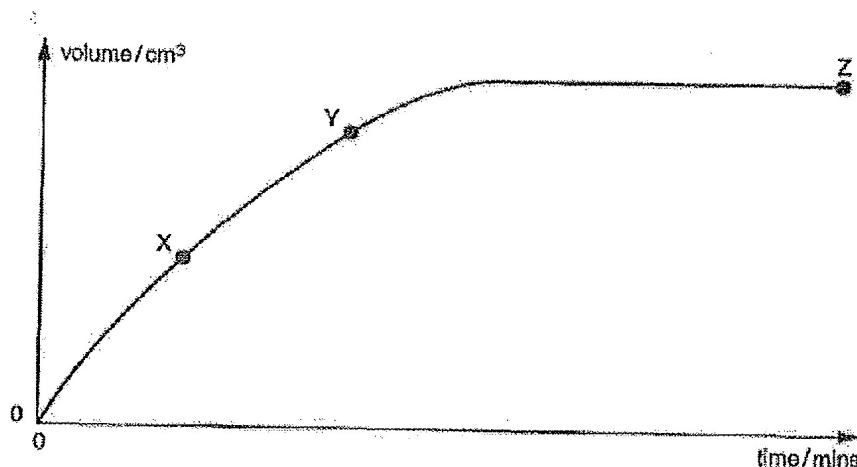


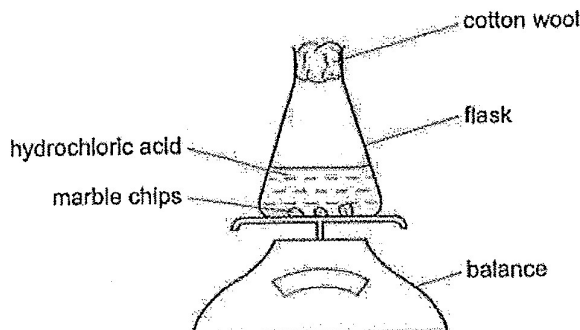
Name: _____ () Class: _____ Date _____

1. The graph shows the total volume of carbon dioxide evolved, plotted against time, when excess calcium carbonate reacts with 20 cm^3 of hydrochloric acid containing 2 mol dm^{-3} .



- (a) Give a balanced chemical equation for the reaction above.
- _____
- (b) Indicate clearly on the graph above the time taken for the reaction to end (T_E)
- (c) Indicate clearly on the graph how the rate of the reaction can be obtained at pt X
- (d) Read the facts provided and answer the following questions.
- (i) What is the name of the product measured? _____
- (ii) How is the product in (di) collected and measured for the rate of reaction?
- _____
- (iii) What are the reactants present? _____ and _____
- (iv) Which reactant will be used up first? Explain.
- _____
- (e) If the experiment was repeated but this time the concentration of the acid was changed to 0.5 mol dm^{-3} , sketch on the graph above what you would expect and label the graph as Rxn II
- (f) Explain in terms of the collision theory how concentration has affected the rate of reaction.

2. Two experiments are carried out using the apparatus below.



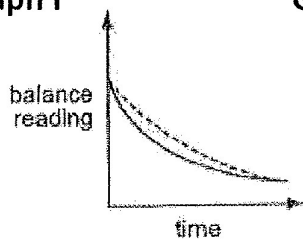
In experiment 1, dilute acid is used

In experiment 2, more concentrated hydrochloric acid is used.

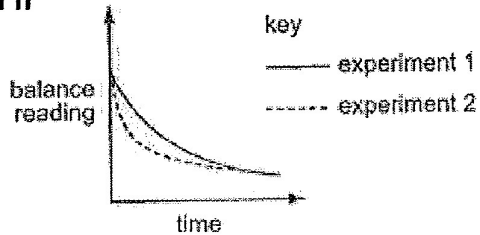
All other conditions are the same and in both experiments all the marble chips completely react.

- (a) What is the chemical formula of marble chip? _____
- (b) What is the observation when marble chip allowed to react with hydrochloric acid?
- _____
- _____
- (c) Give a balanced chemical equation of the above reaction.
- _____
- (d) State the difference in terms of ions between the two acids in experiment 1 and 2.
- _____
- (e) Which diagram shows the correct results obtained for the above experiments?

Graph I

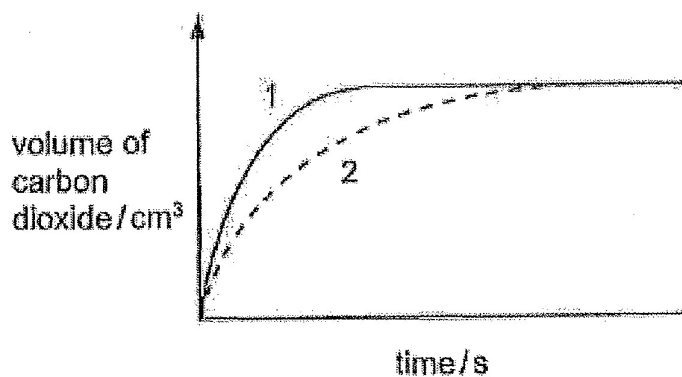


Graph II



Explain your answer in (e)

