meant for classroom discussion. It is being given to promote self-study and self testing amongst the Resonance students.

PART - I : PRACTICE TEST-1 (IIT-JEE (MAIN Pattern))

Max. Marks : 100 **Max. Time : 1 Hr.**

Important Instructions

1. The test is of **1 hour** duration.

2. The Test Booklet consists of **25** questions. The maximum marks are **100.**

3. Each question is allotted **4 (four)** marks for correct response.

4. Candidates will be awarded marks as stated above in Instructions No. 3 for correct response of each question.
¼ (one fourth) marks will be deducted for indicating incorrect response of each question. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.

5. **Test Paper consists of Two (2) Sections.**
Section-1 contains **20** multiple choice questions. Each question has four choices (1), (2), (3) and (4) out of which **one** is correct. For each question in Section-1, you will be awarded 4 marks if you give the corresponding to the correct answer and zero mark if no given answers. In all other cases, minus one **(–1)** mark will be awarded.
Section-2 contains **5** questions. The answer to each of the question is a **Numerical Value.** For each question in Section-2, you will be awarded 4 marks if you give the corresponding to the correct answer and zero mark if no given answers. No negative marks will be answered for incorrect answer in this section. In this section answer to each question is **NUMERICAL VALUE** with two digit integer and decimal upto two digit. If the numerical value has more than two decimal places **truncate/round-off** the value to **TWO** decimal placed.

Section-1

This section contains **20** multiple choice questions. Each questions has four choices (1), (2), (3) and (4) out of which Only **ONE** option is correct.

1. The manufacture of fluorine is done by :
(1) heating anhydrous HF and MnO_2.
(2) electrolysis of aqueous HF.
(3) electrolysis of anhydrous HF mixed with KHF_2.
(4) heating a mixture of KF, MnO_2 and conc. H_2SO_4.

2. The catalyst used in Decons process is :
(1) $CuCl_2$ (2) Cu (3) $CuSO_4$ (4) CuS

3. Which electrolyte is used in Dennis method for the preparation of fluorine ?
(1) KHF_2 solution in anhydrous HF (2) molten cryolite
(3) pure dry molten KHF_2 (4) none of these

4. Chlorine is liberated when we heat :
(1) $KMnO_4$ + NaCl (2) $K_2Cr_2O_7$ + MnO_2 (3) $Pb(NO_3)_2$ + MnO_2 (4) $K_2Cr_2O_7$ + HCl

5. An easy way of obtaining Cl_2 gas in the laboratory is :
(1) by heating NaCl and concentrated H_2SO_4. (2) by heating NaCl and concentrated MnO_2.
(3) by mixing HCl and $KMnO_4$. (4) by passing F_2 through NaCl solution.

6. When chlorine reacts with turpentine oil, the product formed is :
(1) carbon (2) carbon and HCl (3) turpentine chloride (4) none of these

7. In the reaction, $3Br_2 + 6CO + 3H_2O \xrightarrow{2-}_{3} 5Br^- + BrO + 6HCO$:
(1) bromine is oxidised and carbonate is reduced
(2) bromine is both oxidised and reduced
(3) bromine is reduced and water is oxidized
(4) bromine is neither oxidised nor reduced

8. A greenish yellow gas reacts with an alkali metal hydroxide to form a halate which can be used in fire works and safety matches. The gas and halate respectively are :
(1) Br_2, $KBrO_3$ (2) Cl_2, $KClO_3$ (3) I_2, $NaIO_3$ (4) none

9. Two gases X & Y bring about bleaching of flowers, X bleaches by reducing the colouring matter. While Y bleaches due to oxidation of dye. X and Y are respectively
(1) SO_2, Cl_2 (2) Cl_2, SO_2 (3) SO_2, O_2 (4) None of these

10. Which of the following gases can be dried by concentrated H_2SO_4 ?
(1) HCl (2) HBr (3) HI (4) H_2S

11. H_2SO_4 cannot be used for obtaining HBr from KBr because :
(1) HBr oxidises H_2SO_4. (2) HBr reduces H_2SO_4.
(3) HBr undergoes disproportionation. (4) KBr reacts very slowly.

12. Euchlorine is :
(1) obtained by heating perchlorate with conc. HCl.
(2) a chloride of europium
(3) a mixture of Cl_2 and Cl_2O_7
(4) a mixture of Cl_2 and Cl_2O_2

13. How many of the following are correctly match :
(1) Cl_2O - (a) yellow-brown gas (b.p. 10ºC).
(2) ClO_2 - (b) React with O_3 gives Cl_2O_6 (dark red) it is a mixed anhydride of $HClO_3$ and $HClO_4$.
(3) Cl_2O_7 - (c) It is anhydride of $HClO_4$ (only).
(4) Cl_2O_7 - (d) Oily explosive colourless liquid.
(5) Cl_2O_7 - (e) has 2 type of O–Cl bond length.
(6) I_2O_5 - (f) Obtained by reaction between I_2 and CO.
(1) (1) - (a); (2) - (b); (3) - (c); (4) - (d) (2) (3) - (b); (4) - (e); (5) - (d); (6) - (f)
(3) (1) - (b); (2) - (a); (3) - (c); (4) - (d) (4) (2) - (c); (3) - (b); (4) - (d); (5) - (e)

14. Which of the following is not the characteristic of interhalogen compounds ?
(1) They are more reactive than halogens.
(2) They are quite unstable but none of them is explosive.
(3) They are covalent in nature.
(4) They have low boiling points and are highly volatile.

15. Which of the following statement is correct.
(1) All interhalogen compounds are gaseous at room temperature.
(2) Interhalogen are either gaseous or liquid at room temperature.
(3) Interhalogens can solid or liquid or gaseous at room temperature.
(4) Interhalogen compounds are liquid at room temperature.

