

Question	Marking guidance	Mark	AO	Comments
08.1	An electron pair on the ligand Is donated from the ligand to the central metal ion	1	AO1a	
		1	AO1a	
08.2	Blue precipitate Dissolves to give a dark blue solution $[\text{Cu}(\text{H}_2\text{O})_6]^{2+} + 2\text{NH}_3 \longrightarrow \text{Cu}(\text{H}_2\text{O})_4(\text{OH})_2 + 2\text{NH}_4^+$ $\text{Cu}(\text{H}_2\text{O})_4(\text{OH})_2 + 4\text{NH}_3 \longrightarrow [\text{Cu}(\text{NH}_3)_4(\text{H}_2\text{O})_2]^{2+} + 2\text{OH}^- + 2\text{H}_2\text{O}$	1	AO1b	
		1	AO1b	
		1	AO2d	
		1	AO2d	
08.3	$[\text{Cu}(\text{NH}_3)_4(\text{H}_2\text{O})_2]^{2+} + 2\text{H}_2\text{NCH}_2\text{CH}_2\text{NH}_2 \longrightarrow$ $[\text{Cu}(\text{H}_2\text{NCH}_2\text{CH}_2\text{NH}_2)_2(\text{H}_2\text{O})_2]^{2+} + 4\text{NH}_3$	1	AO2b	
08.4	Cu–N bonds formed have similar enthalpy / energy to Cu–N bonds broken And the same number of bonds broken and made	1	AO3 1b	
		1	AO3 1b	
08.5	3 particles form 5 particles / disorder increases because more particles are formed / entropy change is positive Therefore, the free-energy change is negative	1	AO2e	M2 can only be awarded if M1 is correct
		1	AO2e	