07 Practical Chemistry and Qualitative Analysis

Set A **Answer key**

A From the lesson

23 MARKS

1 **B** pipette [1]

A pipette delivers one accurate fixed volume, such as 25.0 cm^3.

A measuring cylinder reads only to the nearest 0.5 cm^3, a beaker is not for measuring and a gas syringe measures gases.

2 **C** 23.45 cm^3 [1]

A burette reads to the nearest 0.05 cm^3, so a reading has two decimal places.

The others give too few or too many decimal places.

3 **C** Zn^{2+} [1]

Zinc hydroxide dissolves in excess sodium hydroxide and in excess ammonia.

Aluminium hydroxide does not dissolve in excess ammonia, calcium gives no precipitate with ammonia, and magnesium hydroxide dissolves in neither.

4 **B** The hydrochloric acid added chloride ions. [1]

Hydrochloric acid supplies Cl^-, so a white precipitate would form anyway.

The solution should be acidified with dilute nitric acid instead.

5 **B** Read the burette at eye level. [1]

The error is the same every time, so repeating or averaging does not remove it.

Reading with the eye level with the meniscus removes a parallax error, which improves accuracy.

6 **(a)** It is more accurate (to 0.05 cm^3 against 0.5 cm^3), and it measures a range of volumes. [1]

(b) It measures only one fixed volume. [1]

7 **(a)** Water displacement, because it is insoluble, or upward delivery, because it is less dense than air. **[1]**

(b) Quicklime (calcium oxide). Concentrated sulfuric acid would react with it. **[1]**

8 **(a)** To mix the titrant in, so the colour changes exactly when enough has been added. **[1]**

(b) $24.65 - 1.20 = 23.45\ cm^3$ **[1]**

9 **(a)** Add aqueous sodium hydroxide to excess: a white precipitate insoluble in excess shows calcium.

If it dissolves, add aqueous ammonia to excess: insoluble shows aluminium, soluble shows zinc. **[2]**

(b) Dark blue. Copper(II) ions. **[1]**

10 **(a)** Add dilute nitric acid, then aqueous barium nitrate: a white precipitate shows sulfate. **[1]**

(b) Add dilute nitric acid, then aqueous silver nitrate: a white precipitate shows chloride, a yellow one iodide. **[1]**

(c) Add dilute acid: a sulfite gives sulfur dioxide, which turns acidified potassium manganate(VII) from purple to colourless. A sulfate gives no gas. **[1]**

11 **(a)** Hydrogen, oxygen or carbon dioxide.

Hydrogen puts out a burning splint with a pop, oxygen relights a glowing splint, carbon dioxide turns limewater milky. **[2]**

(b) Ammonia turns damp red litmus blue. Chlorine turns damp blue litmus red, then bleaches it.

Hydrogen puts out a burning splint with a pop. **[2]**

12 **(a)** The cylinder: $0.5 \div 20.0 \times 100\% = 2.5\%$, against 0.5% for the balance. **[1]**

(b) Precise but not accurate: close together, but all about 0.2 g too high. **[1]**

B Practice

7 MARKS

13 **A** burette [1]

A burette can deliver any volume up to its full scale accurately, so it can measure out 27.8 cm^3.

A pipette delivers one fixed volume only, such as 25.0 cm^3. A beaker is not used for measuring, and a measuring cylinder is less accurate than a burette.

14 **B** 2 only [1]

The volume of acid, 25.0 cm^3, is given to three significant figures, so it is measured with a pipette.

The experiment times how long the magnesium takes to dissolve, so the gas is not collected and a gas syringe is not needed. A measuring cylinder is not accurate enough for 25.0 cm^3.

15 **C** gas syringe and stopwatch [1]

The volume of a gas is measured with a gas syringe and time is measured with a stopwatch.

A burette and a pipette measure liquid volumes. An electronic balance measures mass, which a graph of gas volume against time does not need.

16 **B** less dense than air, soluble: upward delivery yes, displacement of water no [1]

Upward delivery collects a gas that is less dense than air. Displacement of water collects a gas that is insoluble or only slightly soluble in water.

Row A is wrong because a gas denser than air cannot be collected by upward delivery, and a soluble gas cannot be collected over water. Row C is wrong for the same first reason. Row D is wrong because a gas less dense than air can be collected by upward delivery.

17 **B** anhydrous calcium oxide, ammonia [1]

Upward delivery collects a gas that is less dense than air. Of the four gases, only ammonia is less dense than air. Sulfur dioxide and chlorine are denser than air, so they are collected by downward delivery.

Calcium oxide dries ammonia. It cannot be used with carbon dioxide, which reacts with it.

18 **C** row C [1]

The fixed 25.0 cm^3 is measured with a pipette, and the acid is run in from a burette.

Methyl orange is yellow in the alkali and changes to orange at the end-point, as it starts to change towards red.

19

C to prevent precipitation of silver carbonate [1]

Dilute nitric acid removes carbonate ions, which would otherwise give a precipitate with silver ions too.

It is not a catalyst and does not oxidise chloride ions.