16. In which following statement is incorrect :
(1) Pseudohalogen ions are not spherical
(2) Pseudohalides are generally less electronegative than the lighter halide (F^-, Cl^-)
(3) OCN^-, NNN^- pseudohalide are bidentate ligands
(4) Pseudohalogens form dimers and form molecular compound with non metal and Ionic compounds with alkali metal.

17. Among noble gases (from He to Xe) only xenon reacts with fluorine to form stable fluorides because xenon :
(1) has the largest size. (2) has the lowest ionization enthalpy.
(3) has the highest heat of vaporization. (4) is the most readily available noble gas.

18. What are the products formed in the reaction of xenon hexafluoride with silicon dioxide ?
(1) $XeSiO_4$ + HF (2) XeF_2 + SiF_4 (3) $XeOF_4$ + SiF_4 (4) XeO_3 + SiF_2

19. Xenon reacts with P + F_6 to form :
(1) XeF_2 (2) Xe^+ $[P + F_6]^-$ (3) $Xe^-[Pt\ F_6]^+$ (4) XeF_4

20. Which among the following statement is incorrect.
(1) XeF_4 and SbF_5 combine to form salt.
(2) XeF_6 on complete hydrolysis gives XeO_3.
(3) XeF_6 react with H_2 produce XeF_2 and HF.
(4) Xenon hexaflouride react with silica to form a Xenon compound and this Xenon compound have oxidation of Xenon is +6.

SECTION-2

This section contains **5** questions. Each question, when worked out will result in **Numerical Value**.

21. The addition of total number of lonepairs in XeF_2 and XeF_4 are :

22. Heating with aqueous NaOH can produce a gas with how many of the following elements ?
Cl_2, S_8, P_4, C_{60}, Al, B, Fe, Be

23. How many oxides are soluble in moderately concentrated aqueous solution of NaOH.

SO_3 ,	Cl_2O_7 ,	N_2O_5 ,	CO
(1)	(2)	(3)	(4)
K_2O ,	Cr_2O_3 ,	BaO ,	GeO_2
(5)	(6)	(7)	(8)

24. Hybridisation state of Xe and number of lone pair of electron in Xe in
XeO_3, XeO_2F_2, XeF_2 are sp^xd^a, sp^yd^b, sp^zd^c, p, q and r respectively, the sum of a + b + c + p + q + r is :

25. Among the following, number of correct statement are :
(i) Metal iodides are thermally less stable than their chlorides and bromides.
(ii) Oxidation number of metal in metal carbonyls can never be negative as metals are highly electro positive.
(iii) dmg^- (dimethyl glyoximate ion) is a bidentate ligand in which oxygen atoms are donors.
(iv) Metal azides on heating produce N_2 gas.
(v) Standard enthalpy of formation of white phosphorous and monoclinic sulphur are assigned zero value.
(vi) α-decay from a radionuclide follows Arrhenius equation with first order kinetics.

Practice Test-1 (IIT-JEE (Main Pattern))

OBJECTIVE RESPONSE SHEET (ORS)

Que.	1	2	3	4	5	6	7	8	9	10
Ans.										
Que.	11	12	13	14	15	16	17	18	19	20
Ans.										
Que.	21	22	23	24	25					
Ans.										

PART - II : JEE (MAIN) / AIEEE OFFLINE PROBLEMS (PREVIOUS YEARS)

1. In case of nitrogen, NCl_3 is possible but no NCl_5 while in case of phosphorus, PCl_3 as well as PCl_5 are possible. It is due to : **[AIEEE-2002, 3/225]**
(1) availability of vacant d-orbital in P but not in N.
(2) lower electronegativity of P then N.
(3) lower tendency of H bond formation in P than N.
(4) occurrence of P in solid while N in gaseous state at room temperature.

2. Concentrated hydrochloric acid when kept in open air sometimes produces a cloud of white fumes. This is due to : **[AIEEE-2003, 3/225]**
(1) strong affinity of HCl gas for moisture in air results in forming of droplets of liquid solution which appears like a cloudy smoke.
(2) strong affinity for water, conc. HCl pulls moisture of air towards self. The moisture forms droplets of water and hence the cloud.
(3) conc. HCl emits strongly smelling HCl gas all the time.
(4) oxygen in air reacts with emitted HCl gas to form a cloud of chlorine gas.

3. What would happen when a solution of potassium chromate is treated with an excess of dilute nitric acid ? **[AIEEE-2003, 3/225]**
(1) Cr^{3+} and $Cr_2O_7^{2-}$ are formed
(2) $Cr_2O_7^{2-}$ and H_2O are formed
(3) CrO_4^{2-} is reduced to + 3 state of Cr
(4) CrO_4^{2-} is oxidized to + 7 state of Cr

4. Which one of the following statements regarding helium is incorrect ? **[AIEEE-2004, 3/225]**
(1) It is used to produce and sustain powerful superconducting magnets
(2) It is used as a cryogenic agent for carrying out experiments at low temperatures
(3) It is used to fill gas balloons instead of hydrogen because it is lighter and non-inflammable
(4) It is used in gas-cooled nuclear reactors

5. Which among the following factors is the most important in making fluorine the strongest oxidizing halogen? **[AIEEE-2004, 3/225]**
(1) Hydration enthalpy
(2) Ionization enthalpy
(3) Electron affinity
(4) Bond dissociation energy

6. The correct order of the thermal stability of hydrogen halides (H–X) is : **[AIEEE-2005, 3/225]**
(1) HI > HBr > HCl > HF
(2) HF > HCl > HBr > HI
(3) HCl < HF < HBr < HI
(4) HI > HCl < HF < HBr

