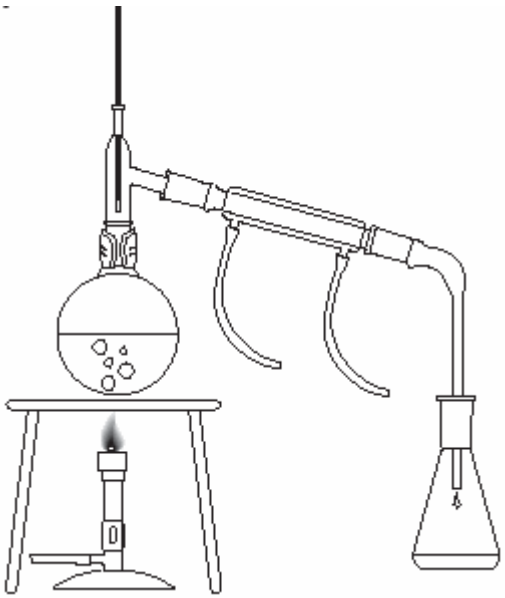
## Answers to 3.5 Paper 2

**Question One**

**a** chloroethene A

**b** $CH_2=CH_2 + Cl_2 \rightarrow CH_2ClCH_2Cl$ A

**c**



A = minor error eg. not closed at top, M = complete distillation setup

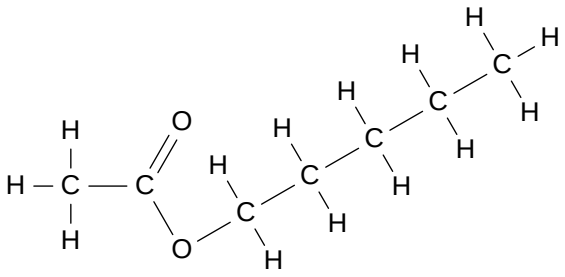
**Question Two**

**a** I ketone (not carbonyl)
II amine / amino
III alkene / C to C double bond
A = 2 correct, M = all 3 correct

**b** OH / alcohol / hydroxyl groups and/or the N–H / amine groups A
These groups can H bond with water. M

**Question Three**

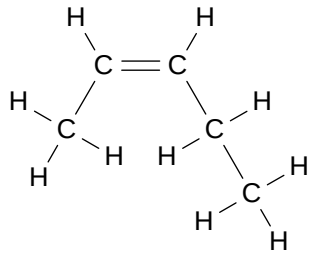
**a** Any ester with 7 carbon atoms and correctly named eg. pentylethanoate A



**b** **i** **3**-methyl**hex**-2-enoic acid A

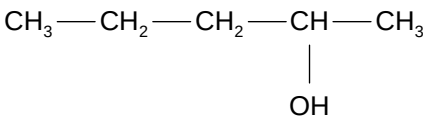
2

**ii**



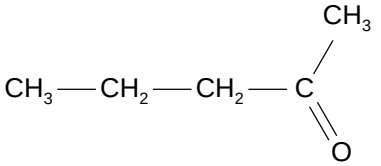
pent-2-ene A

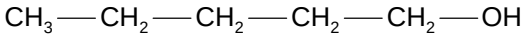
**c** Product:



Name: pentan-2-ol [major product]

Reagent: $Cr_2O_7^{2-}/H^+$ **or** $MnO_4^-/H^+$





Name: pentan-1-ol [minor product]

A = 3 correct, M = 4 correct, E = all 5 correct including the major and minor products

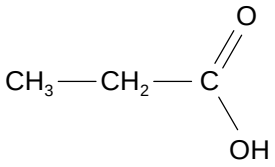
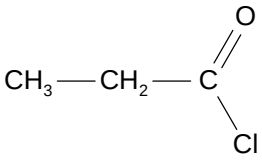
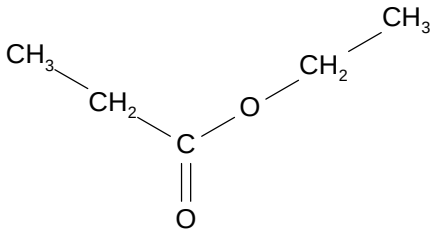
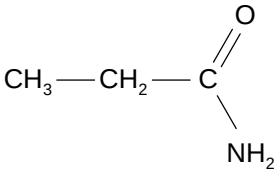
**d** **i** oxidation A

