CHEMISTRY

JEE (MAIN AND ADVANCED) CHEMISTRY

VIIA GROUP ELEMENTS

Examples

1. Write on the electropositivity of iodine.

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2. What is the order of bond enthalpies of halogens? Why is it not opposite to that of bond lengths?

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3. Chlorine can exhibit -1 and $+1$ states, while fluorine can exhibit only -1, but not $+1$. Why?

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4. Iodine is violet coloured. Why?

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5. Among the reactions,

$F_{2(g)} + 2e^- \rightarrow 2F^-_{(g)}$ and

$Cl_{2(g)} + 2e^- \rightarrow 2Cl^-_{(g)}$ which is more feasible ? Give the reason.

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6. Standard reduction potential (SRP) of fluorine is highest. Comment

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7. Electron gain enthalpy of fluorine is less than that of chlorine - explain.

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8. Bond enthalpy of bromine is $194kJmol^{-}$. If enthalpy of vapourisation of Br_2 is $+30kJmol^{-}$, electron gain enthalpy of Br is $-325kJmol^{-1}$ and hydration enthalpy of bromide is $-339kJmol^{-1}$ calculate the change in enthalpy for the reaction, $\frac{1}{2}Br_2(l) + e^{-} \xrightarrow{aq} Br^{-}(aq)$.

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9. Heavier halide is oxidised by lighter halogen. Justify.

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10. Electrolysis of aqueous HF produces O_2 at anode but not F_2 Explain.

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11. Analyse the bonds present in KHF_2

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12. What is the action of litmus with aqueous chlorine?

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13. What kind of reaction that chlorine undergoes with aqueous alkali solution ?

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14. Cl_2 is more reactive than I_2 but when $KCIO_3$ reacts with I_2, $Cl,_2$ is liberated. Why?

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15. When HCl reacts with powdered iron, ferrous chloride is formed, but not ferric chloride. Why?

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16. What happens when some ethyl alcohol is added in the Nelson's cell and the cell is closed ?

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17. Chlorine trioxide is paramagnetic, but chlorine hexoxide is diamagnetic. Explain.

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18. Hypochlorite is a strong oxidant and bleaching agent. Why?

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19. Perchloric acid is strongest acid, but weakest oxidising agent. Why?

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Subjective Exercise 1 Long Answer Questions

1. Discuss the following trends in halogens.

(a) atomic radius

(b) ionisation potential

(c) electron affinity and

(d) electronegativity.

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2. Discuss on the oxidation ability of halogens.

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3. What are interhalogen compounds ? Do all these interhalogen cokpounds have halogens in the same hybridized state ? Write the structures of all the interhalogen compounds.

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Subjective Exercise 1 Short Answer Questions

1. Discuss the electronic configuration of halogens.

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2. Write on the occurrence and important minerals of halogens

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3. Write on the bonding and oxidation states of halogens.

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4. How does halogens react with (a) water (b) alkali and (c) metals

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5. Discuss the reactivity of halogens with hydrogen.

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6. Write a note on bonding and structures of interhalogen compounds.

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7. Explain the oxidation states of chlorine with respect to its electronic configuration

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8. Name the hybridizations occurring in the interhalogen compounds.

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9. Write the names of all the VIIA group elements.

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10. Mention the most electronegative element in the periodic table. What is the electronegativity value of fluorine ?

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11. Name the element with highest electron affinity and give its value.


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12. Why is the electron affinity of chlorine greater than that of fluorine ?


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Subjective Exercise 2 Short Answer Questions

1. Write the examples denoting anamolous behaviour of fluorine

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Subjective Exercise 2 Very Short Answer Questions

1. Compare the bond energy of fluorine with that of other halogens.

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2. Fluorine exhibits only - 1 oxidation state in its compounds. Why?

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3. Rectivity of fluorine with water is different from that of other halogens. Substantiate.

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4. Write two factors supporting anamolous behaviour of fluorine.

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5. Write the distinction between fluorine and rest of the halogens.

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Subjective Exercise 3 Long Answer Questions

1. Describe the Nelson's cell method for the preparation of chlorine.

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2. Write the general chemical properties of chlorine.

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Subjective Exercise 3 Short Answer Questions

1. How does chlorine react with hydrocarbons ? Write the necessary chemical equations.

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2. Mention the important uses of chlorine

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3. How hydrogen chloride is prepared in the laboratory ?

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4. Discuss the acidic character of HCI. How does it decompose salts of weaker acids ?

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Subjective Exercise 3 Very Short Answer Questions

1. Write the electrode reactions in Nelson's cell.

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2. When does Cl_2 react with CO ? Give the equation.

