

**Paper Reference(s) 9CH0/02**  
**Pearson Edexcel Level 3 GCE**

**Chemistry**

**Advanced**

**PAPER 2: Advanced Organic and Physical Chemistry**

**Diagram Booklet**

**In the boxes below, write your name, centre number and candidate number.**

<b>Surname</b>					
<b>Other names</b>					
<b>Centre Number</b>					
<b>Candidate Number</b>					

## INSTRUCTIONS

There may be spare copies of some diagrams in case you need them.

**THIS DIAGRAM BOOKLET MUST BE RETURNED WITH THE QUESTION PAPER AT THE END OF THE EXAMINATION.**

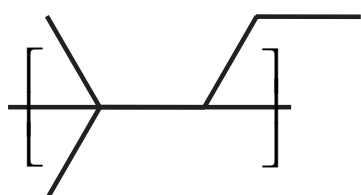
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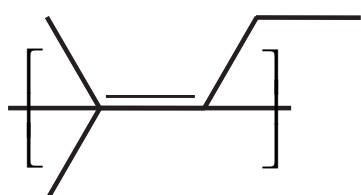
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## Question 1(a)

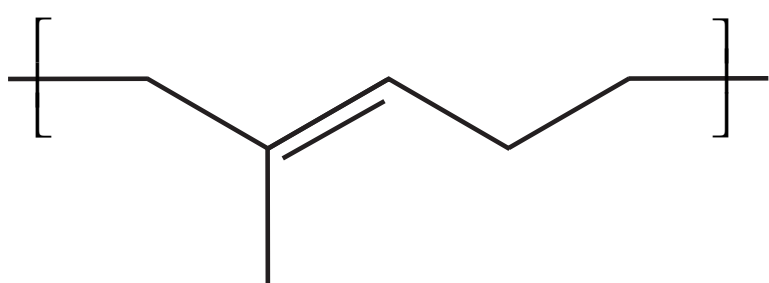
Structure A



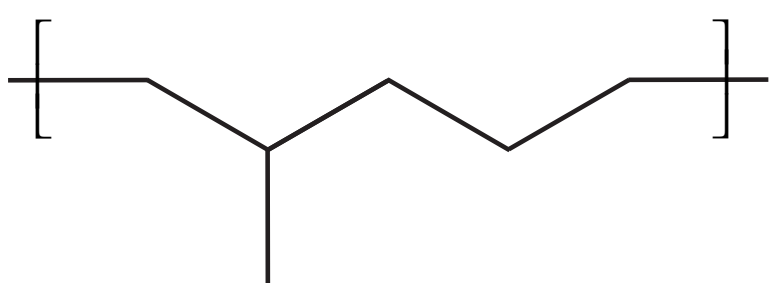
Structure B



Structure C

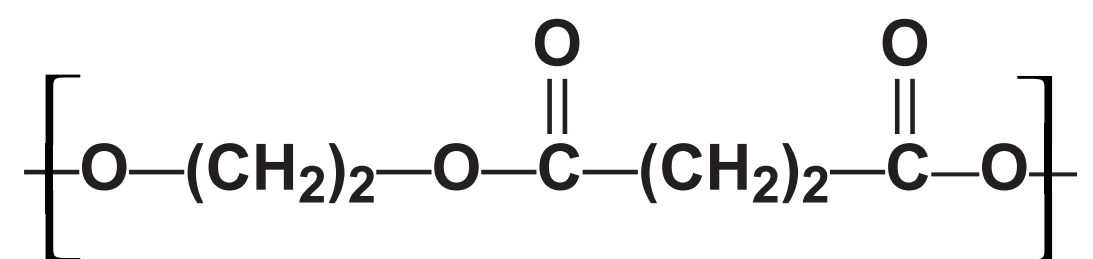


Structure D

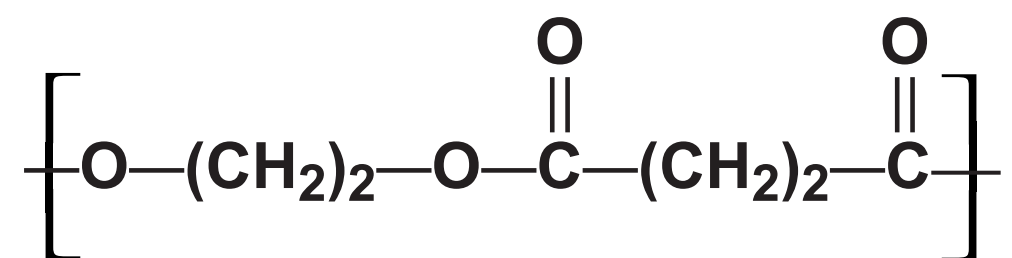


## Question 1(c)

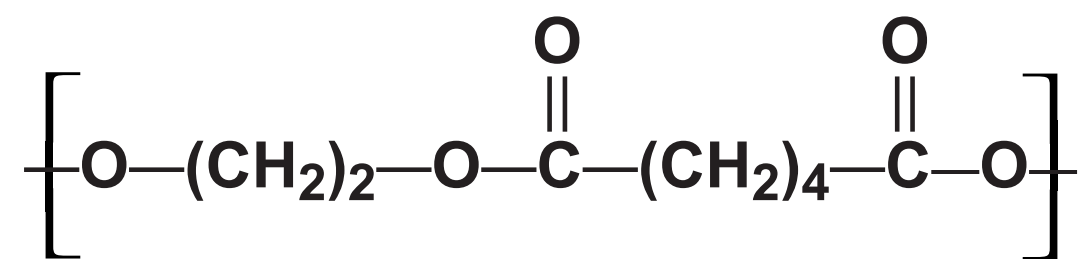
## Structure A



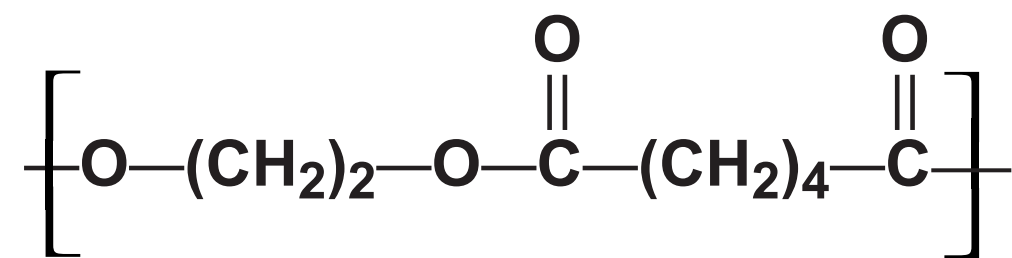
