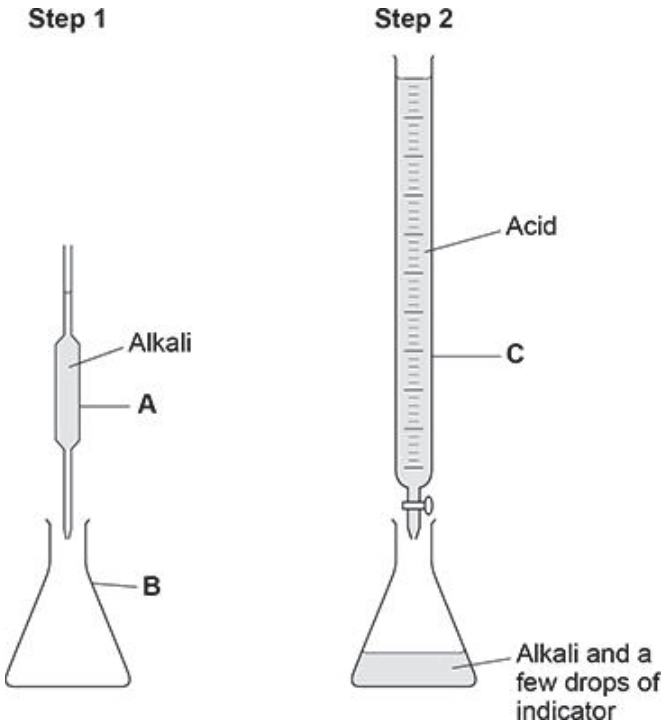
Questions are for both separate science and combined science students unless indicated in the question

Q1.

A titration measures the volumes of an acid and an alkali that neutralise each other.

Figure 1 shows the apparatus used.

Figure 1



(a) Name the pieces of equipment labelled **A**, **B** and **C** in **Figure 1**. **(chemistry only)**

Choose answers from the box.

beaker	**burette**	**conical flask**
measuring cylinder	**pipette**	**test tube**

A _____

B _____

C _____

(3)

In **Step 2** in **Figure 1** the acid is added to the alkali until the solution is neutralised.

The volume of acid added is then read from equipment **C**.

(b) Name a suitable indicator for use in **Step 2** of the titration. **(chemistry only)**

_____

(1)

(c) Give **one** observation that shows the alkali is neutralised. **(chemistry only)**

_____

_____

(1)

(d) Give **two** ways to make sure that the volume of acid added is accurate. **(chemistry only)**

1 _____

_____

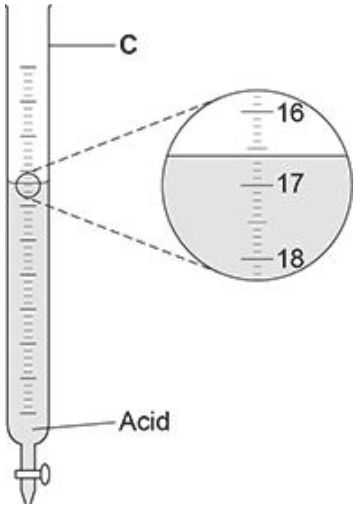
2 _____

_____

(2)

(e) **Figure 2** shows the reading on equipment **C** at the end of **Step 2**.

Figure 2



What is the reading on equipment **C** in **Figure 2**? **(chemistry only)**

Tick (✓) **one** box.

16.4 cm^3 ☐

16.6 cm^3 ☐

17.4 cm^3 ☐

17.6 cm^3 ☐

(1)

(f) A student did a different titration.

The table below shows the results.

	Trial 1	**Trial 2**	**Trial 3**
Volume of acid added in cm^3	25.3	23.7	23.6

Which **two** results should be used to calculate the mean volume of acid added?
(chemistry only)

Tick (✓) **one** box.

Trial 1 and Trial 2 ☐

Trial 1 and Trial 3 ☐

Trial 2 and Trial 3 ☐

(1)

(g) A salt is produced when an acid neutralises an alkali.

Barium chloride is a salt containing the ions Ba^{2+} and Cl^-

What is the formula of barium chloride?

Tick (✓) **one** box.

BaCl ☐ $BaCl_2$ ☐ Ba_2Cl ☐ Ba_2Cl_2 ☐

(1)

(Total 10 marks)

Q2.