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3. Write the balanced equation(s) for the reaction of Cl_2 with NH_3.

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4. One mole of NH_3 is mixed with 8 moles of Cl_2 in a reaction vessel. Write the equation.

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5. How does chlorine react with hypo ?

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Subjective Exercise 4 Long Answer Questions

1. Write various oxyacids of chlorine. Write the oxidation numbers of chlorine in these Oxyacids.

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Subjective Exercise 4 Short Answer Questions

1. Mention different oxyacids of halogens.Discuss their acidic nature.

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2. Discuss the structures of oxyanions of chlorine. Compare the O-Cl bond lengths and bond energies

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Subjective Exercise 4 Very Short Answer Questions

1. What is the structure of $HClO_4$?

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2. Give hybridisation of chlorine lone pairs on chlorine in chloric acid.

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3. Which oxyacids of chlorine is strongest ? . Why?

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Objective Exercise 1 General Characteristics

1. The number of unpaired electrons present in the first excited state of chlorine atom is

A. 1

B. 2

C. 5

D. 2

Answer: B

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2. Which of the following halogens has metallic character ?

A. F_2

B. CI_2

C. Br_2

D. I_2

Answer: D

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3. Super halogen is

A. F_2

B. CI_2

C. Br_2

D. I_2

Answer: A

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4. The element which never acts as reducing agent in a chemical reaction is

A. O

B. Li

C. F

D. C

Answer: C

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5. The high reactivity of fluorine is mainly due to

A. high heat of hydration

B. small size

C. low bond dissociation energy of the F-Fbond

D. high ionisation potential

Answer: C

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6. The type of forces present among halogen molecules

A. H-bonds

B. Covalent bonds

C. Vander waal's forces

D. Ionic bond

Answer: C

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7. The correct order of Vander Waals radius of F, Cl and Br is :

A. $Cl > F > Br$

B. $Br > Cl > F$

C. $F > Cl > Br$

D. $Br > F > Cl$

Answer: B

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8. Liquid and solid halogens are

A. Br_2 and Cl_2

B. I_2 and Br_2

C. Br_2 and I_2

D. Cl_2 and I_2

Answer: C

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9. The halogen that undergoes sublimation is

A. F_2

B. Cl_2

C. Br_2

D. I_2

Answer: D

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10. Ionisation potential of fluorine is abnormally high. It is due to

A. Its high EN value

B. Its high EA value

C. Its small size

D. Its big size

Answer: C

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11. The elements with the highest electron affinity and electronegativity respectively are

A. Cl and Cl

B. F and F

C. F and Cl

D. Cl and F

Answer: D

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12. An element M has an atomic mass 19 and atomic number 9. Its ion is represented by

A. M^+

B. M^{2+}

C. M^-

D. M^{2-}

Answer: C

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13. General oxidation states of halogens are

A. $-1, +1$

B. $-1, +1, +3$

C. $-1, +1, +3, +5$

D. $-1, +1, +3, +5, 7$

Answer: D

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14. Which one of the following elements can show both positive and negative oxidation state ?

A. F

B. I

C. Li

D. He

Answer: B

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15. The maximum oxidation state that can be exhibited by a halogen in its second excited state

A. $+1$

B. $+3$

C. $+5$

D. $+7$

Answer: C

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16. Which one of the following elements show different oxidation states?

A. Sodium

B. Fluorine

C. Chlorine

D. Potassium

Answer: C

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17. Enthalpy of dissociation is low for

A. F_2

B. Cl_2

C. Br_2

D. I_2

Answer: D

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18. F_2 absorbs ..... portion of light and appear yellow and I_2 absorbs ..... portion of light and appears violet

A. Red and Green

B. Violet and Yellow

C. Blue and Orange

D. Green and Red

Answer: B

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19. In AX_3 type of molecule if 'A' undergoes sp^3d^2 hybridisation, then the shape of the molecule is

A. T-shape

B. Octahedral

C. Square pyramidal

D. Tetrahedal

Answer: C

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20. The hybridization in interhalogen compound AX_7 is

A. sp^3d^3

B. sp^3

C. sp^3d

D. sp^3d^2

Answer: A

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21. The strongest oxidising agent among the following is

A. Cl_2

B. F_2

C. O_3

D. H_2O_2

Answer: B

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22. The order of reactivity of halogens with Hydrogen is

A. $F_2 < Cl_2 < Br_2 < I_2$

B. $F_2 > Cl_2 > Br_2 > I_2$

C. $F_2 < Br_2 < Cl_2 < I_2$

D. $F_2 < I_2 < Br_2 < Cl_2$

Answer: B

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23. Which of the following is incorrect with respect to property indicated ?