7. Which of the following statements is true? **[AIEEE 2006, 3/165]**
(1) H_3PO_3 is a stronger acid than H_2SO_3
(2) In aqueous medium HF is a stronger acid than HCl
(3) $HClO_4$ is a weaker acid than $HClO_3$
(4) HNO_3 is a stronger acid than HNO_2

8. What products are expected from the disproportionation reaction of hypochlorous acid? **[AIEEE 2006, 3/165]**
(1) $HClO_3$ and Cl_2O (2) $HClO_2$ and $HClO_4$ (3) HCl and Cl_2O (4) HCl and $HClO_3$

9. Identify the incorrect statement among the following. **[AIEEE 2007, 3/120]**
(1) Cl_2 reacts with excess of NH_3 to give N_2 and HCl.
(2) Br_2 reacts with hot and strong NaOH solution to give NaBr, $NaBrO_4$ and H_2O.
(3) Ozone reacts with SO_2 to given SO_3.
(4) Silicon reacts with $NaOH_{(aq)}$ in the presence of air to give Na_2SiO_3 and H_2O.

10. Which one of the following reactions of Xenon compounds is not feasible ? **[AIEEE 2009, 4/144]**
(1) $3XeF_4 + 6H_2O \rightarrow 2Xe + XeO_3 + 12HF + 1.5O_2$
(2) $2XeF_2 + 2H_2O \rightarrow 2Xe + 4HF + O_2$
(3) $XeF_6 + RbF \rightarrow Rb[XeF_7]$
(4) $XeO_3 + 6HF \rightarrow XeF_6 + 3H_2O$

11. Which among the following is the most reactive ? **[JEE(Main) 2015, 4/120]**
(1) Cl_2 (2) Br_2 (3) I_2 (4) ICl

12. The products obtained when chlorine gas reacts with cold and dilute aqueous NaOH are : **[JEE(Main) 2017, 4/120]**

(1) ClO_2^- and ClO_3^- (2) Cl^- and ClO^- (3) Cl^- and ClO_2^- (4) ClO^- and ClO_3^-

PART-III : NATIONAL STANDARD EXAMINATION IN CHEMISTRY (NSEC) STAGE-I

1. Acid used for making permanent markings on the glass surface is: **[NSEC 2001]**
(A) HNO_3 (B) HF (C) HIO_3 (D) H_2SO_4

2. One gas bleaches the colour of flowers by reduction while the other by oxidation. The gases are **[NSEC 2002]**
(A) SO_2, Cl_2 (B) CO, Cl_2 (C) H_2S, Br_2 (D) NH_3, SO_3

3. Fluorine has –1 oxidation state while iodine exhibits oxidation states of –1, +1, +3, +5 and +7. This is due to **[NSEC 2002]**
(A) fluorine being a gas (B) availability of d-orbitals in iodine
(C) non-availability of d-orbitals in iodine (D) none of the above

4. Which pseudo-halogen does not have dimeric nature **[NSEC 2002]**
(A) cyanogen (B) azide (C) thiogene (D) selenothigen.

5. The correct sequence of reducing power of halide ions are **[NSEC 2002]**
(A) $Cl^- > Br^- > I^-$ (B) $Br^- > I^- > Cl^-$ (C) $I^- > Br^- > Cl^-$ (D) $Cl^- > I^- > Br^-$

6. The order of decreasing basicity in the four halide ions is : **[NSEC 2002]**
(A) $I^- > Br^- > Cl^- > F^-$ (B) $Cl^- > Br^- > I^- > F^-$ (C) $F^- > Cl^- > Br^- > I^-$ (D) $Cl^- > F^- > Br^- > I^-$

7. Which group of periodic table have large negative energy of activation ? **[NSEC 2002]**
(A) Alkali metal (B) Zero group (C) Halogen family (D) Alkaline earth metal.

8. The compound that cannot be formed by xenon is **[NSEC 2003]**
(A) XeO_3 (B) XeF_4 (C) $XeCl_4$ (D) $XeOF_4$

9. $K_2S_2O_8$, acidic $K_2S_2O_8$ and acidic MnO_2 oxidise I-, Br^-, Cl^- to I_2, Br_2 and Cl_2, respectively. From the given data, the sequence that represents the correct order of increasing oxiding ability is **[NSEC 2003]**
(A) $I_2 > K_2S_2O_8 > Br_2$ (B) acidic $MnO_2 > K_2S_2O_8 > Cl_2$
(C) $K_2S_2O_8 > I_2 > Br_2$ (D) $Cl_2 > K_2S_2O_8 > Br_2$.

10. Hydrogen fluoride is a liquid at room temperature due to **[NSEC 2005]**
(A) dimerisation (B) dissociation followed by aggregation.
(C) association (D) polymerisation

11. Which of the following is a ''super acid'' **[NSEC 2008]**
(A) ($HF + SbF_5$) in SO_2 (B) ($H_2SO_4 + SO_3$) in SO_2
(C) ($HNO_3 + BF_3$) in SO_2 (D) ($H_3PO_4 + PF_5$) in SO_2

12. The noble gas was first time discovered by **[NSEC 2008]**
(A) Cavendish (B) Willian Ramsay (C) Rayleigh (D) Frankland

13. Of the interhalogen compounds, ClF_3 is more reactive than BrF_3, but BrF_3 has higher conductance in the liquid state. The reason is that **[NSEC 2011]**
(A) BrF_3 has higher molecular weight (B) ClF_3 is volatile
(C) BrF_3 dissociates into BrF_2^+ and BrF_4^- more easily (D) ClF_3 is most reactive

