

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-}

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^-

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-}

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

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^-
	$\text{KNO}_3 = 2$

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^-
	$\text{Ba}(\text{NO}_3)_2 = 2$

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.