This question is about acids and alkalis.

(a) Acids and alkalis are substances that produce ions in aqueous solution.

Draw **one** line from each substance to the ion always produced by that substance in aqueous solution.

Substance	Ion always produced in aqueous solution
	Cl^-
Acid	H^+
	Na^+
Alkali	OH^-
	SO_4^{2-}

(2)

(b) What type of aqueous solution has a pH of 11?

Tick (✓) **one** box.

- Acidic ☐
- Alkaline ☐
- Neutral ☐

(1)

A student determined the reacting volumes of hydrochloric acid and sodium hydroxide solution by titration.

This is the method used.

1. Measure 25.0 cm^3 of the sodium hydroxide solution.

2. Add the sodium hydroxide solution to a conical flask.

3. Add 3 drops of indicator to the sodium hydroxide solution.

4. Add the hydrochloric acid drop by drop until the indicator changes colour.

5. Record the volume of the hydrochloric acid added.

6. Repeat steps 1 to 5 three more times.

(c) Which piece of equipment should be used to measure 25.0 cm^3 of the sodium hydroxide solution in step 1? **(chemistry only)**

Tick (✓) **one** box.

Beaker ☐

Pipette ☐

Ruler ☐

(1)

(d) Which piece of equipment should be used to add the hydrochloric acid drop by drop in step 4? **(chemistry only)**

Tick (✓) **one** box.

Balance ☐

Burette ☐

Measuring cylinder ☐

(1)

The table below shows the results.

Trial	**1**	**2**	**3**	**4**
Volume of hydrochloric acid added in cm^3	24.3	24.5	28.1	24.4

(e) Which is the anomalous result in the table above? **(chemistry only)**

Trial 1 ☐ Trial 2 ☐ Trial 3 ☐ Trial 4 ☐

(1)

(f) Suggest **one** reason for the anomalous result in the table above. **(chemistry only)**

_____

_____

(1)

(g) The student used a solution of sodium hydroxide of concentration 4.00 g/dm^3.

Calculate the mass of sodium hydroxide in 25.0 cm^3 of this solution.

1 dm^3 = 1000 cm^3

_____

_____

_____

_____

_____

Mass = _____ g

(3)

(Total 10 marks)

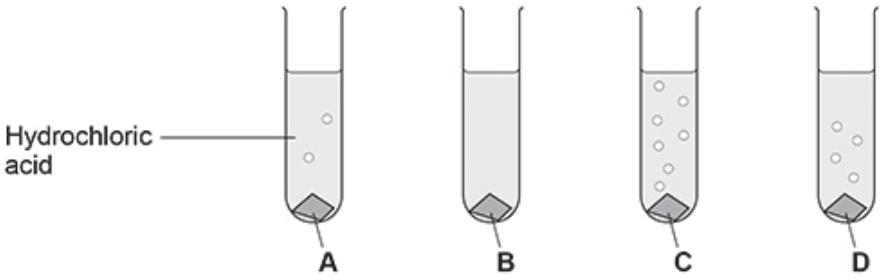
Q3.

This question is about acids.

A student added four metals, **A**, **B**, **C** and **D** to hydrochloric acid.

Figure 1 shows the rate of bubbling in each tube.

Figure 1



Use **Figure 1** to answer parts (a) and (b).

(a) Which metal is copper?

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

(b) Which metal is the most reactive?

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

(c) A metal oxide reacts with an acid to produce zinc sulfate and water.

Name the metal oxide and the acid used in this reaction.

Name of metal oxide _____

Name of acid _____

(2)

(d) Universal indicator is used to measure the pH of a solution.

Draw **one** line from each pH to the colour of universal indicator in a solution with that pH.

pH	Colour of universal indicator
	Blue
1	Green
	Purple
7	Red
	Yellow

(2)

A student reacts an acid with an alkali in a titration.

(e) What is the type of reaction when an acid reacts with an alkali?

Tick (✓) **one** box.

- Combustion ☐
- Decomposition ☐
- Neutralisation ☐

(1)

(f) **Figure 2** shows a piece of equipment used to measure the volume of the acid in the titration.

Figure 2

What is the name of this piece of equipment? **(chemistry only)**

Tick (✓) **one** box.

Burette ☐

Pipette ☐

Syringe ☐

Tube ☐

(1)

(Total 8 marks)