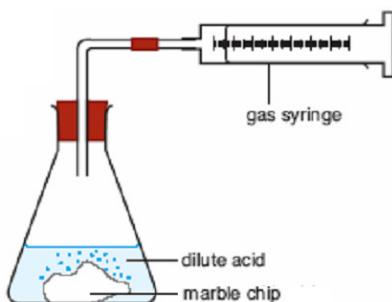


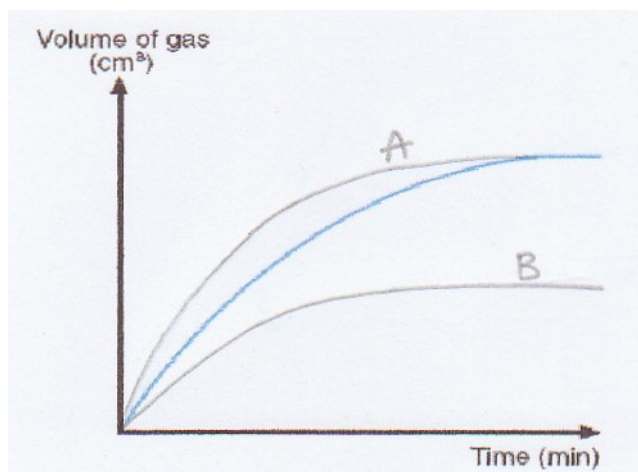
Name : _____ () Class: _____ Date : _____

1. The set-up below shows the reaction between 40cm³ of dilute nitric acid and a piece of marble chip. Note: **Excess** marble chip is used.



- (a) What is the chemical name and formula of marble? [1]
Calcium carbonate, CaCO₃
-
- (b) What is the gas produced in this reaction? **Carbon dioxide gas, CO₂** [1]
- (c) Write the chemical equation for this reaction. [2]
CaCO₃(s) + 2HNO₃(aq) → Ca(NO₃)₂(aq) + CO₂(g) + H₂O(l)
-
- (d) Name the reactants and products in this reaction. [2]
Reactants: calcium carbonate and nitric acid
Products: calcium nitrate, carbon dioxide gas and water
-
- (e) List **three** ways in which you can **measure** the speed of reaction for this reaction. [3]
The change in volume of gas produced over fixed time. (per unit time)
The change in mass of the reaction mixture as the reaction proceeds over fixed time (or per unit time)
The change in the pressure of the gas formed over fixed time. (per unit time)
-
- (f) Predict whether the speed of reaction will **increase, decrease** or **remain the same** by
- | | |
|--|-----------------|
| (1) crushing the marble into smaller pieces | increase |
| (2) decreasing the concentration of dilute nitric acid | decrease |
| (3) increasing the concentration of dilute nitric acid | increase |
| (4) increasing the temperature | increase |
| (5) decreasing the temperature | decrease |
- [5]
- (g) The following are the times taken for the reaction to be completed under different conditions. **Match** the time taken for the reaction to be completed to the respective changes made to the setup. [3]
- | | 2 mins | 3.5 mins | 4 mins |
|---|---------------|-----------------|---------------|
| (1) Set-up as above but the marble chip was crushed into smaller pieces | | 3.5 mins | |
| (2) Set-up as above, carried out at room temperature | | | 4 mins |
| (3) Set-up as above but there is an increase in 10°C in temperature and the marble chip was crushed into smaller pieces | 2 mins | | |

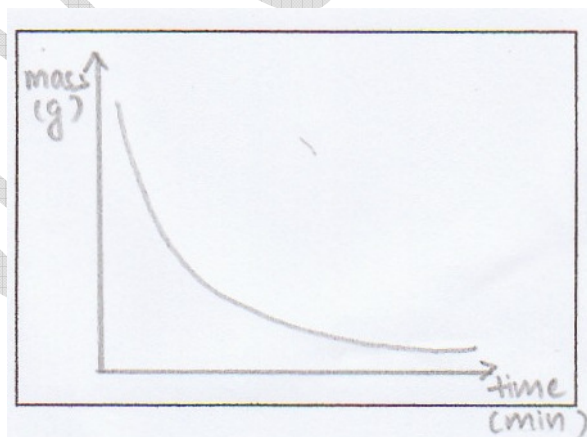
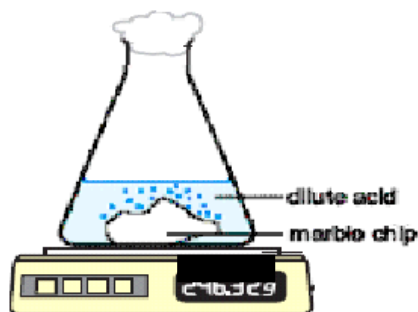
- (h) The diagram below shows how the change in the volume of gas collected in the above reaction changes with time.



On the same diagram, draw the curve you would expect if the experiment were repeated at

- (1) the same temperature but the marble was crushed into smaller pieces. Label this graph as A. [1]
- (2) the same temperature with 40cm³ of dilute nitric acid, half the concentration of that of the original dilute nitric acid used. Label this curve as B. [1]

- (i) (1) Sketch below a diagram, showing how the **mass** of the reaction mixture changes with time. [2]



- (2) Explain why there is a change in the mass of the reaction mixture over time. [1]

Carbon dioxide as one of the products produced, escapes into the atmosphere, causing a decrease in mass.

- (3) Explain why such a method **cannot** be used to measure the rate of reaction between dilute acid and magnesium ribbon. [2]

Relative molecular mass of hydrogen gas is very small, hence the mass of hydrogen gas produced between dilute acid and magnesium ribbon is too insignificant for accurate measurement of mass loss due to hydrogen gas produced.

~ The End ~