**ii** Heat with Fehling's or Benedict or Tollens reagent.
With Fehling's or Benedict reagent the blue $Cu^{2+}$ (ions/complex) is reduced to $Cu^+$ which makes the mixture turn green / yellow / brown (**or** you may get a copper mirror, $Cu^0$). With Tollens reagent the $[Ag(NH_3)_2]^+$ complex is reduced to $Ag^0$, a silver mirror or a black precipitate of elemental silver.
A = correct named reagent and colour changes, M = plus identification of starting and finishing 'indicator', E = plus chemical symbols at start and finish

**Question Four**

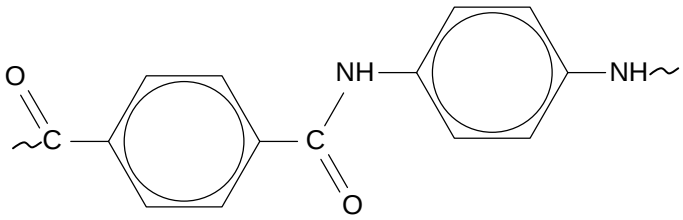
**a** **i** primary A

**ii**

| Compound | Structural Formula |
|---|---|
| **A** |  |
| **B** |  |
| **C** |  |
| **D** |  |

A = 1 error, M = all correct

**b i**



A = correct repeating

**ii** A small molecule, HCl, is removed / formed in the reaction. M

**Question Five**

N: propanoyl chloride
R: $SOCl_2$ / $PCl_3$ / $PCl_5$
SF: $CH_3CH_2COOH$

N: ethyl propanoate
SF: $CH_3CH_2COOCH_2CH_3$

N: propanal

R: $SOCl_2$ / $PCl_3$ / $PCl_5$
SF: $CH_3CH{=}CH_2$ **or** $CH_3CH_2CH_2OH$

A = 1 branch correct, M = both branches correct,
E = all correct including alternatives for final reaction

**Question Six**

**a** **i** reactant: $CH_3OH$ product: $H_2O$ A

**ii** concentrated .sulfuric acid / c. $H_2SO_4$ A

**iii** It acts as a dehydrating agent, it removes water and pushes the equilibrium to the product side. M

**b** **i** carboxylic acid / carboxylate / carboxyl / ester
A = both correct

**ii** The acid group loses an $H^+$ to form a carboxylate ion which is more soluble. M

**c** **i** B A

**ii** The species in the solution do not evaporate on boiling and escape the container. Hence, they have more chance to undergo reaction (many organic reactions being quite slow). It is also safer because it reduces the risk from flammable organic compounds and naked flames / heat.
A = one valid point, M = two valid points, E = comprehensive answer including safety aspect

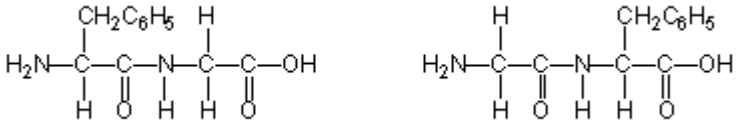
**Question Seven**

**a** **i** It must have a chiral C atom / asymmetric C atom / C atom with four different groups attached. A

**ii** They rotate plane polarised light by equal amounts in opposite directions A

**b** **i** glycine A

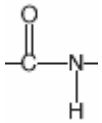
**ii**



A = one correct structure, M = both correct structures

**c** **i** nylon **4, 6** A

**ii** amide group A



**iii** The amide group is hydrolysed, this breaks up the polymer chain. The long molecules are made into smaller ones so the fabric breaks up.
A = answer, M = plus reasoning

## Judgement Statement

**Achievement:** **14 questions answered correctly.**
**A minimum of 14 × A**

**Merit:** **18 questions answered correctly with 7 at Merit level.**
**A minimum of 11 × A + 7 × M**

**Excellence:** **20 questions answered correctly with 9 at Merit level and 2 at Excellence level**
**A minimum of 9 × A + 9 × M + 2 × E**