



Mo	Tu	We	Th	Fr	Sa	Su
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Memo No. _____

Date

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Titration:① Burette $\pm 0.05 \text{ cm}^3$ ② Pipette 25 cm^3 [fixed][1] 2d.p. for all readings $\rightarrow$ including 0.00[1] 2 best readings within $\pm 0.20 \text{ cm}^3$ [2] Accuracy within $\pm 0.10 \text{ cm}^3$ [2] $\pm 0.20 \text{ cm}^3$ [1]

[1] if required draw your table with

headings + units.

Titration number	1	2	3
Final reading / cm^3			
Initial reading / cm^3	0.00	0.00	0.00
Vol. of 'x' used / cm^3			
Best titration results (V)			



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Memo No. _____

Date / /

procedure [in order]:

- 1: **Rinse** burette with titrant [not water] before filling - prevent dilution
- 2: **Fill** burette with titrant above the 0.00cm^3 mark
- 3: **Pipette** a fixed volume of analyte [25.0cm^3] into a clean conical flask.
- 4: Add a **few drops of indicator**
- 5: Place flask on white tile, under the burette
- 6: **Titrate**: add titrant slowly, swirling constantly
- 7: Slow to **dropwise** near the expected end-point
- 8: Stop at the **permanent colour change** [end-point], & record final burette reading.
- 9: **Repeat** at least twice more until 2 titres agree within **0.10cm^3** of each other.
- 10: Take the average of the best two titration results only $\rightarrow$ find the average.



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Memo No. _____

Date _____ / _____ / _____

Common Indicators:

Indicator	In acid	In alkaline
Methyl Orange	red	yellow
Phenolphthalein	colourless	pink



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Memo No. _____

Date / /

Planning Question:

① Aim:

↳ Purpose of the experiment.

② Approach:

* 1 → Independent (variable to be changed)

* 2 → Dependent (variable to be measured)

* 3 → Control (variable to be kept constant)

③ chemicals / Apparatus:

↳ what are the chemicals & apparatus needed for the experiment?

↳ solutions: state concentrations

↳ Solid: state form [lumps, powder, ribbons, strips]



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Memo No. _____

Date / /

Answer Template:

1. Procedure

- ↳ Write down the steps for the experiment
- ↳ state clearly the chemicals & apparatus needed
- ↳ state clearly the independent, dependent, & constant variables [if applicable]
- ↳ draw a labelled diagram [if applicable]

2. Results & Discussion [when applicable]

- ↳ draw a sample table with headings & units to illustrate the type of data to be collected.
- ↳ fill in the column for independent variable but leave blank for the column for dependent variable.
- ↳ when applicable, include rough sketch of graph shape & / or show calculations required.
- ↳ discuss how results can be interpreted to answer the aim of experiment.



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Memo No. _____

Date _____ / _____ / _____

3. conclusion [when applicable]

↳ must address the aim directly.

Types of planning question:

1. Quantitative

2. Qualitative

3. Preparation of salt / solutions

4. Investigative

1. Quantitative

↳ Procedure [Steps + chemicals + Apparatus]

↳ discussion [how to convert data collected
to what qn is asking for]

↳ precautions & assumptions [only if qn asks
for it]



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----	----	----	----	----	----	----

Memo No. _____

Date / /

2. Qualitative

↳ procedure [steps + chemicals + apparatus]

↳ discussion [how to interpret the observations

in order to identify ions / compounds

present]

↳ precautions & assumptions [only if qn asks

for it]

3. Preparation of salt / solution

↳ procedure [steps + chemicals + Apparatus]

↳ precautions & assumptions [only if qn asks

for it]

4. Investigative IV, DV, CV.

↳ procedure [steps + chemicals + Apparatus]

↳ Discussion [how to interpret the observations

in order to reach conclusion]

↳ Precautions & assumptions [only if qn asks

for it.]



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Memo No. _____

Date / /

writing the procedure:

1. State the exact quantities

→ not "some acid", but " 25.0cm^3 of 1.0mol/dm^3 "
of HCl .

2. State the apparatus used to measure each quantity

→ e.g. "measured using burette" for accuracy.

3. Include the starting reading / measurement

before the reaction begins.

4. Describe how & when to take readings

→ e.g. "record the vol. of gas every 15 seconds
until no more gas is produced".

5. State repeats

→ "repeat the experiment 3 times & take an
average" [improves reliability].

6. Mention safety only if genuinely relevant

→ goggles, fume cupboard for toxic gases.



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Memo No. _____

Date _____ / _____ / _____

Measuring technique:

Rate of reaction [gas produced]

- Gas syringe
- Measure vol. vs time

Rate of reaction [mass lost]

- Balance
- Measure mass vs time

Rate of reaction [opacity / colour]

- stopwatch → time for cross to disappear /
solution to turn opaque

concentration of unknown

- titration

Identity of ion

- qualitative analysis tests

Purity of substance

- Melting / boiling point range

Enthalpy change

- Temperature change [thermometer,
insulated container]



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Memo No. _____

Date _____ / _____ / _____

How to make it a 'fair test':

1. Only change ONE variable at a time
2. Keep all other variables constant
3. Repeat & average to check reliability
4. Use the same apparatus / equipment throughout for consistency.



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Memo No. _____

Date

/ /

Gas tests:

Hydrogen / H_2

→ lighted / burning splint at mouth of test tube

→ extinguished with 'pop' sound.

Oxygen / O_2

→ glowing splint into test tube

→ splint relights

Carbon dioxide / CO_2

→ bubble gas through limewater [calcium hydroxide]

→ white precipitate formed

Chlorine / Cl_2

→ damp blue litmus paper at mouth of test tube

→ turns red, then bleaches white

Sulfur dioxide / SO_2

→ filter paper soaked in acidified $KMnO_4$ at mouth of test tube

→ Purple to colourless



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Memo No. _____

Date / /

Ammonia / NH_3

→ damp red litmus paper at mouth of test tube

→ turns blue.

Extra:

① white powder + Acid → CO_2 gas

② Metal + Acid → H_2 gas

③ Thermal decomposition of carbonate

↳ CO_2 gas

Thermal decomposition of nitrate

↳ O_2 gas

④ Ammonium salt + Alkali → NH_3 gas