Question Number	Acceptable Answers	Reject	Mark
1 (a)	Quenches reaction / stops reaction / slows reaction / freezes reaction **(1)** EITHER by neutralizing the acid / removing the acid / neutralizing the catalyst / removing the catalyst **OR** So that the acid does not react with the thiosulfate **(1)**	By neutralizing HI Just "by diluting the reaction mixture" just "by neutralizing the reaction mixture"	**2**

Question Number	Acceptable Answers	Reject	Mark
1 (b)	Starch (solution)		**1**

Question Number	Acceptable Answers	Reject	Mark
1 (c)	**First mark** So that [propanone] and [acid] are (virtually) constant **OR** so that the [propanone] and $[H^+]$ do not affect the rate **OR** Propanone and acid are in excess so **changes in concentration** don't affect rate **(1)** **Second mark** And therefore rate changes would only depend on [iodine] **OR** so that the overall order is not determined ALLOW [Iodine] is the limiting factor **(1)** *NOTE* "so that only the $[I_2]$ changes" scores **(2)** "so that only the I_2 concentration changes" scores **(2)** "so that only the I_2 changes" scores **(1)**	Propanone and acid are in excess, without reference to further comments	**2**

Question Number	Acceptable Answers	Reject	Mark
1 (d)	Zero order **(1)** (Gradient =) **rate** is constant / I_2 (concentration) doesn't affect **rate** / **rate** of change of I_2 (concentration) doesn't change with time **(1)** **Mark independently**	Just 'straight line' Or just 'gradient is constant' [Thiosulfate] or volume of Thiosulfate is proportional to time without reference to iodine Reference to half life $[I_2]$ is proportional to rate	**2**

Question Number	Acceptable Answers	Reject	Mark
1 (e)	Measuring cylinder quicker / Measuring cylinder can measure a variety of volumes **(1)** ALLOW Measuring cylinder can be plastic so unbreakable Comment on lower cost of measuring cylinder if qualified with a reason Pipette more accurate / (graduated) pipette more precise / pipette can be used to extract samples from a reaction mixture (for titration) **(1)**	Just "Measuring cylinder easier to use" Easier to clean Measuring cylinder can be used for large volumes Pipette more reliable Ignore references to easier	**2**

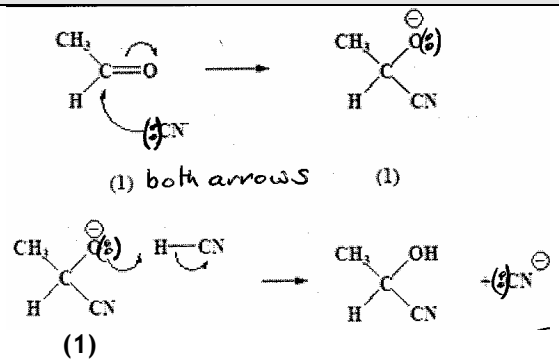
Question Number	Acceptable Answers	Reject	Mark
1 (f) (i)	To keep (total) volume constant / to make the (total) volume 32 cm^3 / to make concentrations proportional to volume of reactant	To keep concentrations constant	**1**

Question Number	Acceptable Answers	Reject	Mark
1 (f) (ii)	First order wrt propanone with explanation **(1)** First order wrt hydrogen ions/ sulfuric acid, with explanation **(1)** Explanation can be in terms of experiments 1 and 3 (propanone) or 1 and 2 (acid) and can be in terms of concentration or volume **Rate = k**$[CH_3COCH_3][H^+]([I_2]^0)$ / **Rate = k**$[CH_3COCH_3][H_2SO_4]([I_2]^0)$ **(1)** ALLOW names of propanone and sulfuric acid in place of formulae Ignore case of k in rate equation Ignore order wrt iodine even if wrong Third mark is consequential if incorrect orders of propanone and acid given.	Expressions without rate or k Expressions with K_c R / r for rate	**3**