## Structure B



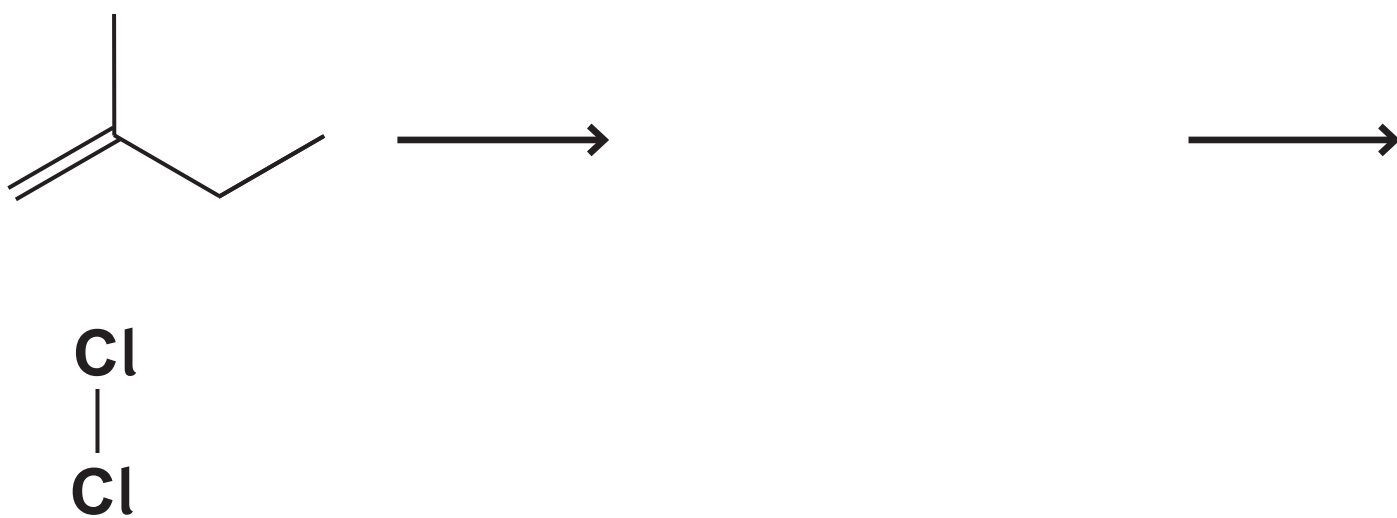
## Structure C



## Structure D



## Question 3(a)

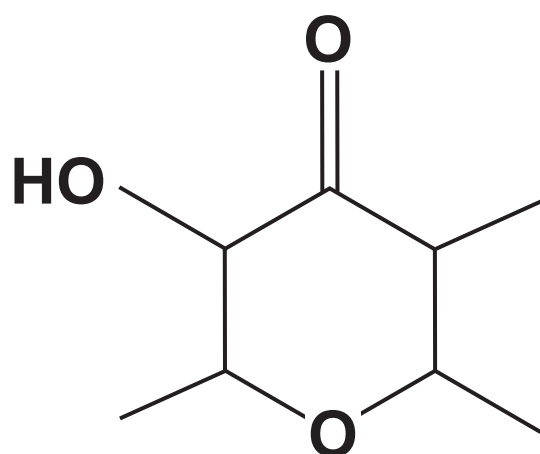


## Question 3(a)

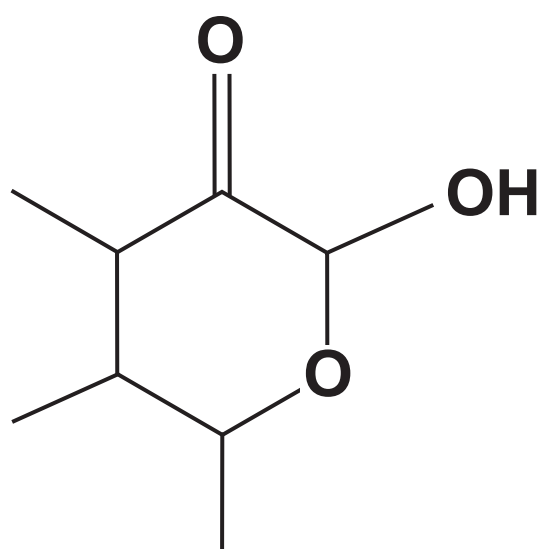


## Question 6(a)

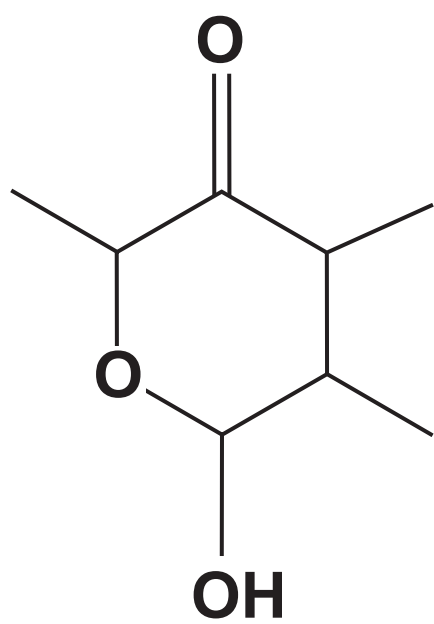
Structure A



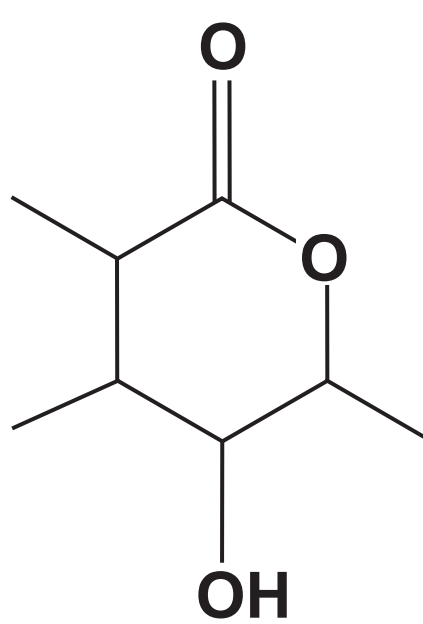
Structure B



Structure C



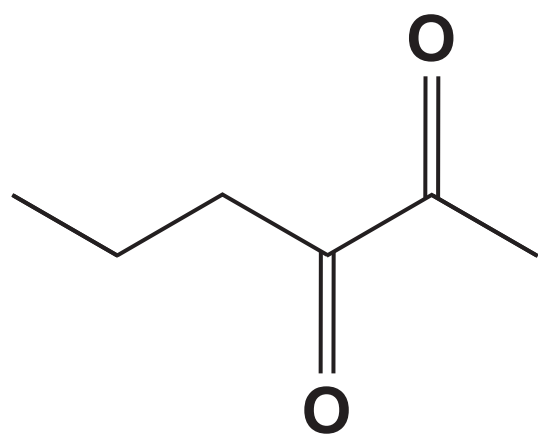