A. $E.N: F > Cl > Br$

B. $E.A: Cl > Br < F$

C. Oxidising power : $F_2 > Cl_2 > Br_2$

D. Bond energy : $F_2 > Cl_2 > Br_2$

Answer: D

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24. Which halogen has highest ionisation potential

A. Fluorine

B. Chlorine

C. Bromine

D. Iodine

Answer: A

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25. The electron affinity values(in $KJ\text{mole}^{-1}$) of three halogens x, y and z are respectively $-349, -333$ and -325. Then x, y and z respectively are

A. F, Cl and Br

B. Cl, F and Br

C. Cl, Br and F

D. Br, Cl and F

Answer: B

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26. Which of the following is most volatile

A. HI

B. HBr

C. HCl

D. HF

Answer: C

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27. Correct order of boiling points of hydrogen halides is

A. $HF > HCI > HBr > HI$

B. $HF < HCl < HBr < HI$

C. $HCl < HBr < HI < HF$

D. $HF < HBr < HI < HCl$

Answer: C

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28. One gas bleaches the colour of flowers by reduction and another gas by oxidation. The gases respectively are

A. SO_2 and Cl_2

B. CO and Cl_2

C. NH_3 and SO_2

D. H_2S and Br_2

Answer: A

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29. In the reaction $2Br^- + X_2 \rightarrow Br_2 + 2X^-$, X_2 is

A. Cl_2

B. Br_2

C. I_2

D. N_2

Answer: A

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30. Which of the following has greatest reducing power ?

A. HI

B. HBr

C. HCl

D. HF

Answer: A

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31. Mark the element which shows only one oxidation state in its compounds

A. F

B. Cl

C. Br

D. I

Answer: A

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Objective Exercise 1 Clorine

1. Cl_2 reacts with water and forms

A. $HCl + HOCl$

B. $HCl + O_2 + O_3$

C. $HCl + HOCl + O_3$

D. $HOCl + O_2$

Answer: A

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2. Chlorine acts as a bleaching agent only in the presence of

A. Dry air

B. Moisture

C. Sun light

D. None of these

Answer: B

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3. Cl_2 (or) Br_2(or)I_2 reacts with cold and dilute alkali solution to form

A. Halide + Hypohalite

B. Halide + Hypohalite + H_2O

C. Halide + halite

D. Halide + Halate + H_2O

Answer: B

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4. CI_2 (or) Br_2 (or) I_2 reacts with hot conc. Alkali solution to form

A. Halide + Hypohalite

B. Halide + Hypohalite + H_2O

C. Halide + halite

D. Halide + Halate + H_2O

Answer: D

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5. The following is not a mineral of Chlorine

A. Carnalite

B. Horn silver

C. Sylvine

D. Cryolite

Answer: D

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6. When Brine solution is subjected to electrolysis the gases liberated at anode and at cathode are

A. H_2 and Cl_2

B. H_2 and O_2

C. Cl_2 and O_2

D. Cl_2 and H_2

Answer: D

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7. At ordinary temperature Cl_2 reacts with

A. O_2

B. N_2

C. He

D. Cu

Answer: D

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8. Chlorine oxidises H_2S to

A. S

B. SO_2

C. H_2SO_4

D. H_2SO_3

Answer: A

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9. The products formed when Cl_2 reacts with excess of NH_3 are

A. $NCl_3 + HCl$

B. $N_2 + HCl$

C. $NCl_3 + N_2$

D. $N_2 + NH_4Cl$

Answer: D

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10. What are the products formed when ammonia reacts with excess chlorine ?

A. N_2 and NCl_3

B. N_2 and HCl

C. N_2 and NH_4Cl

D. NCl_3 and HCl

Answer: D

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11. In the use of Cl_2 as bleaching agent, the substance that is mainly responsible for the bleaching is

A. $HClO_2$

B. $HClO_3$

C. $HClO_4$

D. $HOCl$

Answer: D

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12. Which of the following is used in the extraction of gold

A. F_2

B. Cl_2

C. Br_2

D. I_2

Answer: B

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13. Which one of the following is formed apart from sodium chloride when chlorine reacts with hot concentrated sodium hydroxide?

A. $NaClO$

B. $NaClO_2$

C. $NaClO_3$

D. $NaClO_4$

Answer: C

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Objective Exercise 1 Oxyacids

1. Cl in ClO^- undergoes ..... hybridisation

A. sp^2

B. sp^3

C. sp^3d

D. sp^3d^2

Answer: B

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2. What is the oxidation state of chlorine in hypochlorous acid?

