Q	Part	Sub Part	Marking Guidance	Mark	Comments
4	(a)		Partially filled/incomplete d sub-shell/orbital/shell	1	Ignore reference to f orbitals Do **not** allow d block Do **not** allow half-filled d orbitals
4	(b)		Has ligand(s) linked by co-ordinate bonds	1 1	Allow molecules/ions with lone pairs Allow dative/donation of lone pair
4	(c)		(Blue) light is absorbed (from incident white light) Due to electrons moving to higher levels / electrons excited Red light (that) remains (is transmitted) / light that remains (transmitted light) is the colour observed	1 1 1	 Allow d $\rightarrow$ d transitions Allow red light reflected
4	(d)	(i)	Circle round any O^- Circle round either N	1 1	List principle
4	(d)	(ii)	$EDTA^{4-} + [Co(H_2O)_6]^{2+} \rightarrow [CoEDTA]^{2-} + 6H_2O$	1	Allow missing square brackets Ignore state symbols
4	(d)	(iii)	Increase in entropy/ΔS positive Because 2 mol (of particles/molecules/species/entities) form 7 mol	1 1	Or increase in disorder Allow 'increase in number' as stated in words or as shown by any numbers deduced correctly from an incorrect equation Do not allow increase in ions/atoms

4	(e)	(i)	Co-ordinate/dative/dative covalent bond Covalent bond	1 1	Allow pair of electrons donated by nitrogen/ligand Do not allow pair of electrons donated from Iron/Fe Shared electron pair
4	(e)	(ii)	Transport of oxygen/O_2	1	Allow any statement that implies oxygen carried (around the body) Do not allow transport of carbon dioxide (CO_2). This also contradicts the mark (list principle)
4	(e)	(iii)	Because it bonds to the iron/haemoglobin Displaces <u>oxygen</u>	1 1	Allow blocks site /CO has greater affinity for haemoglobin /carboxyhaemoglobin more stable than oxyhaemoglobin Or prevents transport of <u>oxygen</u> QoL