Practical notes

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Titration

Indicator	Acidic	Neutral	Basic	pH range
Methyl orange	Red	Orange	Yellow	3.2 - 4.4
Screened methyl orange	Violet	Grey	Green	3.2 - 4.4
Thymolphthalein	Colourless	Colourless (if acidic → neutral)/ pale blue (if basic → neutral)	Blue	9.4 - 10.6
Thymol blue	Yellow	Green	Blue	8.0 - 9.6

** Usually, an indicator's neutral colour is a mix of its acidic and basic colour

- If need to see if reached end point → Record the value first, then add another drop from burette → if colour changed, use the previous value
- Solution with unknown concentration should be in conical flask

Tables:

	1	2
Initial burette reading / cm^3	(2dp)	(2dp)
Final burette reading / cm^3	(2dp)	(2dp)
Volume of (reactant) / cm^3	(2dp)	(2dp)

** Put tick under the values you will use (±0.10 cm^3)

Mass of empty weighing bottle / g	
Mass of weighing bottle + (reactant) / g	
Mass of (reactant) used / g	

** If experiment does not expect you to use distilled water to transfer all the reactants in the weighing bottle, insert row "Mass of weighing bottle + residual (reactant) / g" under the "Mass of weighing bottle + (reactant) / g"

** dp for this table depends on the weighing balance

Possible question types:

Whether a value calculated from the experimental results will be more accurate if an instrument of a better precision is used to measure out the reactant used in excess

- No, the precision of the volume measured for the reactant does not matter if it is used in excess

Why need to dilute some reactants before putting them inside the conical flask

- If 25.00 cm^3 of those reactants were used, they require >50.00 cm^3 of the reactant used inside burette. This exceeds burette capacity (50.00 cm^3) → need to refill → Higher percentage error

Gas Collection

Possible question types:

How to ensure reliability of mass of solid measured

- Heat solid gently first (prevents solid from splattering), then heat strongly
- Heat, cool, Reweigh. Repeat this process until a constant mass is obtained

Chemical energetics/ Calorimetry

- Enthalpy change of neutralisation = -57.3kJ/mol
- Graph drawn need to start from origin

Possible question types:

Predicting whether replacing a (strong acid) with a (weak acid) will change the enthalpy change

- Only strong acid + strong alkali reaction will be -57.3kJ/mol. For the remaining acid + alkali reactions, the reaction is less exothermic as some energy from the reaction is absorbed to dissociate the acid completely

Predicting whether doubling the volume of both reactants (acid + alkali) will affect temperature change

- Temperature change remain constant → double the heat produced, distributed double the volume of solution (link to heat capacity)

Why graphical method to determine maximum temperature change is more accurate than direct measurement of initial and maximum temperature reached

- Graphical accounts for heat lost to surroundings

Sources of error for spirit lamp experiment + modifications to minimise the error

- Incomplete combustion → Flush more O_2 to ensure complete combustion
- Burning of wick produces heat, which accounts for the temperature rise → use a fibre wick that does not burn. Ensures that heat transferred to calorimeter is entirely due to combustion of (substance in spirit lamp) only

Reaction Kinetics

Homogeneous catalyst ⟶ Consumed by the reaction & gets regenerated

Heterogeneous catalyst ⟶ Catalyst is different phase from reactants & products

Tables:

Average temperature (T) of reaction mixture = $\frac{1}{2}$ ($T_{initial}$ + T_{final}) / °C						
Time (t) for blotting out the cross / s						

Possible question types:

Explain why water is added to the reaction mixtures

- To keep the total reaction volume constant across all experiments. This allows concentration of reactants used to be directly proportional to its volume added

Explain why $\frac{1}{t}$ is a measure of the rate of reaction

- Since the same end point is reached, it means that the same fixed amount of (product) is formed in each reaction. Thus, $\frac{1}{t}$ is directly proportional to rate of reaction

Inorganic

Test for	Description + Observations
CO_3^{2-}	Add HNO_3 (aq) Effervescence is observed. Gas liberated forms white ppt when bubbled through $Ca(OH)_2$ (aq)
Cl^-, Br^-, I^-	Add $Ag(NO)_3$ (aq), followed by NH_3 (aq) dropwise until in excess Cl^-: White ppt that is soluble in NH_3 forms Br^-: Pale cream ppt that is sparingly soluble in NH_3 I^-: Yellow ppt that is insoluble in NH_3 forms
SO_4^{2-}	Add $Ba(NO_3)_2$ (aq), followed by HNO_3 (aq) dropwise until in excess White ppt forms

Complex ions
$[Al(OH)_4]^-$
$[Zn(OH)_4]^{2-}$
$[Pb(OH)_4]^{2-}$
$[Cr(OH)_6]^{3-}$
$[Zn(NH_3)_4]^{2+}$
$[Cu(NH_3)_4]^{2+}$
$[Ag(NH_3)_2]^+$

Organic

Test name	Procedure
Iodoform	Add 1 cm depth of $NaOH$ (aq) in a test tube, followed by I_2 (aq) dropwise until a permanent yellow colour is obtained. Add 1 cm depth of organic compound. Heat in hot water bath.

	Yellow ppt (CHI_3) forms
Tollen's Test	Add 1 cm depth of $NaOH$ (aq) to 2 cm depth of $AgNO_3$ (aq). Then add NH_3(aq) dropwise until ppt dissolves. Add 2 cm depth of organic compound. Heat in hot water bath. Silver mirror forms
Fehling's Test	Mix 5 drops of Cu^{2+}(aq) and 5 drops of aq solution containing $NaOH$(aq) and Potassium tartrate (aq). Add 1 cm depth of organic compound. Heat in hot water bath. Red ppt (Cu_2O) forms

Planning

- Structure: Pre-calculations → Procedure
- Include measuring capacity of instrument
- Tip: Visualise yourself doing the experiment. Practice more questions to remember the phrasing

Instrument	Measuring capacities available
Measuring cylinder	10 cm^3, 50 cm^3, 100 cm^3
Beaker	100.0 cm^3, 250.0 cm^3, 500 cm^3
Conical flask	50 cm^3, 100 cm^3, 250 cm^3, 500 cm^3
Pipette	10 cm^3, 25 cm^3

% error

- Formula: % error = ±(max error)/ volume measured x 100%
- Max error = half the smallest division on instrument x no. Of times you read the instrument

** Exception to the above max error: Measuring cylinder (can read smallest division instrument)

** From the formula, observe that greater volume measured would decrease % error

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Some words of encouragement/ advice:

1. Stay calm. Don't panic. Fretting = shaky hands = have to redo experiments 😕
2. Spend about 20-25 mins on planning. To practice, try 30 mins first then slowly reduce the time limit. Do planning first cos your mind can still function the best at this time. After 25 mins, die die must stop planning already.
3. Do 2 perfect titrations. Don't waste time on a rough one (Still need refill burette). How to know when going to change colour soon: the colour in the solution starting to take longer time to turn back to original colour.

4. Your bunsen burner is working fine. They checked prior to the exam, so don’t ask for help. Invigilator will only on to show you it works then off for you to on by yourself. Outcome: You know that your bunsen burner works even though that was already known from the start & you may potentially have lost some marks.

All the best for practical! 😃🌟