A. $+7$

B. $+5$

C. $+3$

D. $+1$

Answer: D

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3. Which of the following is not a peroxy acid?

A. Perphosphoric Acid

B. Pernitric Acid

C. Perdisulphuric Acid

D. perchloric acid

Answer: D

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4. The geometry of ClO_3^- according to valence shell electron pair repulsion theory will be

A. Planar triangle

B. Pyramidal

C. Tetrahedral

D. Square planer.

Answer: B

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5. What is the bond angle in $ClO_2(OClO)$?

A. $109^\circ 28^1$

B. 111°

C. 118°

D. 115°

Answer: B

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6. Sigma bond between CI and O in CIO_4^- is formed by ---- overlapping

A. $sp^2 - p$

B. $sp^2 - s$

C. $sp^3 - s$

D. $sp^3 - p$

Answer: D

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7. Shape and bond angle in ClO_4^- ion is

A. planar trigonal , $109^\circ 28^1$

B. tetrahedral , $109^\circ 28^1$

C. pyramidal 105°

D. v-shape , 118°

Answer: B

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8. The number of a bonds in ClO_4^- ion is

A. 2

B. 3

C. 4

D. 1

Answer: B

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9. The number of lone pairs on Chlorine atom in $ClO^-, ClO_2^-, ClO_3^-, ClO_4^-$ ions are

A. $0, 1, 2, 3$

B. $1, 2, 3, 4$

C. $4, 3, 2, 1$

D. $3, 2, 1, 0$

Answer: D

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10. The order of $Cl-O$ bond energy in $ClO^-, ClO_2^-, ClO_3^-, ClO_4^-$ is

A. $ClO^- > ClO_2^- > ClO_3^- > ClO_4^-$

B. $ClO_4^- > ClO_3^- > ClO_2^- > ClO^-$

C. $ClO_4^- > ClO_2^- > ClO_3^- > ClO^-$

D. $ClO_3^- > ClO^- > ClO_2^- > ClO_4^-$

Answer: B

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Objective Exercise 1 Assertion And Reason Type

1. (A): The bond dissociation energy of fluorine is less than bromine.

(R): In fluorine molecule, large lone pair electronic repulsions and appreciable internuclear repulsions are present.

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: A

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2. (A): Reaction given below is possible

$2KCI + Br_2 \rightarrow Cl_2 + 2KBr$

(R): lighter halogen displaces larger halogen from its metal halides .

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: D

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3. (A): Electron affinity of fluorine is lower than that of chlorine

(R): Fluorine has small and compact size and stronger inter electron repulsion than chlorine.

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: A

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4. (A): $Cl-O$ bond length decreases from ClO^- to ClO_4^-

(R): $CI-O$ bond order increases from CIO^- to CIO_4^-.

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: A

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5. (A): Bromine does not displace chlorine from its salt solution

(R): Chlorine is displaced from its oxysalt by bromine

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: B

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6. (A) : Iodine is the only halogen that is naturally available in positive oxidation states

(R): Iodine is slightly electropositive among halogens .

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: A

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7. (A) : Chlorine acts as a bleaching agent in the presence of moisture

(R) : Chlorine forms hypochlorous acid in the presence of moisture.

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: A

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8. (A): HBr is stronger acid than HI.

(R) : Bromine is more electronegative than iodine.

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: D

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9. (A): Iodine displaces bromine from $KBrO_3$

(R): Iodine is strong oxidizing agent than bromine.

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: C

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10. (A) OX^- on heating in the presence of OH^- gives X^- and $XO_3^-(X = Cl, Br, I,)$

(R) Conversion of OX^- to X and XO_3^- is called disproportionation

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: B

11. (A) : Chlorine is gas, bromine is liquid and iodine is solid

(R) : Intermolecular attraction forces increase upon increase in molecular masses .

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: A

12. (A): Hydrogen iodide is most stable among hydrogen halides

(R): Iodide is most powerful reductant among halides.

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: D

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13. (A): Oxidation ability increases from $HOCI$ to $HCIO_4$

(R): Oxidation number of chlorine increases from $HOCI$ to $HCIO_4$.

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: D

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14. (A): Fluorine does not form oxyacids

(R): Electronegativity of fluorine is higher than that of oxygen.

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: A

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15. (A): Iodine appears in violet colour.

(R): Iodine absorbsviolet part of electro magnetic radiation .

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: C

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16. (A) :Among hydrogen halides, hydrogen fluoride is least volatile.

(R): Hydrogen fluoride molecules are associated with hydrogen bonding.

