

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.

| | | | | | |
|-------------------------|--|--|--|--|--|
| Surname | | | | | |
| Other names | | | | | |
| Centre Number | | | | | |
| Candidate Number | | | | | |

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.

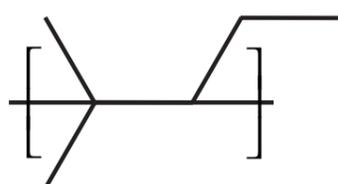
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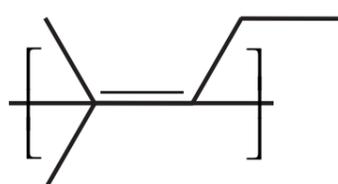
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Question 1(a)

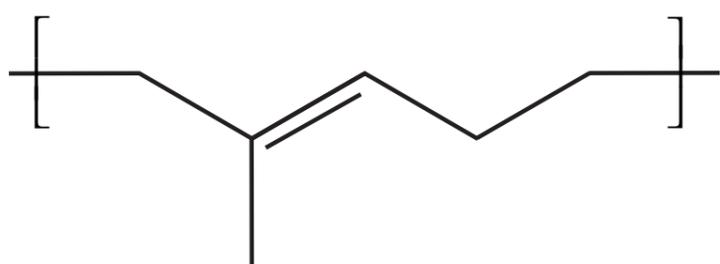
Structure A



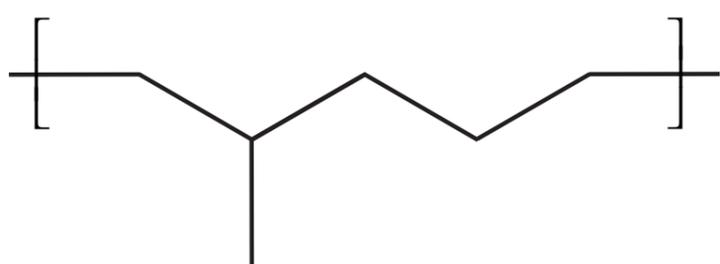
Structure B



Structure C

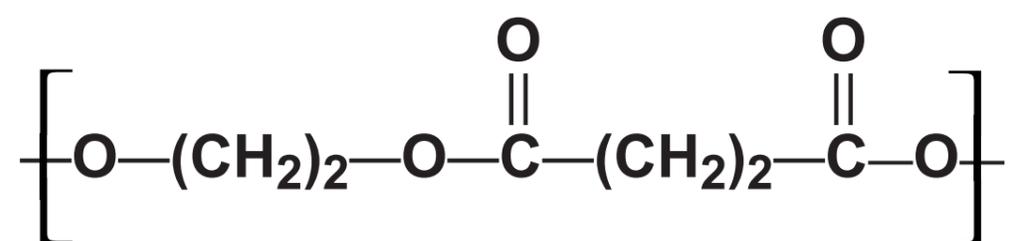


Structure D

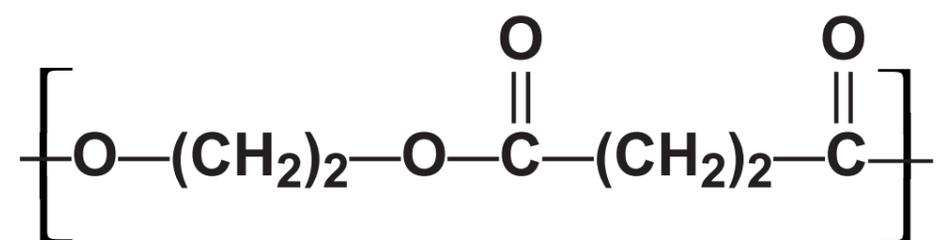


Question 1(c)

