Question 39 (Answer: **D**)

- Learn the flame colours: sodium yellow, potassium lilac, calcium red, copper(II) blue-green.
- So X is sodium and Y is potassium – those two are the easiest pair to swap by mistake.
- The blue-green of Z is copper(II).

Question 39 (Answer: **B**)

- The flame colour identifies the metal: yellow sodium, lilac potassium, red calcium, blue-green copper.
- Adding sodium hydroxide dropwise and then in excess separates the precipitates – Al^{3+} and Zn^{2+} redissolve, Cu^{2+} and Fe^{3+} do not.
- Both tests must point at the *same* cation, so use each to check the other.

3(a)(i)	red
3(a)(ii)	(yellow flame) not hot enough
3(b)(i)	white precipitate
3(b)(ii)	no change
3(c)	(solid **K** is) hydrated
3(d)(i)	**M1** Fe^{2+} / iron(II)
	M2 Cr^{3+} / chromium(III)
3(d)(ii)	**M1** add excess aqueous sodium hydroxide **M2** chromium and forms a solution / (green) precipitate dissolves OR **M1** add excess aqueous sodium hydroxide **M2** iron(II) and forms a (green) precipitate which doesn't dissolve OR **M1** add aqueous sodium hydroxide and leave to stand **M2** iron(II) and (green) precipitate becomes brown OR **M1** add aqueous sodium hydroxide and leave to stand **M2** chromium and (green) precipitate does not turn brown
3(e)	carbon dioxide / CO_2
3(f)	sulfate / SO_4^{2-}

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3(a)(i)	(damp red) litmus (paper) turns blue
3(a)(ii)	ammonia / NH_3
3(b)	white precipitate
3(c)	(solution) becomes pink
3(d)	**M1** sodium / Na^+ **M2** zinc / Zn^{2+} **M3** iodide / I^-

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3(a)	**M1** dropwise: red-brown precipitate **M2** excess: no further change / precipitate remains / red-brown precipitate
3(b)(i)	red-brown precipitate
3(b)(ii)	(damp red) litmus (paper) turns blue
3(b)(iii)	ammonia / NH_3
3(c)	no change
3(d)	carbon dioxide / CO_2
3(e)	**M1** barium / Ba^{2+} **M2** carbonate / CO_3^{2-}

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3(a)	**M1** limewater becomes milky
	M2 effervescence / fizzing / bubbling
3(b)(i)	no change
3(b)(ii)	dropwise: white precipitate
	excess: no (further) change / precipitate remains / white precipitate / insoluble
3(b)(iii)	white precipitate
3(c)	**M1** potassium / K^+ **M2** bromide / Br^-
	KBr = 2

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3(a)	dropwise: green precipitate
	excess**:** no (further) change / precipitate remains / green precipitate / insoluble
3(b)	no change
3(c)	yellow precipitate
3(d)	(solution / liquid becomes) yellow / orange / brown
3(e)	does not contain ammonium / NH_4^+ ions / not ammonium / NH_4^+
3(f)	ammonia / NH_3
3(g)	potassium / K^+
	nitrate / NO_3^- KNO_3 = 2

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3(a)	**M1** dropwise: white precipitate
	M2 excess: precipitate dissolves
3(b)	**M1** dropwise: white precipitate
	M2 excess: precipitate remains / no change
3(c)	white precipitate
3(d)	no change
3(e)	ammonia / NH_3
3(f)	**M1** barium / Ba^{2+}
	M2 nitrate / NO_3^- $Ba(NO_3)_2$ = 2

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Question 39 (Answer: **B**)

- Cu^{2+} gives a light blue precipitate and Fe^{2+} a green one that does *not* redissolve.
- Ca^{2+} gives a white precipitate.
- Cr^{3+} gives a green precipitate that does dissolve in excess alkali.