CHEMISTRY

JEE (MAIN AND ADVANCED) CHEMISTRY

GROUP 17 ELEMENTS

Problems

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

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6. 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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7. Electron gain enthalpy of fluorine is less than that of chlorine. Why?

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

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

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

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

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13. Cl_2 is more reactive than I_2 but when $KClO_3$ reacts with I_2, $Cl,_2$ is liberated. Why?

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

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

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

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

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

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19. Iodine is liberated in the reactions between KI and Cu^{2+}, but chlorine is not liberated when KCl is added to Cu^{2+}, why?

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20. What are pseudohalides, polyhalides and pseudohalogens?

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Exercise 3 1 1

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. Discuss the following trends in halogens :

(a) atomic radius, (b) electron affinity and (c) electronegativity.

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4. The order of reactivity of halogens with Hydrogen is

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

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

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7. Discuss on the oxidation ability of halogens.

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

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Exercise 3 1 2

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

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4. Mention the important uses of chlorine

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5. How is hydrogen chloride prepared? Write its uses.

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6. What is the composition of bleaching powder? How is it prepared.

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Exercise 3 1 3

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

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2. Write various oxyacids formed by halogens.

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3. Write the oxidation numbers of chlorine in its oxyacids.

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

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Exercise 3 2

1. Why elements of group 17 are called halogens?

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

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3. Fluorine exhibits only - 1 oxidation state whereas other halogens exhibit +1, +3, +5 and +7 oxidation states also. Explain.

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4. Which element brings about highest coordination number of elements? Why?

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5. Iodine exhibits basic properties. Explain.

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6. Differentiate the products of water on reaction with fluorine and chlorine.

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7. Discuss the oxidation states of chlorine in its compounds.

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8. Explain the trends in ionisation potential, electron affinity, electronegativity and metallic nature of halogens.

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9. Discuss the ease of formation of hydrogen halides. Write the trends in their thermal stability and volatility.

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10. How do halogens react with water? Give chemical equations.

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11. Discuss the difference in the reactions of halogens with cold dilute alkali and hot concentrated alkali.

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12. Discuss the feasibility of oxidising halides, using halogens, sulphuric acid and manganese dioxide.

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13. What are interhalogen compounds? Discuss on the types of these compounds.

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14. Explain with suitable examples that the oxidation ability of halogens decreases from fluorine to iodine.

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15. With the help of Born-Haber cycle, explain the chemical reactivity of halogens.

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16. The oxidation of fluoride is very difficult to perform. Why?

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17. Iodine is liberated in the reaction between KI and Cu^{2+}, but bromine is not liberated when KBr is added to Cu^{2+}. Explain.

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18. Interhalogen compounds are more reactive than the corresponding halogens. Explain.

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19. Phosphoric acid is preferred in place of sulphuric acid in the preparation of hydrogen iodide from alkalimetal iodide. Why?

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20. Fluorine is called super halogen. Why?

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21. How is chlorine prepared in the laboratory and on a commercial scale?

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22. How does chlorine react with (a) Fe, (b) H_2O and (c) H_2S? Give equations?

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23. Write the addition reactions of chlorine with (a) non-metal oxides and (b) unsaturated hydrocarbons.

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24. What makes gold to dissolve in aqua-regia?

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25. How is chlorine used (a) in bleaching, (b) as disinfectant and (c) in war gases?

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26. Ferric chloride $FeCl_3$ is stable, but ferric iodide Fel_3 is unstable. Explain.

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27. CIF_3 exists but not FCl_3. Substantiate.

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28. HI is prepared from Nal, using H_3PO_3 but not H_2SO_4. Explain.

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29. Mention the action of blue litmus by hypochlorous acid.

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30. Although oxygen contentent is high in perchlorate, it does not act as oxidant. Substantiate.

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31. Red roses on exposure to moist chlorine permanently turns colourless. Explain.

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32. $Na_2SO_3 + HCl \rightarrow Na_2SO_4 + H_2O + X$

$X + Na_2S \xrightarrow{\Delta} S + Y$

$Y + I_2 \rightarrow NaI + 'Z'$

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33.

$NH_4Cl + NaOH \rightarrow (\text{Gas A}), NaCl + H_2SO_4 \rightarrow (\text{Gas B})$

Discuss the acid-base nature of these gases, when dissolved in

water. What is the product formed between these gases when mixed together?

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34. A metal halide X on treating with copper sulphate solution yields a brown precipitate Y. Y turns colourless on adding with hypo. What are X and Y?

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35. A liquid (A) is treated with Na_2CO_3 solution. A mixture of two salts (B) and (C) are product in the solution. The mixture on acidification with sulphuric acid and distillation produces the liquid (A) again.

The mixture of salt's are

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36. Gradual addition potassium iodide with nitric acid produces a dark brown precipitate 'A'. 'A' is soluble in excess KI and gives yellow solution 'B'. What are A and B?

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37.

$NaCl + K_2Cr_2O_7 + H_2SO_4 \rightarrow NA_2SO_4 + K_2SO_4 + H_2O + X$

The oxidation state chromium in the product X

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38. A black power (X) when treated with common salt and chamber acid gives off a greenish yellow gas (Y). Y on passing through boiling potash yields compounds are of which when heated with X evolves oxygen. What are X and Y?

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