3. Curve 2 shows the volume of carbon dioxide given off when 5 g of calcium carbonate lumps react completely with an excess of 1.0 mol/dm³ hydrochloric acid at 40°C

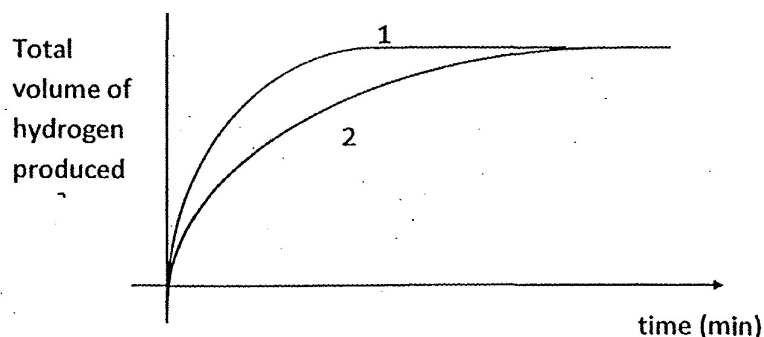


State three different changes that can produce curve 1.

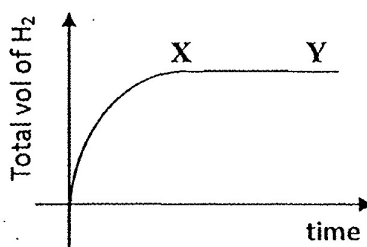
- (a) _____
- (b) _____
- (c) _____

4. Indicate at the side of each statement whether they are True or False

- (a) Curve 1 was obtained when 1 g of granulated zinc reacted with an excess of hydrochloric acid at 30°C.



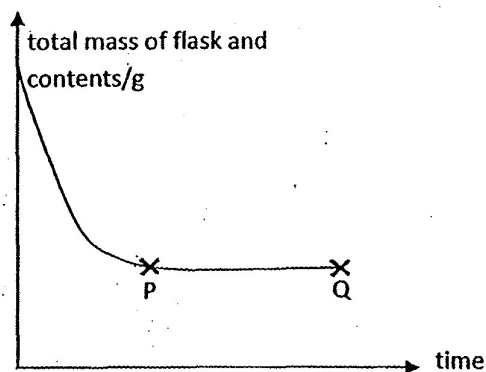
- Diluting the acid with water will result in curve 2 T / F
 - Using finely powdered zinc will result in curve 2 T / F
 - Warming the acid to 40°C will result in curve 2 T / F
 - Using half as much zinc will result in curve 2 T / F
- (b) The graph shows how the total volume of hydrogen produced by reaction between hydrochloric acid and an excess of magnesium varied with time.



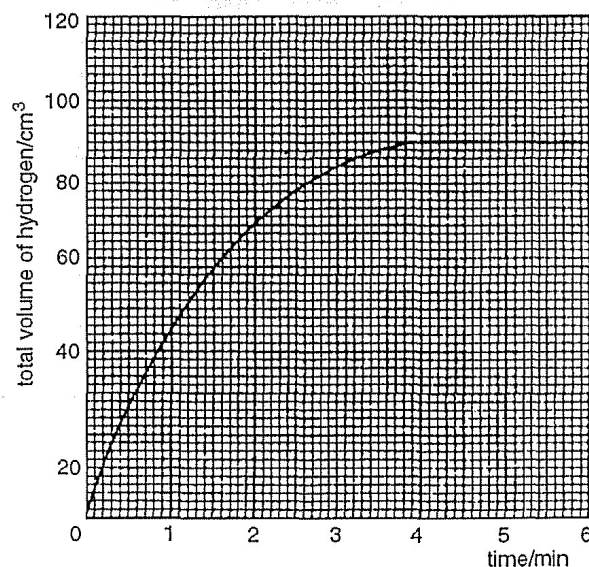
- All the magnesium has reacted at the section XY T/F
 - No more hydrogen is being produced at the section XY T/F
 - The concentration of the acid is decreasing at the section XY T/F
 - The speed of the reaction is at a maximum at the section XY T/F
- (c) One way to study the rate of a reaction is to measure the volume of gas given off during the reaction with a gas syringe. This technique could be conveniently applied the following:

- Limestone with dilute hydrochloric acid. T/F
- Magnesium ribbon with dilute ethanoic acid. T/F
- Sodium hydroxide and hydrochloric acid. T/F
- Hydrogen peroxide in the presence of manganese(IV) oxide T/F

- (d) Magnesium metal was placed in a flask on a balance and excess dilute hydrochloric acid was added. The graph below shows how the total mass of flask and contents varies with time.



- The reaction is continuing at a constant speed at section PQ T / F
 - The speed of reaction is decreasing at a constant rate at section PQ T / F
 - No more magnesium is left in the flask at section PQ T / F
 - All of the acid has reacted at section PQ of the curve T / F
5. 0.10 g of magnesium ribbon was allowed to react at 18°C with 20 cm³ of 1 mol/dm³ hydrochloric acid at atmospheric pressure. The total volume of hydrogen collected was noted at half minute intervals and the graph below was plotted.



