

Question 39 (Answer: B)

- 13.7 cm³ 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 cm³ 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 cm³ 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.