Beatty Secondary School
Science Department (Chemistry Unit)
Chemistry 6092

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Name: _____ ( ) Date: _____

Class: 4E___

Practical 10: QA2 – modified 6020 June 2015

You are provided with a mixture of two solids, **J** and **K**, which are both salts. **J** is water soluble and **K** is insoluble.

Procedure

Carry out the following tests on the mixture, recording all your observations in the table. Include in your observations the identities of any gas produced in the reaction.

Add 10 cm^3 of distilled water to the mixture. Stopper the boiling tube and shake the mixture for a minute. Filter the mixture and keep the residue for tests later.

Tests on the filtrate:

Divide the solution intro three equal portions in three test tubes.

test no.	test	observations
1	To the first portion of the solution, add aqueous sodium hydroxide until no further change.	**No visible reaction / solution remains colourless. [1]** [1]
2	To the second portion of the solution, add a few drops of dilute nitric acid and about 1 cm^3 of aqueous silver nitrate solution.	**Yellow ppt formed. [1]** [1]
3	To the third portion of the solution, add about 1 cm^3 of hydrogen peroxide solution. Add a few drops of starch to the mixture. Test the gas given off.	**Effervescence is observed [1]** **Gas produced relights a glowing splint [1].** **Gas is oxygen [1]** **Test tube feels warm** **Solution turns yellow / brown [1]** **Blue-black solution is formed [1]** [5]

Tests on the residue:

test no.	test	observations
4	Use a spatula to transfer some of the residue into a test-tube. **(a)** Add about 3 cm^3 of dilute hydrochloric acid to the test-tube. Test the gas given off. **(b)** To the solution add about 1 cm^3 of dilute sulfuric acid.	**residue is white solid.** **White solid dissolves to form a colourless solution [1]** **Effervescence is observed. Gas produced forms a white ppt in limewater [1].** **Gas is carbon dioxide [1]** **White ppt formed [1].** [4]

Questions:

(a)(i) Suggest an identity of solid **J**.

sodium iodide / potassium iodide

(ii) Suggest an extension to the experiment to distinguish the identity of the cation present in solid **J**. State the expected observation. [*You need not carry out the experiment*].

Conduct a flame test on the solid J [1]. If the splint burns with a lilac flame, K^+ ions is present. If the splint burns with a yellow-orange flame, Na^+ ions is present.

(b) Identify the anion of solid **K**.

carbonate ion / CO_3^{2-}

(c) Explain the role of hydrogen peroxide **and** the observations seen in Test 3.

Hydrogen peroxide acts as an oxidising agent which oxidises iodide ions to form aqueous iodine which gives the yellow/brown colouration. [1]

Starch will turn blue-black in the presence of iodine molecules. [1]

Oxygen is formed when hydrogen peroxide is reduced. Hence effervescence is seen and oxygen will relight a glowing splint. [1]

(d) An insoluble powder **X** is said to be a catalyst for the decomposition of aqueous hydrogen peroxide.

$$2H_2O_2(aq) \rightarrow 2H_2O(l) + O_2(g)$$

A catalyst is a substance which increases the rate of a reaction but is not used up in the reaction.

Given a sample of **X** and aqueous hydrogen peroxide, describe how you would show that both of the following statements are true.

1 **X** increases the rate of decomposition of aqueous hydrogen peroxide.

2 **X** is not used up in the decomposition of aqueous hydrogen peroxide.

You can assume all the apparatus normally found in a school laboratory is available.

Suggested Answers:

1. **Measure 50 cm^3 of 1 mol/dm^3 of aqueous hydrogen peroxide using a measuring cylinder and pour it into the conical flask.**
2. **Connect the gas syringe to the delivery tube as shown in the diagram. Oxygen gas given off will be collected in the gas syringe.**
3. **Record the time taken, t_1 to first collect 20 cm^3 of oxygen gas.**
4. **Repeat Steps 1 to 3, but measure 0.2 g of solid X using an electronic balance and place it into the conical flask containing aqueous hydrogen peroxide. Replace the stopper immediately.**
5. **Record the time taken, t_2 to first collect 20 cm^3 of oxygen gas in the reaction containing X.**
6. **Compare the time taken, t_1 and t_2. If t_2 is lesser than t_1, X increases the rate of decomposition of aqueous hydrogen peroxide.**
7. **Filter the reaction mixture to obtain the residue.**
8. **Wash the residue with cold deionised water to remove any soluble impurities. Dry the residue with sheets of filter paper.**
9. **Measure the mass of the dry residue obtained at the end of the reaction. If the mass remains the same, X is not used up in the decomposition of aqueous hydrogen peroxide.**