Acids, Bases and Salts

Question Paper 2

Level	IGCSE
Subject	Chemistry
Exam Board	CIE
Topic	Acids, Bases and Salts
Sub-Topic	
Paper Type	Alternative to Practical
Booklet	Question Paper 2

Time Allowed: **57 minutes**

Score: **/47**

Percentage: **/100**

1 Two metal salt solutions, **X** and **Y**, were analysed. Solution **X** was iron(II) chloride.
The tests on **X** and **Y**, and some of the observations, are given in the following tables.
Complete the observations in the table.

tests	observations
tests on solution **X** **(a)** Appearance of solution **X**.	..... [1]
The solution was divided into four equal portions. **(b)** Dilute nitric acid and aqueous silver nitrate were added to the first portion of solution.	..... [1]
(c) Aqueous sodium hydroxide was added to the second portion of solution and the mixture shaken.	..... [2]
(d) Excess aqueous ammonia was added to the third portion of solution.	..... [1]
(e) An oxidising agent was added to the fourth portion of the solution. Aqueous sodium hydroxide was then added to the mixture.	..... [2]

tests	observations
tests on solution **Y** The solution was divided into three equal portions. **(f)** Dilute hydrochloric acid was added to the first portion of the solution.	white precipitate formed
(g) Aqueous sodium hydroxide was added to the second portion of the solution and the mixture shaken. Aluminium powder was added to the mixture and it was warmed gently. The gas given off was tested with damp red litmus paper.	effervescence pungent gas evolved, litmus paper turned blue
(h) Aqueous potassium iodide was added to the third portion of the solution.	pale yellow precipitate

(i) What conclusions can you draw about solution **Y**?

.....

..... [2]

[Total: 9]

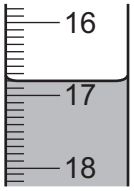
2 A student investigated the reaction between dilute hydrochloric acid and an aqueous alkaline solution **R**, containing two different substances, **S** and **T**.

Three experiments were carried out.

Experiment 1

Using a measuring cylinder, 25 cm^3 of solution **R** was poured into a conical flask and five drops of phenolphthalein were added to the flask.
A burette was filled with hydrochloric acid up to the 0.0 cm^3 mark. Hydrochloric acid was added to the solution **R** and the flask shaken. Addition of hydrochloric acid was continued until the colour just disappeared.
The mixture in the flask was kept for Experiment 2.

(a) Use the burette diagram to record the final volume in the table of results and complete the table.



final burette reading

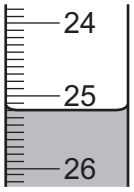
	burette readings
final volume / cm^3	
initial volume / cm^3	
difference / cm^3	

[3]

Experiment 2

Five drops of methyl orange indicator were added to the mixture in the flask from Experiment 1. The mixture turned yellow. The initial volume reading of the burette was the same as the final reading in Experiment 1. Hydrochloric acid was added from the burette to the mixture in the flask and the mixture shaken.
The volume of hydrochloric acid added was recorded when the indicator just changed colour.

(b) Use the burette diagram to record the final volume in the table of results and complete the table.



final burette reading

	burette readings
final volume / cm^3	
initial volume / cm^3	
difference / cm^3	

[3]

(c) *Experiment 3*

Hydrochloric acid was added to about 5 cm^3 of solution **R** in a test-tube.

Rapid effervescence was observed.

(d) When phenolphthalein indicator was used in Experiment 1 the colour changed

from pink to ..... [1]

(e) In a similar experiment, methyl orange indicator was used in Experiment 1 followed by phenolphthalein in Experiment 2.
Suggest why this experiment would not work.

.....

..... [1]

(f) What conclusion can you draw from Experiment 3?

..... [1]

(g) The volume of hydrochloric acid added in Experiment 1 reacted with all of substance **S** and half of substance **T**.
The volume of hydrochloric acid in Experiment 2 reacted with half of substance **T**.

(i) Work out the volume of hydrochloric acid which reacted with substance **S**.

..... [2]

(ii) Work out the volume of hydrochloric acid which reacted with substance **T**.

..... [1]

(iii) Compare the volumes of hydrochloric acid which reacted with substances **S** and **T**.

..... [1]

(h) The experiments were repeated using 100 cm^3 of solution **R**.
Predict the volume of hydrochloric acid which would be added in Experiments 1 and 2.
Explain your answer.

Experiment 1 .....

Experiment 2 .....

Explanation ..... [3]

(ii) Suggest a practical problem that would occur when carrying out these repeat experiments and how you could solve this problem.

.....

..... [2]

[Total: 18]

3 A student investigated the reaction between two different solutions of dilute hydrochloric acid, **A** and **B**, and solution **C** which is alkaline.

Two experiments were carried out.

(a) *Experiment 1*

A burette was filled with solution **A** of dilute hydrochloric acid to the 0.0 cm^3 mark. Using a measuring cylinder, 20 cm^3 of solution **C** was poured into a conical flask. A few drops of methyl orange were added to the flask.

Solution **A** was added to the flask, with shaking, until the mixture just changed colour.
Use the burette diagram to record the burette reading in the table and complete the table.

initial reading

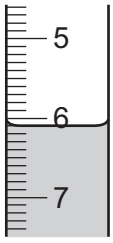
final burette reading / cm^3	
initial burette reading / cm^3	
difference / cm^3	

[2]

(b) *Experiment 2*

The burette was emptied and rinsed, first with distilled water, and then with a little of solution **B**. The burette was filled with solution **B** of dilute hydrochloric acid to the 0.0 cm^3 mark.

Experiment 1 was repeated using solution **B**.
Use the burette diagram to record the burette reading in the table and complete the table.



final reading

final burette reading / cm^3	
initial burette reading / cm^3	
difference / cm^3	

[2]

(c) **(i)** What type of chemical reaction takes place when hydrochloric acid reacts with alkaline solutions?

..... [1]

(ii) Why is methyl orange added to the flask?

..... [1]

(d) Why was the burette rinsed, first with distilled water and then with solution **B**, before starting Experiment 2?

.....

.....

..... [2]

(e) In which experiment was the greater volume of dilute hydrochloric acid used?

..... [1]

(ii) Compare the volumes of dilute hydrochloric acid used in Experiments 1 and 2.

..... [1]

(iii) Suggest, in terms of the concentration of solutions **A** and **B**, an explanation for the difference in volumes used.

.....

.....

..... [2]

(f) If Experiment 2 was repeated using 10 cm^3 of solution **C**, what volume of dilute hydrochloric acid would be used? Explain your answer.

.....

..... [2]

(g) Give **one** advantage and **one** disadvantage of using a measuring cylinder for solution **C**.

advantage .....

disadvantage ..... [2]

(h) Describe a method other than titration, using a **different** reactant, that could be used to compare the concentrations of the two solutions of dilute hydrochloric acid, **A** and **B**.

.....

.....

.....

.....

.....

..... [4]

[Total: 20]