

O Level Chemistry Practical – Planning component

Name: _____

Class: _____

Date: _____

1. State which **key variables** must be kept constant and changed.

E.g. **Mass** of magnesium used must be kept constant. (not 'amount' of magnesium)
Use mass, volume, concentration etc.

2. Outline the procedure in **clear numbered steps**, with the type of setup, apparatus used.

A **clearly labelled diagram** can be sketched to help with explaining the setup. Use a pencil, ruler for straight lines, erase all mistakes cleanly.

In your procedure, a **reasonable quantity** must be suggested, and any **critical assumptions/precautions** must be stated.

E.g. Outline a method to determine the concentration of a sample of sulfuric acid.

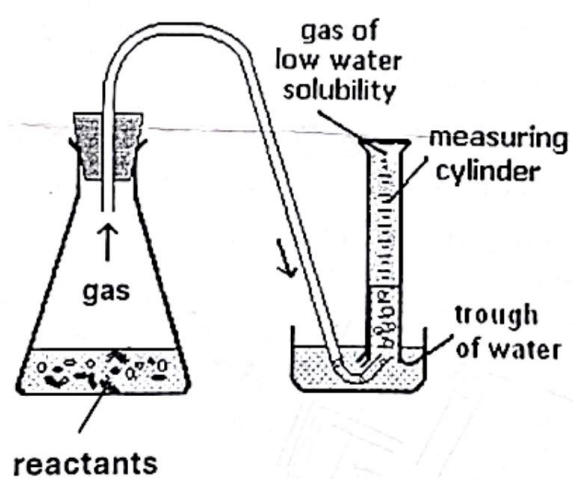
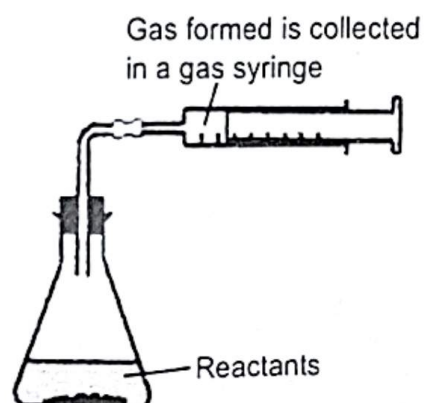
- (i) Using the electronic balance, weigh out 3.00 g of magnesium powder into a clean and dry conical flask.
- (ii) Using a measuring cylinder, measure 100 cm³ of dilute sulfuric acid. Pour it into the same flask. Stopper immediately to deliver the gas into a gas syringe.
- (iii) If this volume is not able to fully dissolve the magnesium, repeat the above steps with larger volumes of acid until acid is in excess.

(State the expected **observations**)

- (iv) Collection of gas is completed when no more effervescence is observed, and the volume of gas collected remains constant.
- (v) Using the chemical equation $\text{Mg} + \text{H}_2\text{SO}_4 \rightarrow \text{MgSO}_4 + \text{H}_2$, the number of moles of hydrogen gas, which is equal to the moles of sulfuric acid is calculated:
No. of moles of hydrogen = no. of moles of acid = Vol of gas (dm³) / 24 (dm³)
Since mol of acid = concentration (mol/dm³) x vol (dm³)
Concentration of acid = mol/vol

3. Where there are any **calculations** needed, clearly show the **working with statements and units**.
4. State the **conclusions** to address the given question.

Gas collection setups



2023

Learning outcomes needed: experimental techniques

Examiner report: The majority of candidates could identify the correct purification technique to obtain pure propanal from the mixture. Weak responses suggested heating the mixture of propanoic acid, propanal and ionic compounds to remove water before carrying out distillation. This is not feasible as propanal would have evaporated before distillation is carried out.

Other common errors included crystallisation and heating the mixture of propanoic acid, propanal and ionic compounds to collect propanal gas. Another common mistake was to omit the condenser in the diagram. Incorrect drawings of condenser were also often seen. Many candidates used a conical flask instead of a round bottom flask for heating the mixture.