- (a) What time was required for half the magnesium to react?

5. Sketching of Graph

2 Important Principles:

- The Maximum Volume of Gas is dependent on the Number of moles of reactant
- The Gradient of the Curve is dependent on the Concentration of the acid.

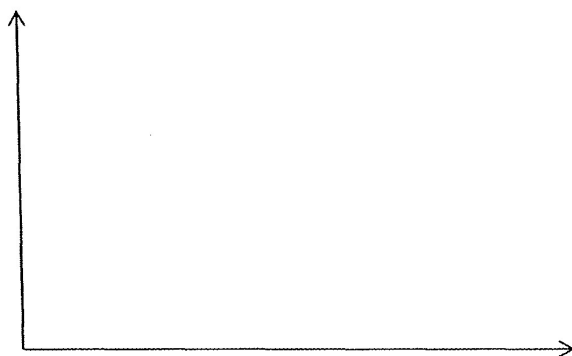
- a. An excess of marble chip reacted with 30cm^3 of 2.5 mol/dm^3 nitric acid. Sketch both graph as stated.

Sketch the following Graph

Step 1: Calculate the Mole of each

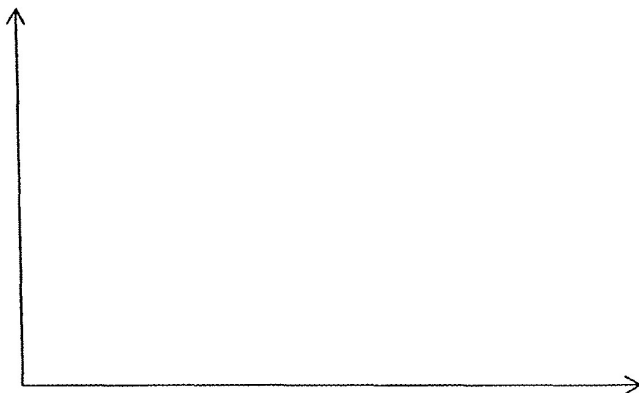
Step 2: Draw the Height of each max for Rxn 1 and 2

- (a) Rxn 1: 30cm^3 of $1.5\text{ mol/dm}^3\text{ HNO}_3$
 Rxn 2: 30cm^3 of $1.0\text{ mol/dm}^3\text{ HNO}_3$



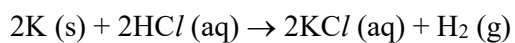
- b. An excess of marble chip reacted with 100cm^3 of 1.5 mol/dm^3 hydrochloric acid. Sketch both graph as stated.

- (b) Rxn 1: 100cm^3 of 1.5 mol/dm^3 HCl
Rxn 2: 50cm^3 of 1.0 mol/dm^3 HCl



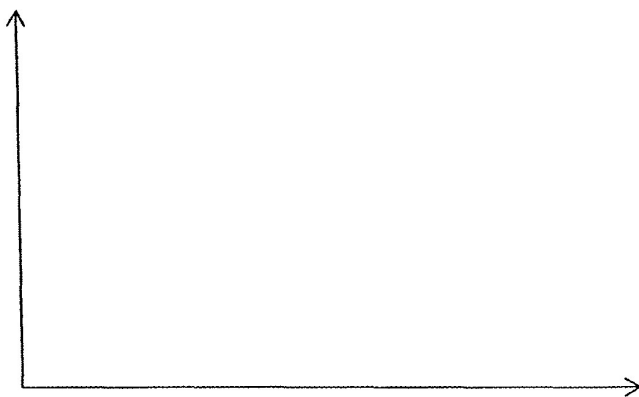
- c. Two experiments (I and II) were carried out to measure the rate of production of hydrogen from the reaction below.

Given that :



Reaction I: 100 cm^3 of 3 mol/dm^3 of HCl

Reaction II: 400 cm^3 of 1.5 mol/dm^3 of HCl



Elements of Thinking	Questions	Student's response
	Rate of Reaction Worksheet 3 SDL Qn 5c	
Question at Issue	What is the problem or Issue? - Read the questions carefully, underline the command : eg Explain/Describe/Calculate - Ask yourself what chapter is this question on.	Command: Chapter:
Information	What data, facts, evidence, observations, experiences or reasons are being used? Underline the keywords/info in the question	Key info:
Interpretation and Inferences	What conclusions may be reached? What can I infer from these info?	Inference:
Concepts	What are theories, definitions, laws, principles and models that can be used to understand the issue or problem? Think of all the definitions/concepts/formulae and CFS you know about the chapter(s)	Relevant formulae/Concepts/Definitions:
Assumptions	What is being taken for granted? Any assumption/formula for this theory to be true?	Assumption:
After applying the thinking routine, organise your facts to answer the question within context and pay close attention to using keywords. Apply CARP/criteria for success (Clarity, Accuracy, Relevance and Precision)		