14. Radioactive inert gas is : **[NSEC 2011]**
(A) technetium (B) radon (C) xenon (D) curium

15. The gas which liberates bromine from a solution of KBr is **[NSEC 2013]**
(A) Cl_2 (B) I_2 (C) SO_2 (D) HI

16. Bleaching powder contains a salt of an oxoacid as one of its components. The anhydride of that acid is
(A) Cl_2O (B) Cl_2O_7 (C) ClO_2 (D) Cl_2O_6 **[NSEC 2014]**

17. Which of the following hydrogen halides react with $AgNO_3$ to give a precipitate that dissolves in hypo solution? **[NSEC 2014]**

(I) HCl (II) HF (III) HI (IV) HBr

(A) (III), (I), (II) (B) (I), (III), (IV) (C) (IV), (II), (I) (D) (II), (IV), (III)

18. With respect to halogens, four statements are given below **[NSEC 2015]**

(I) The bond dissociation energies for halogens are in the order : $I_2 < F_2 > Br_2 < Cl_2$

(II) The only oxidation state is –1

(III) The amount of energy required for the excitation of electrons to first excited state decreases progressively as we move from F to I

(IV) They form HX_2^- species in their aqueous solutions (X = halogen)

The correct statements are

(A) I, II, IV (B) I, III, IV (C) II, III, IV (D) I, III

19. Consider a compound $CsXY_2$ where X and Y are halogens. Which of the following statement/s is/are correct? **[NSEC 2016]**

(i) X and Y have different oxidation states.

(ii) For Y with lower atomic number than X, X can assume oxidation states higher than normal.

(iii) Such compounds exist because Cs^+ has a high charge to size ratio.

(A) Only (i) (B) (i) and (ii) (C) Only (ii) (D) (i) and (iii)

20. Iodine is a solid and sublimes at ordinary temperature. This is because of : **[NSEC 2017]**

(A) weak I–I bonds (B) strong I–I bonds

(C) lone pair-bond pair repulsions (D) weak van der Waals forces between I_2 molecules

21. A 500 mL glass flask is filled at 298 K and 1 atm, pressure with three diatomic gases X, Y and Z. The initial volume ratio of the gases before mixing was 5 : 3 : 1. The density of the heaviest gas in the mixture is not more than 25 times that of the lightest gas. When the mixture was heated, vigorous reactions take place between X and Y and X and Z in which all the three gases were completely used up. The gases X, Y, Z respectively are **[NSEC 2017]**

(A) H_2, O_2, N_2 (B) H_2, O_2, Cl_2 (C) H_2, F_2, O_2 (D) O_2, H_2, F_2

PART - IV : PRACTICE TEST-2 (IIT-JEE (ADVANCED Pattern))

Max. Time : 1 Hr. **Max. Marks : 66**

Important Instructions

A. General :

1. The test is of 1 hour duration.
2. The Test Booklet consists of 22 questions. The maximum marks are 66.

B. Question Paper Format

3. Each part consists of five sections.
4. Section-1 contains 7 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which ONE is correct.
5. Section-2 contains 5 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which ONE OR MORE THAN ONE are correct.
6. Section 3 contains 6 questions. The answer to each of the questions is numerical value, ranging from 0 to 9 (both inclusive).
7. Section 4 contains 1 paragraphs each describing theory, experiment and data etc. 3 questions relate to paragraph. Each question pertaining to a partcular passage should have only one correct answer among the four given choices (A), (B), (C) and (D).
8. Section 5 contains 1 multiple choice questions. Question has two lists (list-1 : P, Q, R and S; List-2 : 1, 2, 3 and 4). The options for the correct match are provided as (A), (B), (C) and (D) out of which ONLY ONE is correct.

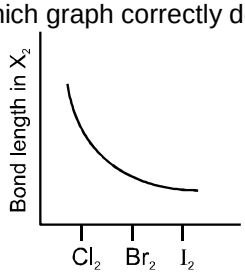
C. Marking Scheme :

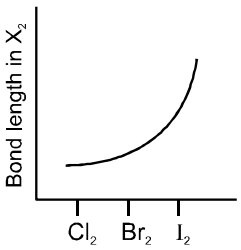
9. For each question in Section 1, 4 and 5 you will be awarded 3 marks if you darken the bubble corresponding to the correct answer and zero mark if no bubble is darkened. In all other cases, minus one (– 1) mark will be awarded.
10. For each question in Section 2, you will be awarded 3 marks. If you darken all the bubble(s) corresponding to the correct answer(s) and zero mark. If no bubbles are darkened. No negative marks will be answered for incorrect answer in this section.
11. For each question in Section 3, you will be awarded 3 marks if you darken only the bubble corresponding to the correct answer and zero mark if no bubble is darkened. No negative marks will be awarded for incorrect answer in this section.

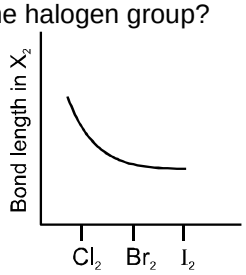
SECTION-1 : (Only One option correct Type)

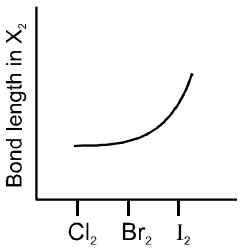
This section contains 7 multiple choice questions. Each questions has four choices (A), (B), (C) and (D) out of which Only ONE option is correct.