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: A

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Objective Exercise 2 General Characteristics

1. The electronic configuration of an element is $1s^2 2s^2 2p^5$. It is most likely to form

A. Anion only

B. Cation only

C. Either cation or anion

D. Neither cation nor anion

Answer: A

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2. Chlorine atom, ini its third excited state, react with fluorine to form compound X. the formula and shape of X are

A. ClF_5, Pentagonal

B. ClF_4, Tetrahedral

C. ClF_4, Pentagonal bipyramidal

D. ClF_7, Pentagonal bipyramidal

Answer: D

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3. Give examples and suggest reasons for the following features of the transition metals.

The highest oxidation state is exhibited in oxoanions of a metal.

A. -1

B. $+1$

C. 0

D. $+2$

Answer: C

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4. When halogen (except F_2) is passed through alkali in different conditions, the halogen undergoes

A. oxidation only

B. Reduction only

C. Both oxidant and reductant

D. neither oxidation nor reduction

Answer: C

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5. The gases liberated during the electrolysis of aqueous solution of hydrogen fluoride

A. H_2 and O_2

B. H_2 and F_2

C. O_2 and F_2

D. can not be electrolysed

Answer: A

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6.

List I	List II
Property	Order
(A) M.Pts	(1) $I_2 < Br_2 < F_2 < Cl_2$
(B) B.Pts	(2) $Cl > F > Br > I$
(C) Electron affinity	(3) $Cl_2 > Br_2 > F_2 > I_2$
(D) Bond dissociation energy	(4) $F_2 > Cl_2 > I_2 > Br_2$

The correct match is

A.

A	B	C	D
5	5	2	3

B.

A	B	C	D
2	5	3	4

C.

A	B	C	D
1	2	3	4

D.

A	B	C	D
5	2	3	4

Answer: A

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7. Which of the following statements about halogens is correct?

A. All are diatomic and forms univalent ion

B. All are capable of exhibiting several oxidation states

C. All are diatomic and form divalent ions

D. They can mutually displace each other from the solution of their compounds with metals

Answer: A

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8. Sulphur reacts with chlorine in 1 : 2 ratio and forms X. Hydrolysis of X gives a sulphur compound Y. What is the hybridisation state of central atom in the anion of Y ?

A. sp^3

B. sp

C. sp^2

D. sp^3d

Answer: A

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9. In which of the following molecules, sigma bonds formed by the overlap of sp^3d and P orbitals are absent ?

A. PCl_5

B. ClF_4

C. $SbCl_5$

D. $HClO_4$

Answer: D

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10. The correct order of the thermal stability of hydrogen halide (H - X) is

A. $HI > HBr > HCI > HF$

B. $HF > HCI > HBr > HI$

C. $HCI > HF > HBr > HI$

D. $HI > HCI > HF > HBr$

Answer: B

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11. Hydrogen bonding does not play any role in boiling of

A. NH_3

B. H_2O

C. HI

D. C_2H_5OH

Answer: C

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12. Bond dissociation energies of HF, HCl, HBr follow the order

A. $HCI > HBr > HF$

B. $HF > HBr > HCI$

C. $HF > HCI > HBr$

D. $HBr > HCI > HF$

Answer: C

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13. Hydrolysis of NCl_3 gives NH_3 and X. which of the following is X?

A. $HClO_4$

B. $HClO_3$

C. $HOCl$

D. $HClO_2$

Answer: C

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14. Which of the following reaction does not takes place.

A. $F_2 + 2Cl^- \rightarrow 2F^{-1} + Cl_2$

B. $Br_2 + 2I^- \rightarrow 2Br^- + I_2$

C. $Cl_2 + 2F^- \rightarrow 2Cl^- + F_2$

D. $Cl_2 + 2Br^- \rightarrow 2Cl^- + Br_2$

Answer: C

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15. Which of the following shows variation of bond energy (BE) of halogens

A. 

B. 

C. 

D. 

Answer: A

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Objective Exercise 2 Chlorine

1. Consider the following reaction

$$6NaOH_{(\text{Hot. Conc.})} + 3Cl_2 \rightarrow 5NaCl + A + 3H_2O.$$

What is the oxidation number of chlorine in "A"?

A. $+5$

B. -1

C. $+3$

D. $+1$

Answer: A

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2. When Cl_2 reacts with Fe (or) Cu it does not form

A. $FeCl_2$

B. $CuCl$

C. $FeCl_3$ and $CuCl_2$

D. $FeCl_2$ and $CuCl$

Answer: D

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3. Chlorine is passed into dilute, cold KOH solution. What are the oxidation numbers of chlorine in the products formed ?