Structure D



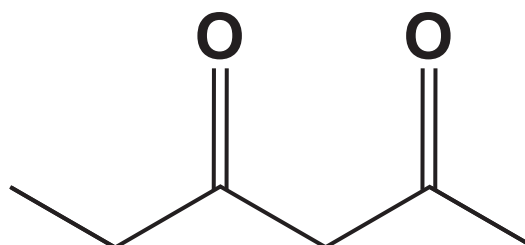


## Question 6(b)

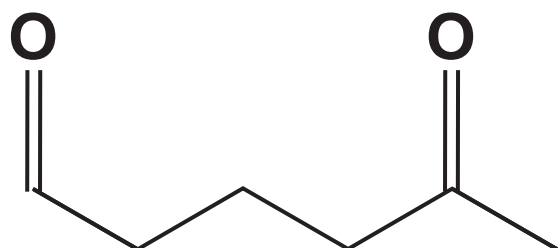
Structure A



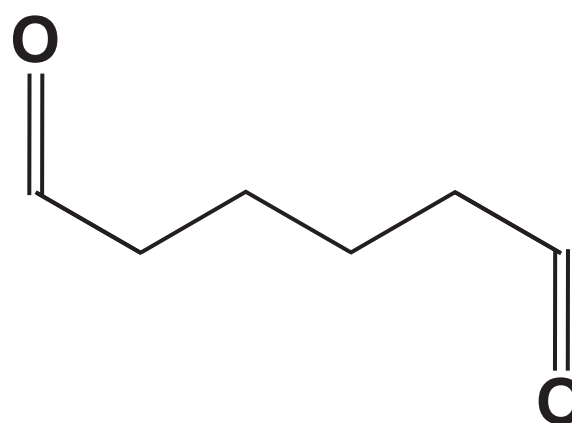
Structure B



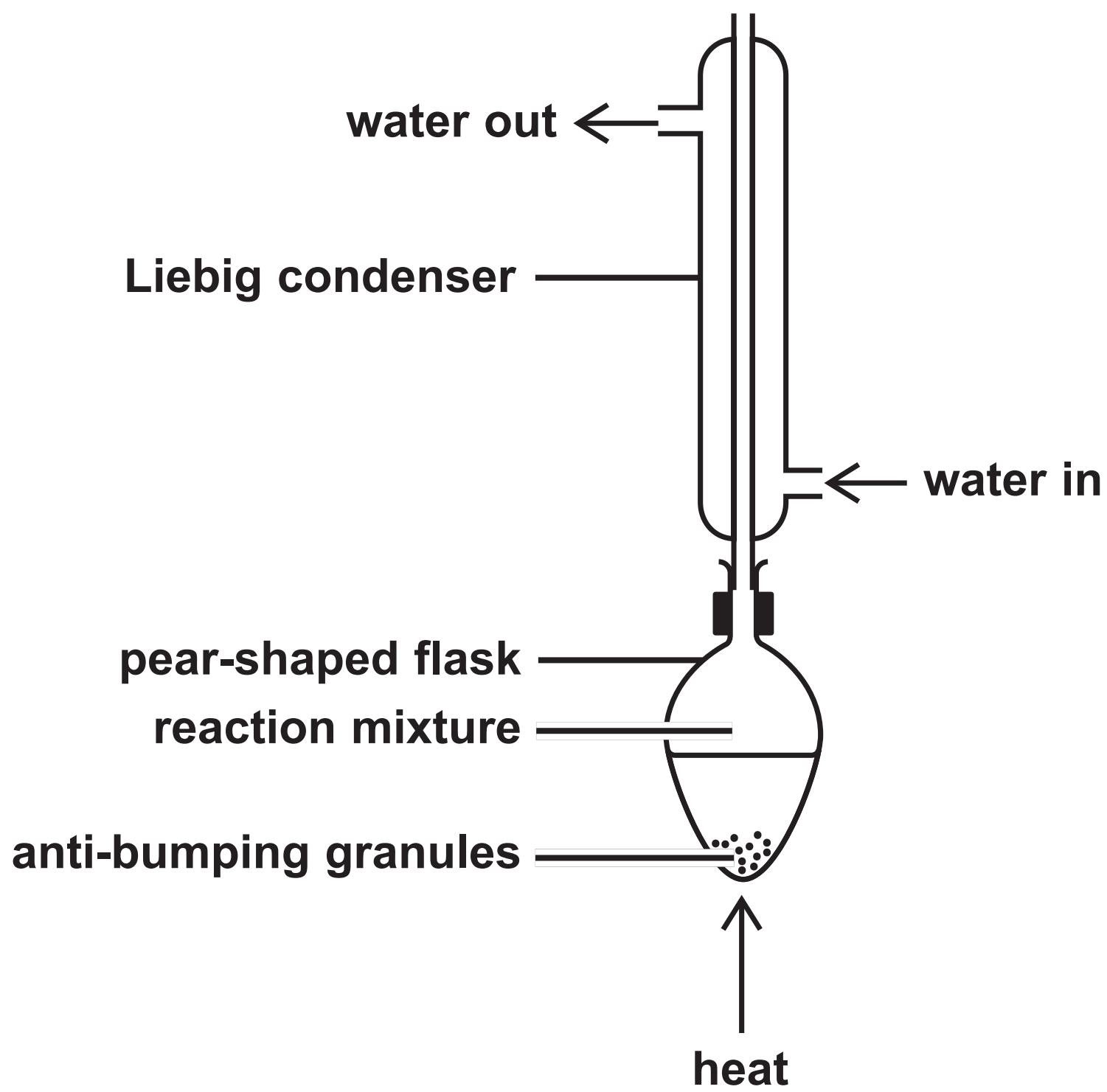
Structure C



Structure D



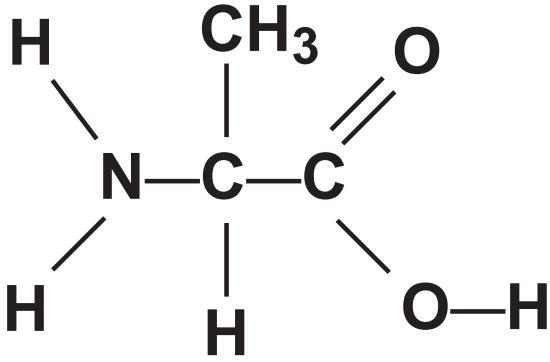
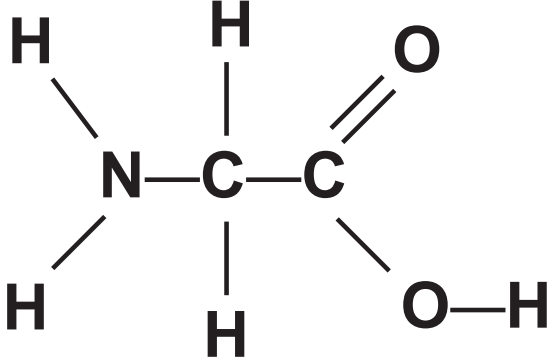
## Question 6(c)(i)



