

**Quiz Topic:** Chemical Analysis

**Possible Score:** 35 Marks

**Level of Difficulty:** Medium High

1. A student was given an aqueous solution to analyse. It contains copper(II) chloride and aluminium nitrate.

(a) Describe how he could detect the presence of chloride ions in the above solution. (2)

(b) Name the precipitate(s) formed when excess aqueous ammonia is added to the above solution. (1)

2. W is an alkali and X, a salt. When the two solutions were mixed together, a reddish-brown precipitate, Y, was obtained.

When a salt Z was added to solution W and heated, a pungent gas which turned moist red litmus blue was evolved.

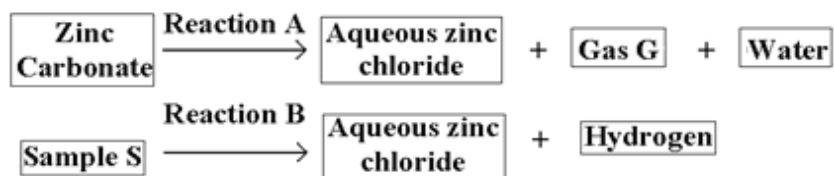
Suggest possible identities of W, X, Y and Z. (4)

3. Give the name and formula of the ion present in each of the below solutions X, Y and Z:

(a) Solution X gives a white precipitate when dilute hydrochloric acid and aqueous barium chloride are added to it. (2)

(b) An alkaline gas is given off when sodium hydroxide solution is added to the colourless solution Z and the mixture heated. (2)

4. A similar reagent is added to zinc carbonate and sample S to initiate both reactions A and B.



(a)(i) Name the reagent(s) required for Reaction A. (1)

(ii) Write down the chemical equation (including state symbols) for reaction A. (1)

(b)(i) Give a possible identity of Sample S. (1)

(ii) Based on your answer in (b)(i), write a chemical equation with state symbols for Reaction B. (1)

5(a) Complete the following table.

(4)

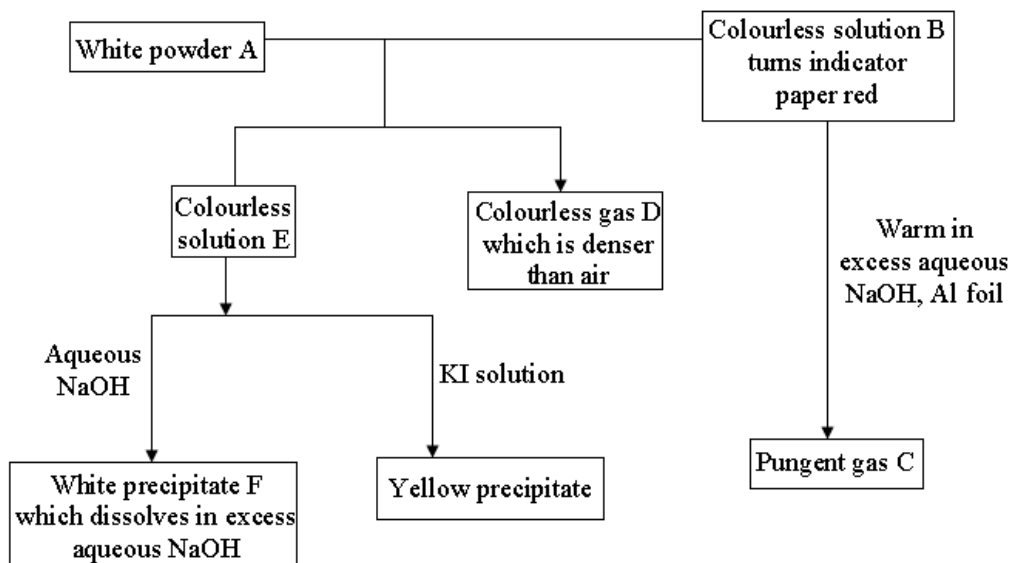
	Formula of compound	Colour of aqueous solution	Reaction of aqueous solution with aqueous		
			Ammonia		Acidified silver nitrate
			A few drops	In excess	
(i)			White precipitate	Precipitate dissolves, colourless solution formed	White precipitate
(ii)	$\text{Fe}(\text{NO}_3)_2$				
(iii)			No precipitate	No precipitate	Yellow precipitate

(b) Write a chemical equation for the reaction between acidified silver nitrate and the compound in (a)(i). (1)

(c) Write an ionic equation, with state symbols, for the reaction between a few drops of aqueous ammonia and the compound in (a)(ii). (2)

(d) Some hydrogen peroxide solution was added to the product formed between excess aqueous ammonia and the compound in (a)(ii). What would be observed and why? (2)

6.



(a) Identify A, B, C, D, E and F. (6)

(b) Write an ionic equation, with state symbols, for the formation of the yellow precipitate. (2)

(c) Describe a test for the pungent gas, R. (1)

(d) Pungent gas, R, dissolves in water to form a solution.

Describe the observations when a few drops of copper(II) sulphate solution is added to this solution. (2)

**Answers:**

1(a) - Add dilute nitric acid followed by aqueous silver nitrate.  
- A white precipitate will be seen in the presence of chloride ions.

OR:

- Add dilute nitric acid followed by aqueous lead(II) nitrate.  
- A yellow precipitate will be seen in the presence of chloride ions.

(b) Aluminium hydroxide

2. W: Sodium hydroxide

X: Iron(III) chloride [or any other iron(III) salts such as iron(III) sulphate]

Y: Iron(III) hydroxide

Z: Ammonium chloride [or any other ammonium salts such as ammonium nitrate]

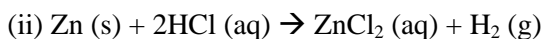
3(a) Sulphate.  $\text{SO}_4^{2-}$

(b) Ammonium.  $\text{NH}_4^+$

4(a)(i) Hydrochloric acid.

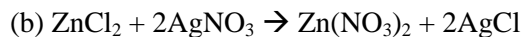


(b)(i) Zinc



5(a)

	Formula of compound	Colour of aqueous solution	Reaction of aqueous solution with aqueous		
			Ammonia		Acidified silver nitrate
			A few drops	In excess	
(i)	$\text{ZnCl}_2$	Colourless	White precipitate	Precipitate dissolves, colourless solution formed	White precipitate
(ii)	$\text{Fe(NO}_3)_2$	Pale green	Dirty green precipitate	Precipitate remains insoluble	No precipitate
(iii)	NaI / KI / $\text{NH}_4\text{I}$	Colourless	No precipitate	No precipitate	Yellow precipitate



(d) - The dirty green precipitate will turn into a reddish brown precipitate.  
- This is because  $\text{Fe}^{2+}$  is oxidised to  $\text{Fe}^{3+}$ .

6(a) A: Lead(II) carbonate

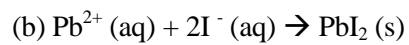
B: Dilute nitric acid

C: Ammonia gas

D: Carbon dioxide

E: Lead(II) nitrate solution

F: Lead(II) hydroxide



(c) Two pieces of damp red and blue litmus papers are placed at the mouth of the test tube. If the gas is ammonia, the damp red litmus paper will turn blue. A pungent smell will also be detected.

(d) - Blue precipitate formed.

- Blue precipitate dissolves in excess aqueous ammonia to form a dark blue solution.