A. $1 \text{ and } +5$

B. -1 and $+3$

C. $+1$ and $+7$

D. $+1$ and -1

Answer: D

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4. The compound in which the number of $d\pi - p\pi$ bonds are equal to those present in ClO_4^-

A. XeF_4

B. XeO_3

C. XeO_4

D. XeF_6

Answer: B

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5. Which of the following dissolves in water but does not give any oxyacid solution?

A. SO_2

B. OF_2

C. SCl_4

D. SO_3

Answer: B

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6. Oxyacid of chlorine with $+5$ state of the central atom is

A. hypochlorous acid

B. chlorous acid

C. chloric acid

D. perchloric acid

Answer: C

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7. Which one of the following pairs of reactants does not form oxygen when they react with each other?

A. F_2, $NaOH$ solution (hot, conc)

B. F_2, H_2O

C. Cl_2, $NaOH$ solution (cold, dilute)

D. $CaOCl_2$, H_2SO_4 (dilute, small amount)

Answer: C

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8. $OClO$ bond angle in ClO_2^- is

A. 111°

B. 109.5°

C. 106°

D. 104.5°

Answer: A

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Objective Exercise 2 Interhalogen Compounds

1. Which of the following inter-halogen compounds does not exist ?

A. IF_7

B. ClF_3

C. Icl

D. $BrCl_7$

Answer: D

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2. Halogens combine among themselves to form covalent compounds which are called

A. Pseudohalides

B. Interhalogen compounds

C. Polyhalides

D. None of these

Answer: B

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3. The halogen forming largest number of inter-halogens is

A. F

B. Cl

C. Br

D. I

Answer: A

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Practice Exercise

1. Fluorine does not exhibit positive oxidation states because

A. it is the most electronegative element

B. of absence of d-orbitals in its valency shell

C. it is the element with highest EA

D. of it's high ionisation energy

Answer: A

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2. When I_2 is passed through KCI, KF and KBr solutions

A. Cl_2 and Br_2 are evolved

B. Cl_2, Br_2 and F_2 are evolved

C. Cl_2 is evolved

D. None of these

Answer: D

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3. Oxidation of thiosulphate with iodine gives

A. Sulphate ion

B. Sulphite ion

C. Tetrathionate

D. Sulphide ion.

Answer: C

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4. The order of acidic character of hydrogen halides is

A. $HF > HCI > HBr > HI$

B. $HI > HBr > HCI > HF$

C. $HCI > HI > HBr > HF$

D. $HF = HCl = HBr = HI$

Answer: B

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5. Which of the following can be prepared only by electrolysis

A. Cl_2

B. Br_2

C. F_2

D. I_2

Answer: C

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6. The Ionic radius of Br^{-1} is $1.96A^{\circ}$ and the Ionic radius of I^{-1} will be

A. $2.20A^{\circ}$

B. $1.96A^{\circ}$

C. $1.84A^{\circ}$

D. $1.33A^{\circ}$

Answer: A

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7. The isoelectronic pair is

A. Cl_2O, ICl_2^-

B. Cl_2^-, ClO_2

C. IF_2^+, I_3^-

D. ClO_2^-, ClF_2^+

Answer: D

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8. The halogen having Greenish - yellow gas reacts with hot and concentrated NaOH solution, and give products. The oxidation state of that halogen changes from

A. $0 \rightarrow \ -1$

B. $0 \rightarrow \ +5$

C. $-1 \ \text{and} \ \ +1$

D. $0 \rightarrow \ '' -1'' \ \text{and} \ \ '' +5''$

Answer: D

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9.

List I	List II
$(A) H_2 + F_2$	(1) Slow in dark but fast in sun light sun light
$(B) H_2 + I_2$	(2) Does not take place at room temp. but takes place at 593 K in hv
$(C) H_2 + Cl_2$	(3) fast in dark but slow in sunlight
$(D) H_2 + Br_2$	(4) Takes place even in the dark (21 - 23k)
	(5) Pt, 713 K and reversible

the correct match is

A.

A	B	C	D
4	5	1	2

B.

A	B	C	D
4	5	2	1

C.

A	B	C	D
1	2	3	4

D.

A	B	C	D
2	1	5	4

Answer: A

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10. Which of the following has highest hydration energy ?

A. I^-

B. Br^-

C. Cl^-

D. F^-

Answer: D

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11. The SRP for the different halogens is in the order of

A. $F > Cl > Br > I$

B. $F < Cl < Br < I$

C. $F < CI > Br > I$

D. $F = Cl = Br = I$

Answer: A

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12. Which of the following shows variation of electron gain enthalpy values (on y-axis) of halogens

A. 

B. 

C. 

D. 

