# INORGANIC CHEMISTRY SAMPLE REVISION QUESTIONS

**1.** (a) Explain why fluorine shows some differences in its properties from the rest of the elements in group VII of the periodic table.

(b) Compare the reactions of fluorine and chlorine when they react separately with the following compounds (in each case, illustrate your answer with equations)

i) Water

ii) Cold dilute sodium hydroxide

iii) Hot concentrated sodium hydroxide.

(c) Describe how you would distinguish between three solutions containing halide ions using aqueous silver nitrate and ammonia.

**2.** (a) Explain how both sodium hydroxide and chlorine are obtained on a large scale.

(b) Describe briefly how chlorine can be converted to potassium chlorate (v) crystals in the laboratory.

(c) Explain why chlorine is more soluble in dilute sodium hydroxide than in water.

(d) State the differences between the chemistry of fluorine and the rest of the elements of group (VII) of the periodic table.

**3.** Explain the following observations

(a) Iodine is much more soluble in potassium iodide than in water.

(b) Hydrogen fluoride has a higher boiling point and is a weaker acid than hydrogen chloride.

(c) The elements of group II of the periodic table are harder and have higher melting points than group I elements.

(d) Beryllium is in group II of the periodic table but its properties resemble those of aluminium which is in group III of the periodic table.

(e) The melting point of aluminium chloride is $180^0$C whereas that of aluminium oxide is $2045^o$C.

(f) Carbon dioxide is a gas at room temperature whereas silicon dioxide is a solid with a very high melting point.

(g) When dilute hydrochloric acid is added to lead II ethanoate solution, a white ppt is formed. The ppt is soluble in excess concentrated hydrochloric acid.

(h) Silicon tetrachloride is rapidly hydrolyzed by water, but carbon tetrachloride is not.

(i) The melting point of sodium chloride is 800$^{o}$C but that of aluminium chloride is 180$^{o}$C.

(j) The pH of a solution of magnesium chloride is less than 7.

(k) The tendency of group II metal ions to form complexes decreases in the order Be $>$ $Mg > Ca > Sr > Ba.$

(l) When sodium carbonate solution was added to a solution of aluminium chloride, a white ppt was formed and a colourless gas is evolved.

(m) When sodium hydroxide solution is added drop-wise until in excess to potassium chromium (III) sulphate solution, a green precipitate is formed that dissolves to form a green solution. On addition of hydrogen peroxide, the solution turns to yellow.

(n) When concentrated hydrochloric acid is added to a solution of copper II sulphate, the blue solution changed to yellow and on addition of water, the solution changed to blue.

(o) Although zinc belongs to the d-block, it is not a typical transition element.

(p) When solid lead IV chloride is added to water, white fumes are observed and a brown solid is formed.

(q) The polarizing power of group II elements are much higher than those of group I elements.

**4.** Carbon, silicon, tin and Lead are elements in group IV of the periodic table.

(a) State

i) The common oxidation states shown by elements in group IV of the periodic table.

*ii)* How the stability of the oxidation states of the group IV elements vary down the group. *(Illustrate your answer using the chlorides of carbon and Lead)*

(b) Give a reason for your answer in a)(ii)

(c) Discuss the reactions of the chlorides of each element with water.

(d) (i) State four properties in which carbon differs from the rest of the members of the group IV of the periodic table.

(ii) Give reasons why carbon differs from the rest of the members of group IV elements.

(e) A sample of lead IV oxide was treated with warm concentrated hydrochloric acid.

(i) State what was observed

(ii) Write an equation for the reaction.

**5.** Discuss the reactivity of group IV elements of the periodic table with

(a) Water

(b) Dilute acids

(c) Concentrated acids

**6.** A is a white compound of Lead. On heating, it gives a yellow solid B and a gas that turns limewater milky. When B is heated in air for 7 hours, at 470$^{o}$C, it is converted into a red powder C, which contains 90.66% Lead, and 9.34% oxygen by mass

(a) (i) Identify substances A and B.

(ii) Determine the empirical formula of C (Pb =207, O=16)

(b) C reacts with warm dilute nitric acid to give a colourless solution D and a brown solid E. Identify the colourless solution D and the brown solid E.