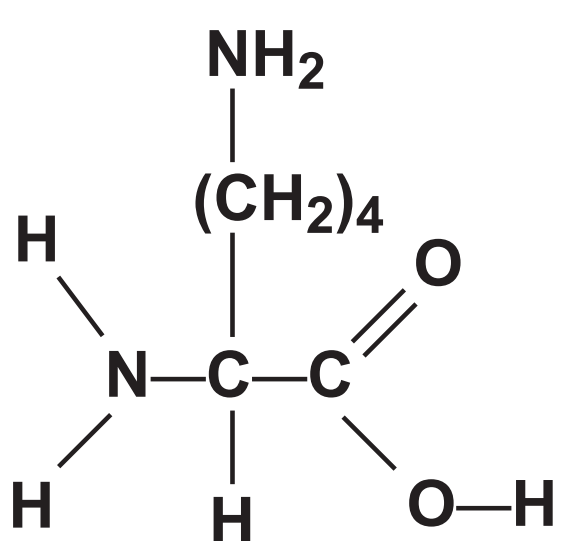
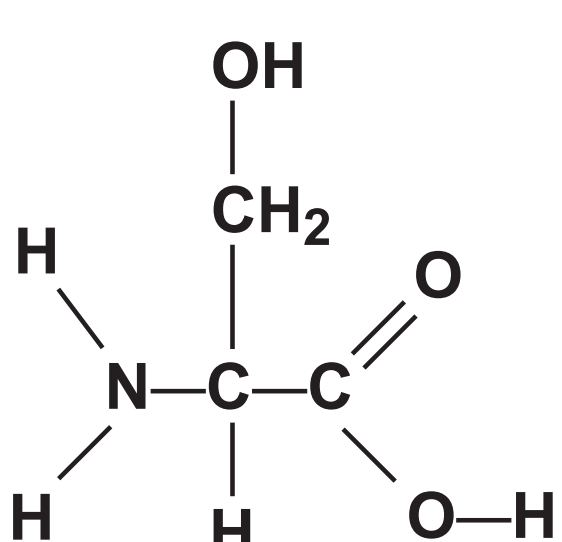
Question 6(d)

Substance	Molar mass / $\text{g mol}^{-1}$	Boiling temperature / $^{\circ}\text{C}$	Solubility in water
Propanone	58	56	completely miscible
Ethanoic acid	60	118	completely miscible

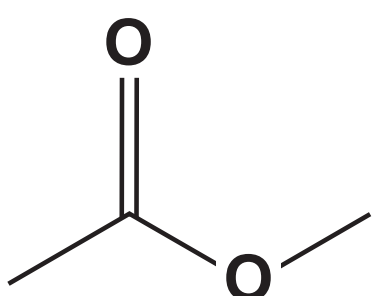
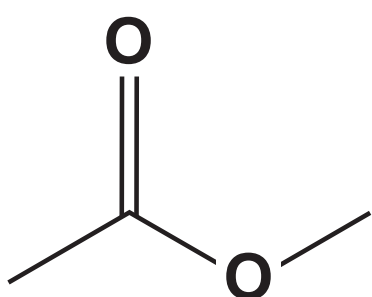
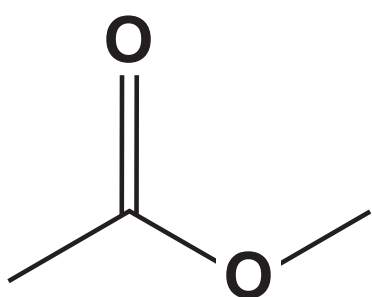
## Question 7(c)