1. Which graph correctly describes a trend found in the halogen group?

(A) 

(B) 

(C) 

(D) 

2. (i) (r) + (p) $\longrightarrow$ $NaClO_2 + O_2$

(ii) $IO_3^- + I^- \xrightarrow{H^+}$ (q)

(iii) Acidic solution of $ClO_2^- \longrightarrow$ (s) + (r).
(disproportionation reaction)

(p) used as air purifier and CO_2 absorber.
(q) estimated by hypo and it forms voilet colour vapour (it self).
(r) is yellow colour gas
(s) gives chromylchloride test.
Which option is correct.

(A) (p) = Na_2O_2, (q) = I_2 (B) (q) = I_2O_5, (r) = Cl^-
(C) (p) = Na_2O, (r) = Cl_2O (D) (r) = Cl_2, (s) = Cl_2O_3

3. $[HXeO_4]^- + OH^- \longrightarrow [X] + [Y] + O_2 + H_2O$
The products [X] and [Y] in unbalanced reaction are :
(A) $[XeO_6]^{4-}$ & Xe (B) $[XeO_6]^{4-}$ & XeO_3 (C) XeO_3 & Xe (D) H_2XeO_4 & Xe

4. Consider following properties of the noble gases.
I : They readily form compounds which are colourless.
II : They generally do not form ionic compounds.
III : Xenon has variable oxidation states in its compounds.
IV : the smaller He and Ne do not form clathrate compounds.
Select correct properties.
(A) I, II, III (B) II, III, IV (C) I, III, IV (D) All

5. Which behave like pseudohalide in following
(A) $(CN)_2$ (B) $(SCN)_2$ (C) N_3^- (D) I_3^-

6. Cl_2 (g) + $Ba(OH)_2 \longrightarrow$ X (aq) + $BaCl_2 + H_2O$
$X + H_2SO_4 \longrightarrow Y + BaSO_4$
$Y \xrightarrow[> 365\ K]{\Delta} Z + H_2O + O_2$
Y and Z, are respectively :
(A) $HClO_4$, ClO_2 (B) $HClO_3$, ClO_2 (C) $HClO_3$, ClO_6 (D) $HClO_4$, Cl_2O_7

7. Which of the following on treatment with XeF_6 gives Xe?
(A) H_2 (B) HCl (C) OH^- (conc) (D) All of these

Section-2 : (One or More than one options correct Type)

This section contains 5 multipole choice questions. Each questions has four choices (A), (B), (C) and (D) out of which ONE or MORE THAN ONE are correct.

8. Which of the following have melting points less than 298 K.
(A) Fluorine (B) Bromine (C) Iodine (D) Chlorine

9. Aq. solution of salt $\xrightarrow[\text{acid (X)}]{\text{Halogen}}$ A $\xrightarrow[\text{Halogen acid (X)}]{\text{excess}}$ soluble

$\downarrow K_2CrO_4$ (aq.)

Yellow precipitate
The halogen acid (X) is
(A) HF (B) HCl (C) HI (D) Cl_2 (aq.)

10. Select the correct statement(s).
(A) Cl_2O and ClO_2 are used as bleaching agents and as germicides.
(B) I_2O_5 is used in the quantitative estimation of CO.
(C) ClO_2 is the anhydride of $HClO_2$ and $HClO_3$.
(D) Cl_2O is a colouless oily liquid.

11. Which of the following are Pseudo halid.
(A) CN^- (B) N_3^- (C) OCN^- (D) NO_3^-

12. Which of the following can be obtained by hydrolysis of XeF_6
(A) XeO_3 (B) HF (C) XeO_2F_2 (D) Xe

Section-3 : (Numerical Value Type.)

This section contains 6 questions. Each question, when worked out will result in numerical value from 0 to 9 (both inclusive)

13. What is the sum of group number and period number (according to IUPAC system) of the non-metal which exist in liquid state at room temperature.

14. How many of the following compounds form HCl on hydrolysis as one of the products (major or minor)
(i) BCl_3 (ii) $BiCl_3$ (iii) SO_2Cl_2 (iv) NCl_3 (v) PCl_5
(vi) CrO_2Cl_2 (vii) CH_3Cl (viii) NaCl (ix) $ZnCl_2$

15. $NH_4ClO_4 + NHO_3 \longrightarrow$ (A) + (B) $\xrightarrow{\Delta}$ (C) (neutral oxide)
The summation of number of lone pairs and atomicities of compound B and C is.

16. The oxidation state of iodine in compound which is obtained by heating HIO_3 at 170ºC is +n.
Give value of n.

17. Hydrolysis of compound A, two acids P and Q forms, P is used in etching of glass, Q on strongly heating gives a oxide R. R is used in estimation of carbon monoxide. Calculate total number of lone pairs on compound A.

18. The simplest ratio x : y of xenon and fluorine when passes through Ni-tube (400ºC) at high pressure gives XeF_6. Here x + y is :

SECTION-4 : Comprehension Type (Only One options correct)

This section contains 1 paragraphs, each describing theory, experiments, data etc. 3 questions relate to the paragraph. Each question has only one correct answer among the four given options (A), (B), (C) and (D)

Paragraph for Questions 19 to 21

White crystalline solid (A) reacts with H_2 to form a highly associated liquid (B) and a monoatomic, colorless gas (C). The liquid (B) is used for etching glass. Compound (A) undergoes hydrolysis slowly to form (C), (B) and a diatomic gas (D) whose IE is almost similar to that of (C). (B) forms an addition compound with KF to form (E) which is electrolysed in the molten state to form a most reactive gas (F) which combines with (C) in 2:1 ratio to produce (A).

19. According to Molecular Orbital Theory, which of the following is correct about the molecule D ?
(A) its bond order is 2.0 (B) it has two unpaired electrons in π–bonding M.O.
(C) both the above are correct (D) none of these is correct

20. Which of the following is correct for the white crystalline solid (A) ?
(A) It oxidises F^- to F_2
(B) It on hydrolysis with alkali under goes disproportionation.
(C) It is obtained by the reaction of (C) with O_2F_2 at 118ºC.
(D) None of these.