(c) Concentrated hydrochloric acid was added to solid E and the mixture warmed

(i) State what was observed

(ii) Write an equation for the reaction that took place

(d) Potassium iodide was added to the Solution D. State what was observed and writes the ionic equation for the reaction that took place.

**7.** (a)With reference to transition metals, explain what is meant by the following:

(i) Complex ion formation

(ii) Catalytic activity

(iii) Coloured ion formation

(b) Hydrated chromium (III) chloride, $CrCl_3.6H_2O$ exists as three structural isomers.

i) Write down the structural formulae of the isomers

ii) Describe a test that can be used to distinguish between the isomers in b)(i) above.

**8.** (a)Describe the difference between a d-block element and a transition element.

(b) Explain why scandium and Zinc are not considered to be transition element.

(c) Discuss the similarities and differences in the chemistry of zinc and magnesium. (Your answer should include reactions with water, acids and sodium hydroxide)

9. State what would be observed and write the equation for the reaction that takes place when

a) Copper is added to a solution of concentrated nitric acid.

b) Potassium iodide is added to acidified solution of hydrogen peroxide.

c) Hydrogen sulphide is passed through acidified potassium dichromate (VI) solution.

d) Aqueous iron (II) sulphate is added to acidified potassium manganate VII solution.

10. (a)State the common oxidation states of chromium and Lead

(b) Discuss the chemistry of chromium and Lead showing:

(i) Similarities

(ii) Differences

*(Your answer should include reactions with water, acids and Alkalis)*

11. (a)Outline the reactions that take place in the blast furnace during the extraction of Iron from spathic iron ore, $FeCO_3$

(b) Briefly describe how iron reacts with the following: (Your answers should include equations)

(i) Water

(ii) Chlorine

(iii) Sulphuric acid

12. (a)Describe how

i) Impure copper can be obtained from copper pyrites. (Your answer should include the relevant equations)

ii) The percentage of copper can be determined in the laboratory by titrimetric method.

(b) Outline how an impure sample can be purified.

**13.** (a)Explain the following processes as used in the extraction of metals

i) Floatation

ii) Roasting

iii) Smelting

(b) Describe briefly how the percentage purity of an iron ore can be determined in the laboratory.

**14.** (a)Describe how nitric acid

i) Is manufactured

ii) Can react with copper

(Your answer should include equations for reactions)

(b) State why nitric acid is not used to acidify potassium manganate VII solutions in volumetric analysis.

(c) Concentrated nitric acid is 70% (w/w) and has a density of $1.42gcm^{-3}$

i) Determine the molarity of the concentrated acid

ii) 12.68 $cm^3$ of the acid was dissolved in water and the solution made up to 250 $cm^3$. Determine the molarity of the diluted acid.

**15.** (a)Describe how sulphuric acid can be manufactured. Explain the reasons for the chemical and physical conditions used in each stage of the process.

(b) Give two large scale uses of sulphuric acid.

(c) Describe how sulphuric acid reacts with the following and in each case state the conditions for the reaction and write an equation for the reaction.

i) Potassium bromide

ii) Hydrogen sulphide.

**16.** Ammonia is obtained on a large scale from nitrogen and hydrogen by the Haber process.

(a) (i) How is nitrogen obtained for the process

(ii) State the conditions used in the Haber process to obtain ammonia.

(iv) Describe how ammonia is obtained and explain the reasons for choosing the conditions named above.

(b) State three large scale uses of ammonia.

(c) State what would be observed and write equations for the reactions that would take place if aqueous ammonia was added drop wise until in excess to solutions containing the following cations

i) Zinc ions

ii) Aluminium ions

**17.** (a)(i) What is meant by the term ore.

(ii) Write the name and formula of one ore of zinc

(iii) Briefly describe how pure zinc can be obtained from the ore above.

(b) Describe how zinc reacts with the following

i) Water

ii) Dilute acids

iii) Sodium hydroxide

*(Your answers should include equations)*

**18.** (a)"The extraction of all metals from their ores is a reduction process". Discuss this statement with respect to the extraction of Sodium, aluminium and iron.

(b) Rusting is another redox reaction. Explain the process of rusting in terms of oxidation and reduction.

(c) Explain how zinc protects iron from rusting.

(d) Outline the chemistry involved in the process of converting crude iron into carbon steel.