Question Number	Acceptable Answers	Reject	Mark
2 (a) **QWC**	**Each mark is a stand alone mark.** **First mark:** hydrogen bonds in **both** ethanoic acid **and** ethanol OR no hydrogen bonds in ethanal **(1)** **Second mark:** hydrogen bonds are stronger than van der Waals'/ dipole-dipole/London/dispersion/ induced dipole / permanent dipole /intermolecular forces (in ethan**a**l) OR hydrogen bonds are the strongest/strong intermolecular forces **(1)** **Third mark:** ethanoic acid has more electrons/ethanoic acid has the most electrons OR ethanoic acid is dimeric OR ethanoic acid forms dimers OR description of ethanoic acid dimers (N.B. In the context of dimerisation, ignore statement that "ethanoic acid forms two hydrogen bonds per molecule") OR ethanoic acid is more polar because of having more oxygen atoms **(1)**	any reference to hydrogen bonding in ethanal **just** references to ethanol and ethanoic acid forming H bonds **with water** references to breaking **covalent** bonds **Just** "ethanoic acid has more hydrogen bonds than ethanol"	**3**

Question Number	Acceptable Answers	Reject	Mark
2 (b)(i)	**(Test):** 2,4-dinitrophenylhydrazine /Brady's reagent/2,4-dnp/ 2,4-DNP/2,4-DNPH **(1)** **(Result):**yellow **precipitate** /orange **precipitate** /red **precipitate** ALLOW: 'solid' or 'crystals' in lieu of precipitate **(1)** **Result** mark for result CQ on correct reagent (or a near miss reagent (e.g. 2,4-DHPN))	**1,2**-DNP etc/ hydrazine / /2,4-dinitrophen**o**lhydrazine /2,4-dinitrophenylhydraz**o**ne	**2**

Question Number	Acceptable Answers	Reject	Mark
2 (b)(ii)	(Warm with) Fehling's (solution) / Benedict's (solution) **(1)** red precipitate/brown precipitate/brick-red precipitate **(1)** *ALLOW* "solid" *ALLOW* "red Cu_2O" *ALLOW* yellow/orange solid for Benedict's test *Penalise omission of "solid" **once only** in parts (b)(i) and (b)(ii)* **OR** (Warm with) Tollens' (reagent) **(1)** silver (mirror)/black(solid) **(1)** **(N.B. here, solid not required)** **OR** (Warm with) ammoniacal silver nitrate (solution) **(1)** silver (mirror)/ black / dark-grey (solid) **(1)** **(N.B. here, solid not required)** 2nd mark CQ on correct reagent or a near miss *Penalise omission of "solid" **once only** in (b)(i) and (b)(ii)*	acidified potassium dichromate(VI) / manganate(VII) **(0)** iodoform reaction **(0)** just "red due to Cu^{+}" / "red solid due to Cu^{3+}" **(0)**	**2**

Question Number	Acceptable Answers	Reject	Mark
2 (c)(i)	 (1) both arrows (1) **(1)** *IGNORE* any dipoles shown Check curly arrows are all **double-headed** in mechanism. (If all arrows are **single-headed**, can only score intermediate mark.) **Accept:** arrow to an H^+ instead of an H-CN for third mark. [It is **not** necessary to show the lone pairs.] *IGNORE* any equations which generate CN^- ions	 arrow from N in CN^-	**3**

Question Number	Acceptable Answers	Reject	Mark
2 (c)(ii)	With HCN alone, insufficient CN^- OR KCN provides (sufficient) CN^- OR KCN increases the concentration of CN^- *ALLOW* "nucleophile" instead of CN^- *IGNORE* any subsequent comments about the role of the CN^- ion	Just "HCN is a weak acid" OR HCN "is too weak a nucleophile"	**1**

Question Number	Acceptable Answers	Reject	Mark
2 (c)(iii) QWC	**These are stand alone marks** **First mark:** attack from both sides **OR** attack from above and below **(1)** **Second mark:** (gives) racemic mixture / (gives) equal amounts of each isomer / (gives) equal amounts of each enantiomer **(1)**	attack on a (planar) carbocation OR attack on a (planar) intermediate OR S_N1 OR S_N2 "planar product"	**2**