21. The compound 'A' reacts with sulphur to form a compound in which hybridisation state of sulphur atom is :
(A) sp^3d (B) sp^3d^2 (C) sp^3 (D) sp^3d^3

SECTION-5 : Matching List Type (Only One options correct)

This section contains 1 questions, each having two matching lists. Choices for the correct combination of elements from List-I and List-II are given as options (A), (B), (C) and (D) out of which one is correct

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22. Match the reaction products listed in column–I with the particulars listed in column-II

	Column–I		**Column–II**
(A)	$XeF_2 + H_2O \longrightarrow$	(p)	Redox reaction
(B)	$XeF_4 + H_2O \longrightarrow$	(q)	Disproportionation
(C)	$XeF_6 + H_2O \longrightarrow$	(r)	O_2 formation
(D)	$XeO_3 + NaOH \longrightarrow$	(s)	Xe formation
		(t)	Etching glass

Practice Test-2 (IIT-JEE (ADVANCED Pattern))

OBJECTIVE RESPONSE SHEET (ORS)

Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Ans.										
Que.	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Ans.										
Que.	**21**	**22**								
Ans.		**(A)**		**(B)**		**(C)**		**(D)**		

APSP Answers

PART - I

1.	(3)	**2.**	(1)	**3.**	(1)	**4.**	(4)	**5.**	(3)
6.	(2)	**7.**	(2)	**8.**	(2)	**9.**	(1)	**10.**	(1)
11.	(2)	**12.**	(4)	**13.**	(1)	**14.**	(4)	**15.**	(3)
16.	(3)	**17.**	(2)	**18.**	(3)	**19.**	(2)	**20.**	(3)
21.	23	**22.**	4	**23.**	7	**24.**	7	**25.**	2

PART - II

1.	(1)	**2.**	(4)	**3.**	(2)	**4.**	(3)	**5.**	(1)
6.	(2)	**7.**	(4)	**8.**	(4)	**9.**	(2)	**10.**	(4)
11.	(4)	**12.**	(2)						

PART - III

1.	(B)	**2.**	(A)	**3.**	(B)	**4.**	(B)	**5.**	(C)
6.	(C)	**7.**	(C)	**8.**	(C)	**9.**	(D)	**10.**	(C)
11.	(A)	**12.**	(B)	**13.**	(C)	**14.**	(B)	**15.**	(A)
16.	(A)	**17.**	(B)	**18.**	(D)	**19.**	(B)	**20.**	(D)
21.	(C)								

PART - IV

1.	(B)	**2.**	(A)	**3.**	(A)	**4.**	(B)	**5.**	(C)
6.	(B)	**7.**	(D)	**8.**	(ABD)	**9.**	(BC)	**10.**	(ABC)
11.	(ABC)	**12.**	(ABC)	**13.**	21	**14.**	5	**15.**	24
16.	5	**17.**	16	**18.**	21	**19.**	(A)	**20.**	(C)
21.	(B)	**22.**	(A) – (p,q,r,s,t) ; (B) – (p,q,r,s,t) ; (C) – (t) ; (D) – (p,q,r,s)						

APSP Solutions

PART - I

1. Moissan method

$KHF_2 \xrightarrow{\text{electrolysis}} KF + HF$

At Cathode K^+ | At Anode F^-

$K^+ + e^- \longrightarrow K$

$K + HF \longrightarrow KF + H$

$H + H \longrightarrow H_2$

$F^- \longrightarrow F + e^-$

$F + F \longrightarrow F_2$

2. $4HCl + O_2 \xrightarrow[400^oC]{CuCl_2} 2Cl_2 + 2H_2O$

3. KHF_2 solution in anhydrous HF.

4. Only $K_2Cr_2O_7$ and HCl will give Cl_2

$K_2Cr_2O_7 + 8\,HCl \longrightarrow 2KCl + 2CrCl_3 + 4H_2O + 3O$

$2HCl + O \longrightarrow H_2O + Cl_2 \times 3$

$K_2Cr_2O_7 + 14\,HCl \longrightarrow 2KCl + 2CrCl_3 + 7H_2O + 3Cl_2$

5. $2KMnO_4 + 16HCl \rightarrow 2KCl + 2MnCl_2 + 8H_2O + 3Cl_2$

6. $C_{10}H_{16} + 8Cl_2 \longrightarrow 10C + 16HCl$

Terpentine oil

7. $3Br_2 + 6CO_3^{2-} + 3H_2O \longrightarrow 5Br^- + BrO_3^- + 6HCO_3^-$ (disproportionation reaction)

In this reaction O.S. of Br changes from 0 (in Br_2) to –1 (in Br^-) and +5 (in BrO_3^-). Thus, in this reaction bromine is both oxidised (increase in O.S.) and reduced (decrease in O.S.) –disproportionation reaction.

10. HCl is dried over conc. H_2SO_4. Because HBr, HI and H_2S are oxidised by H_2SO_4.

11. The HBr so formed reduces H_2SO_4 and itself gets oxidised to evolve Br_2.

$2HBr + H_2SO_4 \longrightarrow 2H_2O + SO_2 + Br_2$

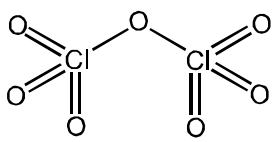
12. When $KClO_3$ is heated with conc. HCl, a mix. of Cl_2 and ClO_2 is formeed known as euchlorine.

