

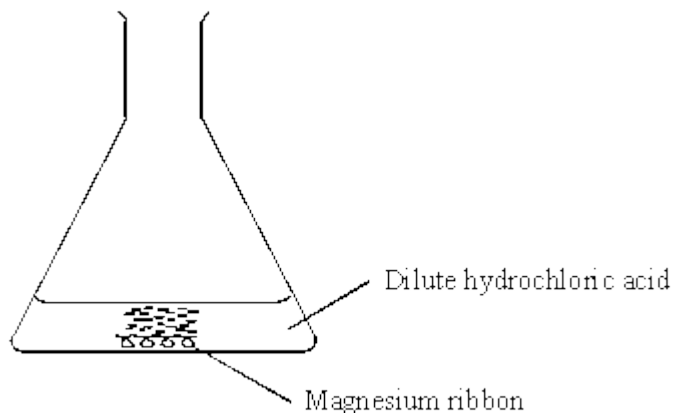
1.

In this question you will need to use the following information:

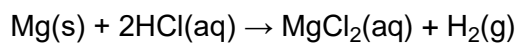
Relative atomic masses: H 1; O 16; Mg 24.

The volume of one mole of any gas is 24 dm^3 at room temperature and atmospheric pressure.

The diagram shows a chemical reaction taking place in a conical flask.



The balanced equation for this reaction is:



(a) Write a balanced ionic equation for this reaction.

(2)

(b) Calculate the mass of magnesium required to produce 0.50 g of hydrogen.

Show clearly how you work out your final answer and give the unit.

Mass = _____

(2)

(c) (i) Draw a diagram to show how the electrons are arranged in a hydrogen molecule.

(1)

(ii) What is the name of the type of chemical bond between the hydrogen atoms in a hydrogen molecule?

(1)

(d) The chemical formula for hydrogen peroxide is H_2O_2 .

Calculate, to the nearest whole number, the percentage, by mass, of hydrogen in hydrogen peroxide. Show clearly how you work out your answer.

Percentage = _____ %

(2)

(Total 8 marks)

2.

Crude oil is a resource found in rocks.

Most of the compounds in crude oil are hydrocarbons.

(a) Complete the sentence.

Crude oil is formed by the decomposition of _____.

(1)

(b) Alkanes are hydrocarbons.

Give the name of the alkane molecule that has three carbon atoms.

(1)

(e) C_2H_4 is an alkene.

What is the test for alkenes?

Give the result of the test if an alkene is present.

Test _____

Result _____

(2)

(Total 11 marks)

3.

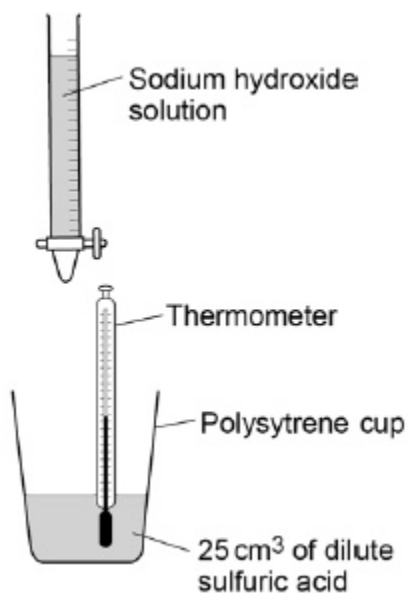
Some students investigated the change in temperature as sodium hydroxide solution is added to dilute sulfuric acid.

This is the method used.

1. Put 25 cm^3 of dilute sulfuric acid into a polystyrene cup.
2. Measure the initial temperature of the dilute sulfuric acid.
3. Add 4 cm^3 of sodium hydroxide solution to the dilute sulfuric acid.
4. Stir the mixture.
5. Measure the highest temperature of the mixture.
6. Repeat steps 3–5 until 40 cm^3 of sodium hydroxide solution have been added.

Figure 1 shows the apparatus the student used.

Figure 1



(a) The volume of sodium hydroxide solution is a variable.

Which **two** words can be used to describe this type of variable?

Tick **two** boxes.