Question:

- 3 (a)** Propanoic acid is produced by reacting propanol with potassium manganate(VII) and dilute sulfuric acid. This reaction can also produce another organic compound, propanal.

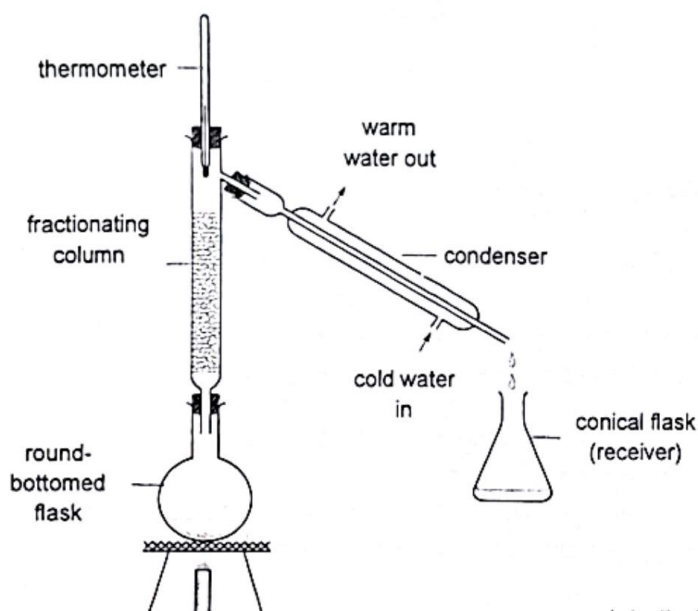
A student reacts propanol, potassium manganate(VII) and sulfuric acid. At the end of the reaction, the reaction flask contains propanoic acid, propanal and an aqueous solution containing ionic compounds. The student plans to collect pure propanal.

Describe a method the student can use to separate pure propanal from propanoic acid, water and ionic compounds.

Include a diagram of the apparatus required. You may assume that the apparatus normally found in a school laboratory are available.

[boiling points: propanoic acid, 141 °C; propanal, 49 °C]

Sample answer:



labelled diagram [1] / description of apparatus

Set up the apparatus as shown in the diagram. Heat the mixture in the round-bottomed flask. [1]

Propanol, which has a lower boiling point than propanoic acid and ionic compounds, reaches the upper part of the column and is distilled over. At this stage, the thermometer shows a constant temperature of 49°C , which is the boiling point of propanol. [1]

In this condenser, hot propanol vapour condenses as running water cools it; liquid ethanol flows down the inner tube of the condenser and into the receiver. [1]

Propanol is collected as the distillate in the receiver. [1]

Planning practice 1

Background

Metals react with hydrochloric acid to produce a salt and hydrogen gas. The temperature rises in the reaction as heat is produced. The more reactive the metal, the more heat is produced.

You are provided with three metal powders, A, B, C, and dilute hydrochloric acid.

Use the powders and information given to outline a method to determine the reactivity of the metals.

Your method you should include:

- Apparatus you would use
- Measurements you would take
- Explanation on how you would use the results to determine reactivity of the three metals

You can assume the apparatus normally found in a school laboratory are available.

You may wish to use a labelled diagram to illustrate your answer.

Planning Sheet:

Make a plan of action for your investigation. Use the table below as a guide.

1	What are you trying to find out? Very important for clarity of your planning	
2	What do you know about the reactions? LOs?	
3	Variables: Dependent, Independent and Controlled variables (For comparing reactions e.g which shell has more carbonate, which acid is more concentrated?)	
(a)	What will you measure in each experiment? DV – variable that is measured or tested	
(b)	What is changing in the experiment? Write down details of masses, volumes, etc. IV - variable that is changed to test the effects on <u>the dependent variable</u>	

(c)	What will you keep the same in all experiments to make a fair comparison? Controlled variables – usually more than one	
4	Write an outline of your procedure to achieve the aim. Your variables can be incorporated into the outline.	