Amino acid	Structure
alanine	 <p>The chemical structure of alanine is shown. It consists of a central carbon atom (C) bonded to a hydrogen atom (H) on the left, a hydrogen atom (H) below, a methyl group (CH<sub>3</sub>) above, and a carboxyl group (COOH) on the right. The carboxyl group is represented by a carbon atom double-bonded to an oxygen atom (O) and single-bonded to a hydroxyl group (OH). The nitrogen atom (N) is bonded to two hydrogen atoms (H) and the central carbon atom.</p>
glycine	 <p>The chemical structure of glycine is shown. It consists of a central carbon atom (C) bonded to a hydrogen atom (H) on the left, a hydrogen atom (H) below, a hydrogen atom (H) above, and a carboxyl group (COOH) on the right. The carboxyl group is represented by a carbon atom double-bonded to an oxygen atom (O) and single-bonded to a hydroxyl group (OH). The nitrogen atom (N) is bonded to two hydrogen atoms (H) and the central carbon atom.</p>

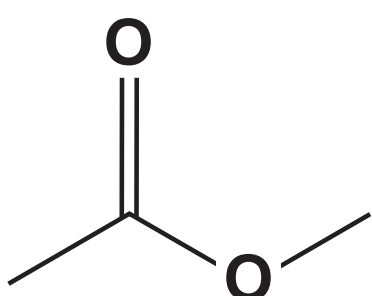
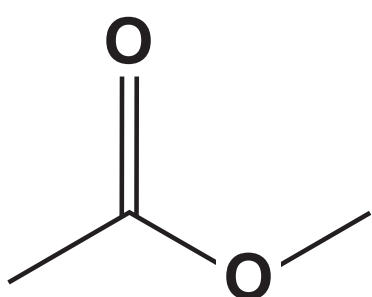
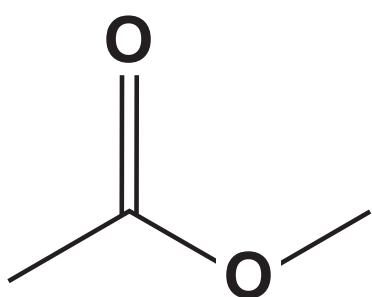
## Question 7(d)

Amino acid	Structure of amino acid
lysine	 <p>The chemical structure of lysine is shown. It features a central alpha-carbon (C) bonded to a hydrogen atom (H) below, an amino group (NH<sub>2</sub>) above, a carboxyl group (C(=O)OH) to the right, and a side chain to the left. The side chain consists of a methylene group (CH<sub>2</sub>) bonded to an epsilon-amino group (NH<sub>2</sub>). The epsilon-amino group is shown with two hydrogen atoms (H) bonded to the nitrogen (N).</p>
serine	 <p>The chemical structure of serine is shown. It features a central alpha-carbon (C) bonded to a hydrogen atom (H) below, an amino group (NH<sub>2</sub>) above, a carboxyl group (C(=O)OH) to the right, and a side chain to the left. The side chain consists of a methylene group (CH<sub>2</sub>) bonded to a hydroxyl group (OH). The hydroxyl group is shown with an oxygen atom (O) bonded to a hydrogen atom (H).</p>

## Question 8(f)(i)



## Question 8(f)(i)



## Question 9(c)

Time / s	Concentration of ethanal / mol dm <sup>-3</sup>
0	0.72
420	0.36
1260	0.18



Question 9(e)

Temperature (T) / K	1 / Temperature (1/T) / K <sup>-1</sup>	Rate constant (k) / units in (b)	ln k
700	1.43 × 10 <sup>-3</sup>	0.011	-4.51
730	1.37 × 10 <sup>-3</sup>	0.035	-3.35
760	1.32 × 10 <sup>-3</sup>	0.105	-2.25
790		0.343	
810	1.23 × 10 <sup>-3</sup>	0.787	-0.24

Question 9(e)

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### Question 9(e)

[illegible]

### Question 9(e)

[illegible]