



AS PRACTICAL 5

Titration 1 – HCl standardisation (Grid)

Concentration of HCl given by student's results		% experimental error	Is the result within maximum apparatus uncertainty?	CPAC Criteria												
				other	1	2a	2b	2c	2d	3a	3b	4a	4b	5a	5b	
Procedure & results	Achieved concordant results															
	Achieved results within total apparatus uncertainty															
	Followed instructions carefully and independently															
	Worked safely															
Recording of results	Table has lines within and round the outside (drawn with ruler)															
	Clear recording of masses in table															
	All masses required recorded															
	All masses shown to resolution of balance															
	All burette readings shown															
	All burette readings shown to nearest 0.05 cm ³															
Calculation	Clearly shows which titres are used in the mean															
	Uses concordant results only in the mean															
	Quotes mean to 2dp															
	M _r of Na ₂ CO ₃ and HCl shown as 106.0 and 36.5															
	Moles of Na ₂ CO ₃ found correctly															
	Moles of HCl found correctly															
	Concentration of HCl found correctly (should be close to 0.1 mol dm ⁻³)															
	Concentration of HCl found correctly (should be close to 3.65 g dm ⁻³)															
	Both concentration values shown to 3sf															
Calculation is clear and coherent																
Apparatus uncertainty	Burette found as 100 x 0.15/litre (0.6% ish)															
	Volumetric flask as 100 x 0.1/250 = 0.04%															
	Pipette as 100 x 0.1/25 = 0.40%															
	Balance as 2 x 100 x 0.0005/mass used (0.08% ish)															
	Added up to give total apparatus uncertainty															
	Each piece of apparatus clearly identified in calculation															
Questions	Correct comment that reliable if there are concordant results															
	Correctly calculates % error															
	Correct statement whether accurate or not															
	Correct explanation that lost mass leads to lower titre and higher[HCl]															
	Correct explanation that overshooting leads to higher titre and lower [HCl]															

	Good evidence	Working towards	Description
1			Correctly follows instructions to carry out the experimental techniques or procedures.
2a			Correctly uses appropriate instrumentation, apparatus and materials (including ICT) to carry out investigative activities, experimental techniques and procedures with minimal assistance or prompting.
2b			Carries out techniques or procedures methodically, in sequence and in combination, identifying practical issues and making adjustments when necessary.
2c			Identifies and controls significant quantitative variables where applicable, and plans approaches to take account of variables that cannot readily be controlled.
2d			Selects appropriate equipment and measurement strategies in order to ensure suitably accurate results.
3a			Identifies hazards and assesses risks associated with these hazards when carrying out experimental techniques and procedures in the lab or field.
3b			Uses appropriate safety equipment and approaches to minimise risks with minimal prompting.
4a			Makes accurate observations relevant to the experimental or investigative procedure.
4b			Obtains accurate, precise and sufficient data for experimental and investigative procedures and records this methodically using appropriate units and conventions.
5a			Uses appropriate software and/or tools to process data, carry out research and report findings.
5b			Sources of information are cited demonstrating that research has taken place, supporting planning and conclusions.