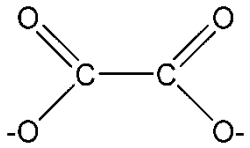
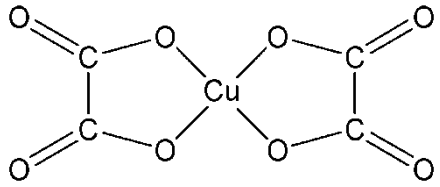
Question	Marking Guidance	Mark	Comments
7(a)(i)	absorbs (certain frequencies of) (white) light / photons	1	not absorbs white / u.v. light
	<u>d</u> electrons excited / promoted	1	or <u>d</u> electrons move between levels / orbitals d electrons can be implied elsewhere in answer
	the colour observed is the light not absorbed / light reflected / light transmitted	1	allow blue light transmitted penalise emission of light in M3
7(a)(ii)	ΔE is the energy gained by the (excited) electrons (of Cu^{2+})	1	allow: • energy difference between orbitals / sub-shells • energy of photon / light absorbed • change in energy of the electrons • energy lost by excited electrons • energy of photon / light emitted
	h (Planck's) constant	1	
	ν frequency of light (absorbed by $Cu^{2+}(aq)$)	1	do not allow wavelength If energy lost / photon lost / light emitted in M1 do not penalised light emitted

7(a)(iii)	$[Cu(H_2O)_6]^{2+} + 4Cl^- \rightarrow [CuCl_4]^{2-} + 6H_2O$	1	note that $[CuCl_4^-]^{2-}$ is incorrect penalise charges shown separately on the ligand and overall penalise HCl
	tetrahedral	1	
	Cl^- / Cl / chlorine too big (to fit more than 4 round Cu)	1	allow water smaller than Cl^- explanation that change in shape is due to change in co-ordination number
7(b)		1	allow: • ion drawn with any bond angles • ion in square brackets with overall / 2- charge shown outside the brackets • ion with delocalised O=C—O bonds in carboxylate group(s)
	lone pair(s) on O^- / O	1	allow position of lone pair(s) shown on O in the diagram even if the diagram is incorrect.
7(c)(i)	$[Cu(H_2O)_6]^{2+} + 2C_2O_4^{2-} \rightarrow [Cu(C_2O_4)_2(H_2O)_2]^{2-} + 4H_2O$		
	product correct	1	
	equation balanced	1	
	6	1	note can only score M3 and M4 if M1 awarded or if complex in equation has 2 waters and 2 ethanedioates
	octahedral	1	If this condition is satisfied the complex can have the wrong charge(s) to allow access to M3 and M4 but not M1

7(c)(ii)	 90^o	1 1	ignore charges diagram must show both ethanedioates with correct bonding ignore water allow 180^o mark bond angle independently but penalise if angle incorrectly labelled / indicated on diagram