Name _____ **Class** _____ **Date** _____

1 **Figure 1** shows four hazard symbols (**A**, **B**, **C** and **D**).

A

B

C

D

Figure 1

a Which hazard symbol in **Figure 1** shows that a substance is harmful to the environment?

Tick **one** box.

☐ **A**

☐ **B**

☐ **C**

☐ **D**

(1)

b Explain why hazard symbol **D** would be found on a bottle of ethanol.

_____

_____

(2)

(Total for Question 1 = 3 marks)

2 Litmus, methyl orange and universal indicator are indicators.

Indicators change colour depending on whether they are in acidic, neutral or alkaline solutions.

Complete **Figure 2** to show the missing pH value and indicator colours.

		Indicator colour		
Solution	**pH of solution**	**Litmus**	**Methyl orange**	**Universal indicator**
Hydrochloric acid	_____	red	_____	red
Sodium hydroxide	12	_____	yellow	_____

Figure 2

(4)

(Total for Question 2 = 4 marks)

3 Dilute hydrochloric acid reacts with potassium hydroxide solution.

a Name this type of reaction.

_____

(1)

b Name the **two** products that form in the reaction of dilute hydrochloric acid with potassium hydroxide solution.

Product 1: _____

Product 2: _____

(2)

c Which of the following is the correct formula for hydrochloric acid?

Tick **one** box.

☐ **A** H_2Cl

☐ **B** HCl

☐ **C** HOCl

☐ **D** HCl_2

(1)

(Total for Question 3 = 4 marks)

4 Some salts are soluble in water and some salts are insoluble in water.

Figure 3 shows the rules for the solubility of some salts.

Soluble in water	Insoluble in water
most sulfates	lead sulfate, barium sulfate, calcium sulfate
sodium carbonate, potassium carbonate	most carbonates

Figure 3

a Name, using the rules shown in **Figure 3**, **two** solutions that will form magnesium carbonate when mixed together.

Solution 1: _____

Solution 2: _____

(2)

b Insoluble magnesium carbonate forms when two suitable solutions are mixed together.

Describe how to obtain a dry sample of magnesium carbonate from the reaction mixture.

_____

_____

_____

_____

(2)

(Total for Question 4 = 4 marks)

5 **a** Which of the following substances could be made using nitric acid?

Tick **one** box.

☐ **A** potassium chloride

☐ **B** potassium nitrate

☐ **C** potassium phosphate

☐ **D** potassium sulfate

(1)

b Which of the following substances is a **base**?

Tick **one** box.

☐ **A** calcium oxide

☐ **B** calcium phosphate

☐ **C** lithium sulfate

☐ **D** sodium chloride

(1)

(Total for Question 5 = 2 marks)

6 A student investigates the reaction between calcium oxide powder and dilute hydrochloric acid.

Calcium oxide powder was added one spatula at a time to 25 cm^3 of dilute hydrochloric acid.

The student measured the pH of the reaction mixture after each addition of calcium oxide powder.

a Name a suitable piece of apparatus to measure 25 cm^3 of dilute acid accurately.

_____

(1)

b Complete the balanced equation for this reaction.

Include state symbols for each reactant.

$$CaO(\_\_\_\_) + \_\_\_\_HCl(\_\_\_\_) \rightarrow CaCl_2(aq) + H_2O(l)$$

(2)

c **Figure 4** shows the results of the experiment.

Number of spatulas of calcium oxide added	pH of reaction mixture
0	0.3
2	2.1
4	3.5
6	5.0
8	6.3
10	7.7

Figure 4

Explain the results in **Figure 4** in terms of what happened to the reaction mixture as more calcium oxide was added.

_____

_____

_____

(3)

(Total for Question 6 = 6 marks)

7 **Figure 5** shows part of a method for making dry copper sulfate crystals.

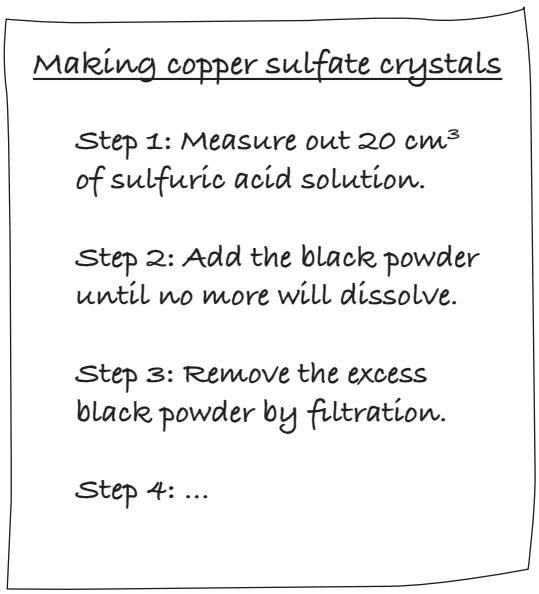

Figure 5

a Name **one** suitable black oxide to use in **Step 2**.

_____

(1)

b Give a reason why black oxide is added until it is in excess in **Step 2**.

_____

_____

(1)

c The instructions for **Step 4** are missing.

Give suitable instructions for **Step 4** to make dry copper sulfate crystals.

_____

_____

_____

(2)

d Copper carbonate is an insoluble grey-green powder that can be used to make copper sulfate.

Write a word equation for the reaction between copper carbonate and sulfuric acid.

_____

(2)

(Total for Question 7 = 6 marks)

8 Sodium sulfate is a soluble salt.

Describe how to make a sample of pure, dry, large sodium sulfate crystals, including:

- the essential steps you will take
- the substances you will use
- the apparatus you will need.

You may include labelled diagrams as part of your answer.

(Total for Question 8 = 6 marks)

TOTAL FOR PAPER = 35 MARKS