Categoric

Continuous

Control

Dependent

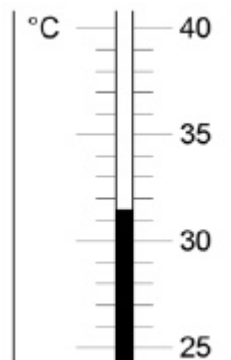
Independent

(2)

(b) The dilute sulfuric acid has an initial temperature of 24.0 °C

Figure 2 shows the highest temperature.

Figure 2



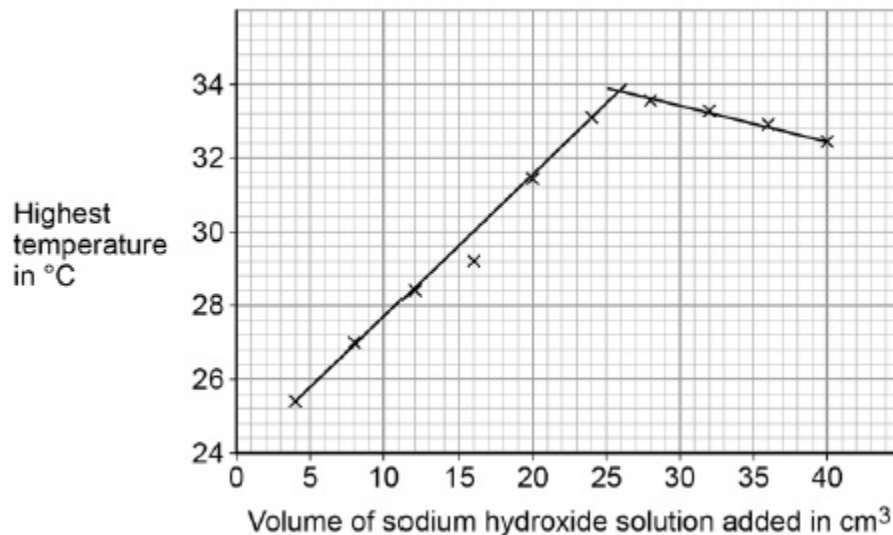
Calculate the change in temperature.

Temperature = _____ °C

(2)

Figure 3 shows the students' results.

Figure 3



- (c) Determine the volume of sodium hydroxide solution that gives the highest temperature change.

Use **Figure 3** to help you answer this question.

Volume = _____ cm³

(1)

- (d) In **Figure 3** the temperature when 16 cm³ of sodium hydroxide solution is added is anomalous.

Suggest **one** error that could have been made in the method which would cause this anomalous result.

(1)

(e) The sodium hydroxide solution in this investigation contains 80 grams per dm^3

The students use 40 cm^3 of sodium hydroxide solution.

Calculate the mass of sodium hydroxide in 40 cm^3

Mass = _____ g

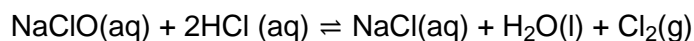
(3)

(Total 9 marks)

4.

Bleach is a solution of sodium hypochlorite (NaClO).

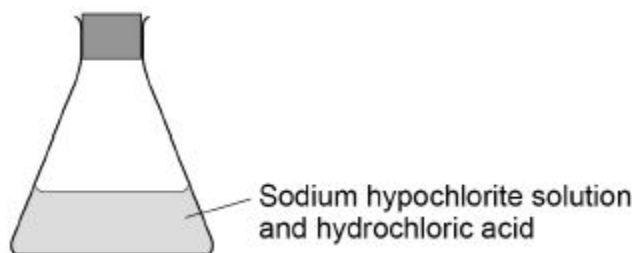
Chlorine gas is produced when bleach reacts with hydrochloric acid.



(a) Give the test and result for chlorine gas.

(2)

The diagram below shows a sealed flask of sodium hypochlorite and hydrochloric acid at equilibrium.



(b) Explain why equilibrium is reached in this reaction.

(2)

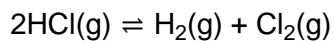
(c) The stopper in the diagram above is removed and hydrochloric acid is added.

The stopper is replaced.

Explain what happens to the equilibrium.

(4)

Chlorine gas is also produced when hydrogen chloride decomposes.



The forward reaction is endothermic.

- (d) Predict the effect of increasing the temperature on the amount of chlorine gas produced at equilibrium.

Explain your answer using Le Chatelier's Principle.

(2)

- (e) Explain the effect of increasing the pressure on this equilibrium.

(2)

(Total 12 marks)