$2KClO_3 + 4HCl \longrightarrow 2KCl + \underbrace{2ClO_2 + Cl_2}_{\text{euchlorine}} + 2H_2O$

13. $ClO_2 + O_3 \xrightarrow{0^oC} Cl_2O_6$ (dark red)

$Cl_2O_6 + H_2O \longrightarrow HClO_3 + HClO_4$

$2HClO_4 \xrightarrow{-H_2O} Cl_2O_7$

$Cl_2O_7 \equiv$ 

2 : $O \overset{(1.71\text{Å})}{-} Cl$ bond

6 : $O = Al$ $\overset{(1.41\text{Å})}{}$ bond

$I_2O_5 + 5CO \longrightarrow I_2 + CO_2$ (this I_2 titrated by hopo solution).

14. Interhalogen compounds are mostly liquid or solid at room temperature and are not highly volatile.

15. It is a fact.

16. OCN^-, NNN^- are ambidentate and monodentate ligends both denate only one lone pair. So both are monodentate ligand.

17. Out of He, Ne, Ar, Kr and Xe, Xe has the lowest ionisation energy as ionisation energies decreases down a group.

18. $2XeF_6 + SiO_2 \longrightarrow SiF_4 + 2XeOF_4$

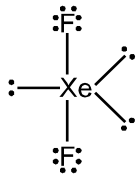
20. (1) $XeF_4 + SbF_5 \longrightarrow [XeF_3]^+ [SbF_5]^-$

(2) $XeF_6 + H_2O \longrightarrow XeO_3 + HF$

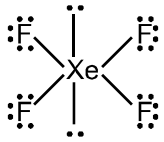
(3) $XeF_6 + H_2 \longrightarrow Xe + HF$

(4) $SiO_2 + XeF_6 \longrightarrow \overset{+6}{X}eOF_4 + [SbF_5]^-$

21.



Total number of lone pair = 9



Total number of lone pair = 14

addition = 9 + 14 = 23

22. B, Al, Be can liberate H_2 with NaOH. P_4 liberates PH_3. C_{60} and Fe fail to react.

23.

SO_3 ,	Cl_2O_7 ,	N_2O_5 ,	GeO_2	Acidic
Cr_2O_3 ,	Amphoteric			
K_2O ,	BaO	Basic		
CO ,	Neutral			

Reactions :

$SO_3 + 2NaOH \longrightarrow Na_2SO_4 + H_2O$

$Cl_2O_7 + 2NaOH \longrightarrow 2NaClO_4 + H_2O$

$N_2O_5 + 2NaOH \longrightarrow 2NaClO_4 + H2O$

$CO + NaOH \longrightarrow$ No reaction

$K_2O + NaOH \longrightarrow$ No reaction but $K_2O + H_2O \longrightarrow 2KOH$

$BaO + NaOH \longrightarrow$ No reaction but $BaO + H_2O \longrightarrow Ba(OH)_2$

$Cr_2O_3 + 2NaOH + 3H_2O \longrightarrow 2Na[Cr(OH)_4]$

$GeO_2 + 2NaOH \longrightarrow Na_2GeO_3 + H_2O$

24. a = 0, b = 1, c = 1, p = 1, q = 1, r = 3

a + b + c + p + q + r = 0 + 1 + 1 + 1 + 1 + 3 = 7

25. (ii) Oxidation number of metals may be – ve.

(iii) N-atoms are donors.

(v) ΔH^o_f (S(mono) $\neq 0$

(vi) Radioactive decay does not follow Arrhenius equation.

PART - II

1. In phosphorous the vacant 3d-orbitals are available. So it can increase its covalence beyond three.

2. $4HCl + O_2 \rightarrow 2Cl_2 + 2H_2O$ white fumes cloud

3. Dilute nitric acid converts chromate into dichromate according to the following chemical reaction.

$2K_2 CrO_4 + 2HNO_3 \rightarrow K_2Cr_2O_7 + 2KNO_3 + H_2O$.

4. Helium is twice as heavy as hydrogen. But it is a non-inflammable gas has 92% lifting power to that of hydrogen.

5. The bond dissociation energy of F–F bond is very low. The weak F–F bond makes fluorine the strongest oxidising halogen.

6. As the size of the halogen atom increases from F to I, H – X bond length in HX molecules also increases from H–F to H–I (H–F < H–Cl < H–Br < H–I). The increase in H–X bond length decreases the strength of H–X bond from H–F to H–I. The decrease in the strength of H–X bond is evident from the fact that H–X bond dissociation energies decrease from H–F to H–I. Due to successive decrease in the strength of H–X bond from H–F to H–I, thermal stability of HX molecules also decreases from HF to HI (HF > HCl > HBr > HI).

7. Higher is the oxidation state of the central atom, greater is the acidity.
Hence, $HClO_4$ is a stronger acid than $HClO_3$. HNO_3 is a stronger acid than HNO_2.
Now greater is the electronegativity and higher is the oxidation state of the central atom, greater is the acidity. Hence H_2SO_3 is a stronger acid than H_3PO_3.
Due to higher dissociation energy of H–F bond and molecular association due to hydrogne bonding in Hf, HF is a weaker acid than HCl.

8. $\overset{+2}{}\quad\quad\overset{+5}{}\quad\quad\overset{-1}{}$
$3HClO(aq) \rightarrow HClO_3(aq) + 2HCl(aq)$.
It is disproportionation reaction of hypochlorus acid where the oxidation number of Cl changes from +1 (in ClO^-) to +5 (in ClO_3^-) and –1 (in Cl^-).

