Question 39 (Answer: **B**)

- 13.7 cm^3 is an awkward volume quoted to one decimal place.
- A volumetric pipette delivers only one fixed volume, so it cannot give 13.7.
- A burette measures any volume to one decimal place, so it is the right choice.

2(a)	**M1** all five experiments have volume of hydrochloric acid recorded as 25.0 (cm^3)
	M2 final and initial burette readings for experiment 1 correct and recorded the correct way round (46.1, 0.6)
	M3 final and initial burette readings for experiment 2 correct and recorded the correct way round (41.3, 1.3)
	M4 all titres calculated correctly (45.5, 40.0, 34.6, 23.8)
	M5 all readings recorded to 1 decimal place
2(b)	**M1** *y*-axis scale is linear, and the points extend over halfway up the scale
	M2 AND **M3** all points plotted correctly
	M4 best-fit line correctly drawn
2(c)	**M1** line is extrapolated to reach *x*-axis (to the right)
	M2 correct reading from graph at volume of sodium hydroxide = 0.0 cm^3
	M3 units of g
2(d)(i)	(volumetric pipette is) more accurate (than a measuring cylinder)
2(d)(ii)	volumetric pipettes measure a fixed volume
2(e)	**M1** no sharp colour change / keeps changing colour / many colours / more than two colours / gradual colour change / sharp colour change is needed
	M2 so cannot determine end-point / end-point not clear / difficult to tell when to stop adding /
2(f)	**M1** sketch line is below plotted line at all volumes
	M2 line is straight, starts on *y*-axis between 20 and 25 and ends on *x*-axis between 2.0 and 2.2

2(a)	**M1** all burette readings correct in experiment 1 (21.2, 41.0, 1.6) **M2** all burette readings correct in experiment 2 (10.2, 20.1, 0.4) **M3** burette readings recorded in correct place in table **M4** all four titres in experiment 1 and 2 calculated correctly (19.6, 39.4, 9.8, 19.7) **M5** all ten readings/volumes given to 1 decimal place or better and a consistent number of decimal places
2(b)(i)	to clean / to remove contaminants / to remove impurities
2(b)(ii)	**M1 (**volume (added) is) greater / more / higher / bigger (if not rinsed with C) **M2** water left in the burette dilutes solution **C** / solution **C** becomes less concentrated
2(b)(iii)	colour (changes) easier to see / colour change can be seen easily/clearly/better/accurately
2(c)	**M1 D** / experiment 2 is more concentrated (than **C/**experiment 1) OR **C** / experiment 1 is less concentrated (than **D/**experiment 2) **M2** smaller volume of **D** (required to reach end point/neutralisation) **OR** larger volume **C** (required to reach end-point/neutralisation) **M3** answer is quantitative. **Either D** is 2 x concentration of **C OR** the volume of **C** is 2 x the volume of **D**
2(d)(i)	**M1** 39.2 **M2** units given as cm^3
2(d)(ii)	volume would be more than burette can hold
2(e)	**M1** none / no change / same volume needed **M2** (warming) does not change moles / concentration
2(f)	use a volumetric pipette instead of a measuring cylinder

Question 38 (Answer: **D**)

- A volume quoted as 25.0 cm^3 needs accurate, not approximate, apparatus.
- A pipette delivers exactly that fixed volume.
- A measuring cylinder or beaker is far too imprecise for one decimal place.

Question 38 (Answer: **A**)

- 26.3 cm^3 is an awkward volume quoted to one decimal place.
- A pipette only delivers one fixed volume, so it cannot give 26.3.
- A burette measures any volume accurately to one decimal place, so it is the right choice.