Answer: B

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13. The purpose of addition of KF to HF in the preparation of Fluorine by electrolysis is

A. to increase the conductance of HF

B. to decrease the oxidation potential of HF

C. to lower the solubility of HF

D. to increase the melting point of HF

Answer: A

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14. The bond not present in KHF_2 is

A. hydrogen

B. Dative

C. Ionic

D. Covalent

Answer: B

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15. The F_2 liberated at the anode in the whytlaw Gray method is passed through U - tube, then the following reaction takes place

A. $NaHF_2 \rightarrow NaF + HF$

B. $NaF + HF \rightarrow NaHF_2$

C. $KHF_2 \rightarrow HF + KF$

D. $2F^- - 2e^- \rightarrow F_2$

Answer: B

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16. $H_2S + 4F_2 \rightarrow 2HF + B$

The shape of molecule of compound B is

A. Octahedral

B. Tetrahedral

C. Trigonal planar

D. linear

Answer: A

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17. $NH_3 + 3F_2 \rightarrow A + 3HF$

The correct statement regarding A is

A. sp^3, Tetrahedral, no lone pair

B. sp^3, Pyramidal, one lone pair

C. sp, linear, no lone pair

D. sp^3, angular, two lone pairs

Answer: B

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18. $4HCI + A \rightarrow MnCl_2 + Cl_2 \uparrow + 2H_2O$, In this reaction the change in oxidation state of metal present in A is

A. 2 to -2

B. $+4$ to $+6$

C. -1 to $+3$

D. $+4$ to $+2$

Answer: D

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19. Bond angles in Cl_2O and ClO_2, are

A. $118^\circ, 120^\circ$

B. $109^\circ 28^1, 111^\circ$

C. $111^\circ, 118^\circ$

D. $115^\circ, 120^\circ$

Answer: C

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20. In the reaction of Cl_2 with Na_2SO_3, chlorine acts as

A. Reductant

B. Oxidant

C. Both oxidant and reductant

D. Neither oxidant nor reductnat

Answer: B

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21. In the known interhalogen compound the maximum number of halogen atoms is

A. 4

B. 5

C. 7

D. 8

Answer: D

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22. 50g of a good sample of $CaOCl_2$, is made to react with CO_2. The volume of Cl_2 liberated at S.T.P is

A. 5.6 lit

B. 11.2 lit

C. 22.4 li

D. 4.48 lit

Answer: A

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23. The hybridisation of chlorine in CIO^-, ClO_2, ClO_3^-, and ClO_4^- ions are

A. sp^3, sp^3d, sp^3d^2, sp^3d^3

B. sp^3d^3, sp^3d^2, sp^3d, sp^3

C. sp^2, sp^2, sp^2, sp^2

D. sp^3, sp^3, sp^3, sp^3

Answer: D

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24. $CI - O$ bond length is 170 pm in the oxyanion

A. Hypochlorite

B. chlorite

C. chlorate

D. Perchlorate

Answer: A

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25. Which of the following form inter-halogen compounds ?

A. F

B. Cl

C. Br

D. All of these

Answer: D

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26. The electronic state of chlorine in one of the excited states is $3s^2 3p^3 2d^2$. With this state the interhalogen compound formed is

A. ICl

B. ClF_3

C. $BrCl_5$

D. IF_7

Answer: C

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27. Chloroform is prepared by the use of bleaching powder. The organic compound taken is

$A) C_2H_5OH$ $B) CH_3CHO$

$C) CH_3COOH$ $D) CH_3COOH$

A. A,B,C

B. B,C,D

C. A,C,D

D. A,B,D

Answer: A

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28. In the formation of XA_5 type interhalogen compound, X undergoes

A. sp^3, hybridisation

B. sp^3d, hybridisation

C. dsp^2, hybridisation

D. sp^3d^2, hybridisation

Answer: D

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29. The composition of tear gas is

A. $ClC_2H_4SC_2H_4Cl$

B. CCl_3NO_2

C. $COCl_2$

D. CF_2Cl_2

Answer: B

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30. Which one of the following can be purified by sublimation ?

A. F_2

B. Cl_2

C. Br_2

D. I_2

Answer: D

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31. Number of delocalised pi electrons present in perchlorate anion is

A. 8

B. 6

C. 4

D. 2

Answer: B

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32. Halogen that is naturally available even in positive oxidation states is

A. Fluorine

B. Chlorine

C. Bromine

D. Iodine

Answer: D

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33. As the atomic number of halogens increases down the group, the halonges

A. Lose the outermost electrons more readily

B. Become lighter in colour

C. Become less denser

D. Gain electrons more readily

Answer: A

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34. The type of bonding in HCl molecule is

A. Pure covalent

B. Polar covalent

C. Highly polar .

D. H-bonding

Answer: B

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35. Which of the following molecule form hydrogen bond even in the vapour state also