9. $3Br_2 + 6NaOH \rightarrow 5NaBr + NaBrO_3 + 3H_2O$
$O_3 + SO_2 \rightarrow O_2 + SO_3$
$Si + 2NaOH + O_2 \rightarrow NaSiO_3 + H_2O$
Cl_2 reacts with excess of ammonia to produce ammonium chloride and nitrogen.

$$2NH_3 + 3Cl_2 \rightarrow N_2 + 6HCl$$
$$6NH_3 + 6HCl \rightarrow 6NH_4Cl$$
$$\overline{8NH_3 + 3Cl_2 \rightarrow N_2 + 6NH_4Cl}$$

10. This reaction is not feasible because XeF_6 formed will get hydrolysed according to the following reaction,

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

11. In general, interhalogen compounds are more reactive than halogens except fluorine (as per NCERT)

12. $Cl_2 + 2NaOH \xrightarrow[\text{Cold \& dil.}]{} Cl^- + ClO^- + Na^+ + H_2O$
Disproportionation reaction.

PART - IV

1. With increasing number of electrons in the molecule and hence increasing molecular size and increase in van der Waal's forces.

2. $ClO_2 + Na_2O_2 \longrightarrow NaClO_2 + O_2$
$IO_3^- + I^- \longrightarrow I_2 + H_2O$
$5\overset{(+3)}{ClO_2^-} \xrightarrow{H^+} 4\overset{(+4)}{ClO_2} + \overset{(-1)}{Cl^-} + H_2O$
$A = Na_2O_2$; $B = I_2$; $C = ClO_2$; Cl^-

3. $2[HXeO_4]^- + 2OH^- \longrightarrow [XeO_6]^{4-} + Xe + O_2 + 2H_2O$

4. (I) They do not form compounds readily as they are chemically inert on account of stable electron configuration.
(II), (III) & (IV) are correct statement.

5. N_3^- is pseudohalide.
$(CN)_2$ and $(SCN)_2$ behave like pseudohalogen.
I_3^- is polyhalide.

6. $6Cl_2\,(g) + Ba(OH)_2 \longrightarrow Ba(ClO_3)_2\,(X) + 5BaCl_2 + 6H_2O$

$\downarrow H_2SO_4$

$2ClO_2 + H_2O + \frac{1}{2}O_2 \xleftarrow{\Delta} 2HClO_3\,(Y) + BaSO_4$

7. $XeF_6 + 3H_2 \longrightarrow Xe + 6HF$
$XeF_6 + 6HCl \longrightarrow Xe + 6HF + 3Cl_2$

8. At room temperature; (298 K = 25ºC)

$F_2\ (g)$, $Cl_2(g)$, $Br_2(\ell)$ — These have M.P.s < 25ºC

$I_2(s)$

10. $2ClO_2 + H_2O \longrightarrow HClO_2 + HClO_3$
$I_2O_5 + 5CO \longrightarrow I_2 + 5CO_2$
Cl_2O is brownish yellow gas which condenses to an orange coloured liquid in a freezing mixture (b.pt. = 2ºC).

12. $XeF_6 + 3H_2O \longrightarrow XeO_3 + 6HF$ Complete hydrolysis
$XeF_6 + 2H_2O \longrightarrow XeO_2F_2 + 4HF$ (Partical hydrolysis)

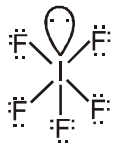
13. Bromine is the only non-metal which exist as liquid at room temperature.

Group no. = 17, Period no. = 4 — For Bromine

14. (i), (ii), (iii), (v), (vi), (ix)

16. $HIO_3 \xrightarrow{\Delta} I_2O_5$

17. $\underset{(A)}{IF_5} + H_2O \longrightarrow \underset{(P)}{HF} \longrightarrow + \underset{(Q)}{HIO_3}$
HF is used in etching of glass



$\underset{(Q)}{HIO_3} \underset{}{\overset{\text{Strong heating}}{\rightleftharpoons}} \underset{(R)}{I_2O_5}$

$\underset{(R)}{I_2O_5} + CO \longrightarrow I_2 + CO_2$

Total number of lone pair in A = 16.

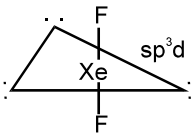
18. 1 : 20 mixture of Xe and F_2 will give XeF_6.
$\therefore \quad x + y = 1 + 20 = 21$
$Xe + 3F_2 \xrightarrow{Ni/400^oC} XeF_6$

19. Compound (D) is O_2 and therefore, its bond order = $\frac{10-6}{2}$ = 2.

20. Compound (A) is XeF_2 ; so, $Xe + O_2F_2 \xrightarrow{118^\circ C} XeF_2 + O_2$

21. $XeF_2 + H_2 \rightarrow Xe(g) + 2HF(l)$
(A) (C) (B)
$2XeF_2 + 2H_2O \rightarrow 2Xe(g) + 4HF + O_2(g)$
(A) (C) (B) (D)
$HF + KF \rightarrow KHF_2$ (E) $\xrightarrow{\text{Electrolysis}}$ F_2(F)

$K^+ [F–H.....F]^-$



$Xe + F_2 \rightarrow XeF_2$; $S_8 + 24\ XeF_2 \rightarrow 8\ SF_6 + 24\ Xe$
1 : 2
(C) (F) (A)

22. (A) $2XeF_2 + 2H_2O \longrightarrow 2Xe + 4HF + O_2$
(B) $6XeF_4 + 12H_2O \longrightarrow 4Xe + 2XCO_3 + 24HF + 3O_2$
(C) $XeF_6 + 3H_2O \longrightarrow XeO_3 + 6HF$
(D) $XeO_3 + NaOH \longrightarrow Na^+ [HXeO_4]^-$
$2[HXeO_4]^- + 2OH^- \longrightarrow [XeO_6]^{4-} + Xe + O_2 + H_2O$