A. NO_2

B. H_2O

C. HF

D. $C_2H_5NH_2$

Answer: C

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36. Which of the following properties does not correspond to the order given below: `HI < HBr < HCI

A. Thermal stability

B. Reducing power

C. Ionic character

D. Dipole moment

Answer: B

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37. Which acid can combine with its own salt again

A. HF

B. HBr

C. HCl

D. HI

Answer: A

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38. The order of basic strength of $ClO^-, ClO_2^-, ClO_3^-, ClO_4^-$ is

A. $ClO_4^- > ClO_3^- > ClO_2^- > ClO^-$

B. $ClO_4^- > ClO_2^- > ClO^- > ClO_3^-$

C. $ClO^- > ClO_2^- > ClO_3^- > ClO_4^-$

D. $ClO^- > ClO_4^- > ClO_3^- > ClO_2^-$

Answer: C

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39. Cl_2O_6 is the mixed anhydride of

A. $HOCl$ and $HClO_2$

B. $HClO_2$ and $HClO_3$

C. $HClO_3$ and $HClO_4$

D. $HClO$ and $HClO_3$

Answer: C

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40. Which one of the following is most unstable

A. BrF

B. ClF

C. $BrCl$

D. IF

Answer: D

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41. Cl_2O is the anhydride of

A. $HOCl$

B. $HClO_2$ and $HClO_3$

C. $HClO_3$ and $HClO_4$

D. $HClO_4$

Answer: A

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42. Hybridisation of the central atom in Cl_2O molecule is

A. sp^2

B. sp^3

C. sp^3d

D. sp^3d^2

Answer: B

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43. The anhydride of perchloric acid is

A. Cl_2O

B. ClO_2

C. Cl_2O_6

D. Cl_2O_7

Answer: D

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44. In Cl_2O_7 each chlorine atom is linked to

A. four oxygen atoms

B. three oxygen atoms

C. two oxygen atoms

D. five oxygen atoms

Answer: A

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45. $4HCl + A \rightarrow MnCl_2 + Cl_2 \uparrow + 2H_2O$, In this reaction the change in oxidation state of metal present in A is

A. 2 to -2

B. $+4$ to $+6$

C. -1 to $+3$

D. $+4$ to $+2$

Answer: D

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46. Which one of the following is most unstable

A. BrF

B. ClF

C. $BrCl$

D. IF

Answer: D

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47. The anhydride of perchloric acid is

A. Cl_2O

B. ClO_3

C. Cl_2O_6

D. Cl_2O_7

Answer: D

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48. The type of bonding in HCI molecule is

A. Pure covalent

B. Polar covalent

C. Highly polar

D. H-bonding

Answer: B

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49. The following acids have been arranged in the order of decreasing acid strength. Identify the correct order

$CIOH(I)$ $BrOH(II)$ $IOH(III)$

A. $I > II > III$

B. $II > I > III$

C. $III > II > I$

D. $I > III > II$

Answer: A

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50. F_2 combines with all non-metals directly except

A. N_2

B. P

C. Xe

D. Kr

Answer: A

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51. Antichlor is a compound which

A. absorbs chlorine

B. removes Cl_2 from a material

C. liberates Cl_2 from bleaching powder

D. acts as a catalyst in the manufacture of CI_2

Answer: B

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52. Which has the highest heat of vaporisation

A. HF

B. HCl

C. HBr

D. HI

Answer: A

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53. Which possesses highest percentage of ionic character

A. HCl

B. HBr

C. HF

D. HI

Answer: C

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54. "Chlorine-type" laundry bleaches are in reality aqueous solution of

A. $HOCl$

B. $HClO_3$

C. $NaClO_3$

D. $NaOCl$

Answer: A

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55. Most powerful oxidant among halogens and most powerful reductant among halide ions are

A. F_2, F^-

B. F_2, I^-

C. I_2, I^-

D. I_2, F^-

Answer: C

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56. The most reactive among the following is

A. ICl

B. Cl_2

C. Br_2

D. I_2

Answer: A

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57. The triiodide ion I_3^- formed by dissolving iodine in aqueous potassium iodide has which one of the following structures/ geometries ?

A. Triangular

B. Tetrahedral with one corner occupied by a lone pair of electrons

C. Trigonal bipyramidal with three lone pairs, one occupying the equatorial and two axial positions

D. Linear with bond angle of exactly 180°

Answer: D

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58. Which of the following molecule form hydrogen bond even in the vapour state also .

A. NO_2

B. H_2O

C. HF

D. $C_2H_5NH_2$

Answer: C

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