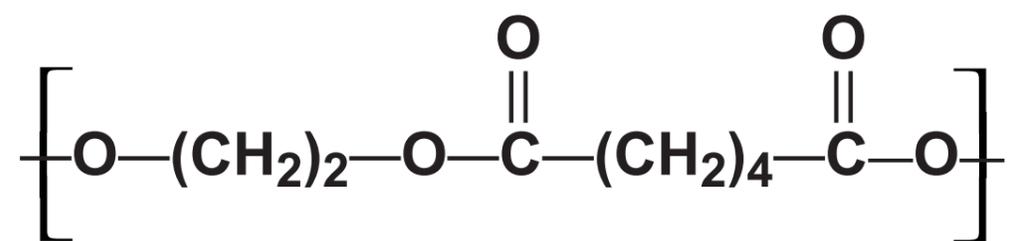
Structure A



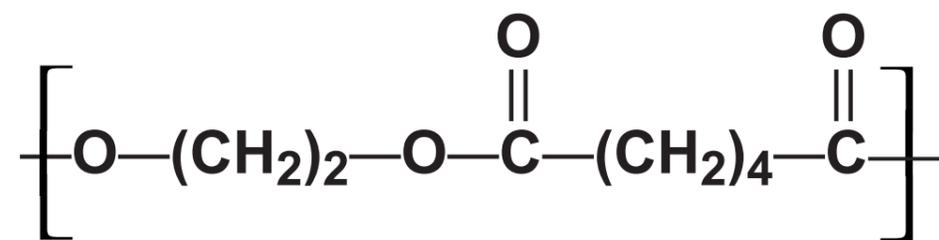
Structure B



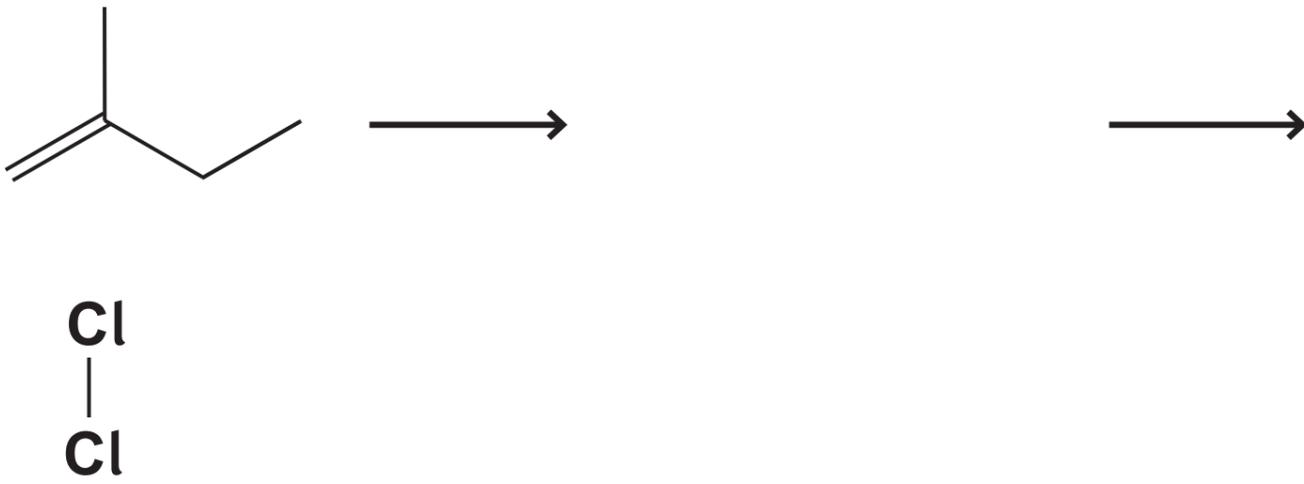
Structure C



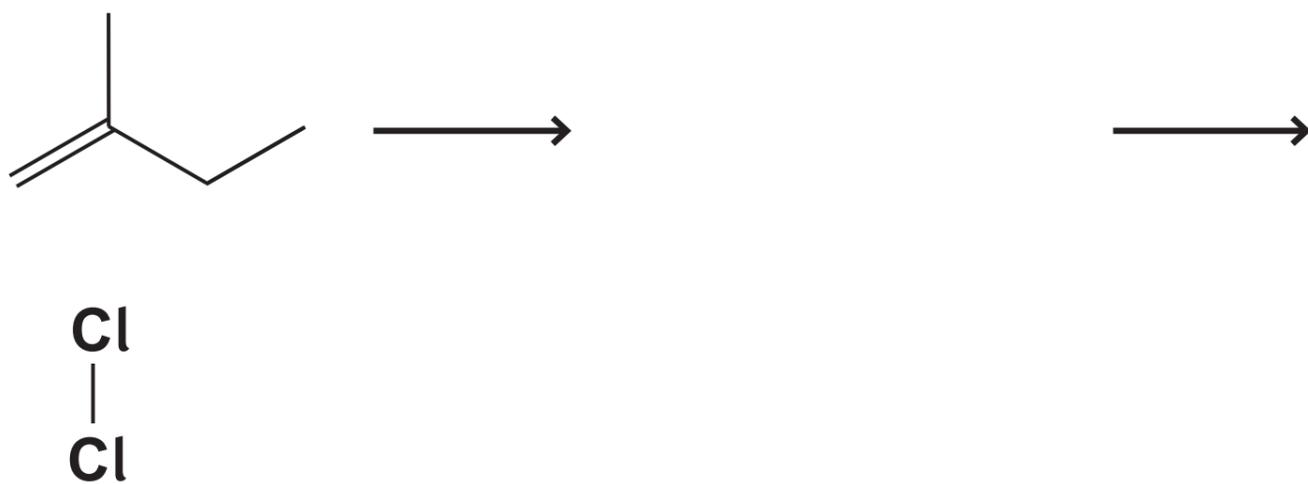
Structure D



Question 3(a)

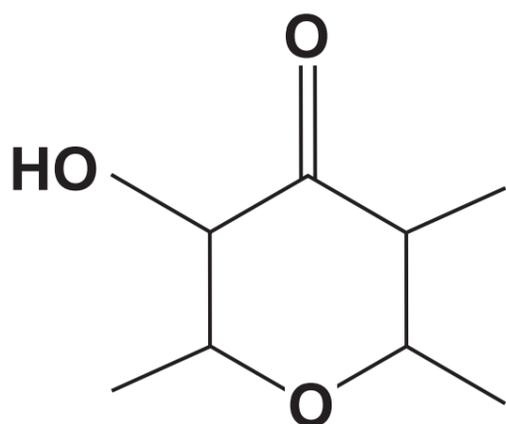


Question 3(a)

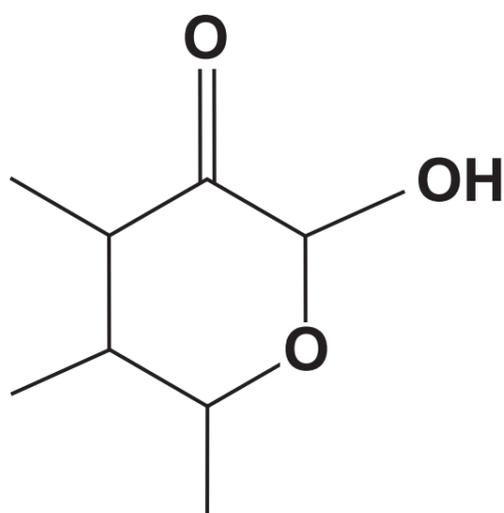


Question 6(a)

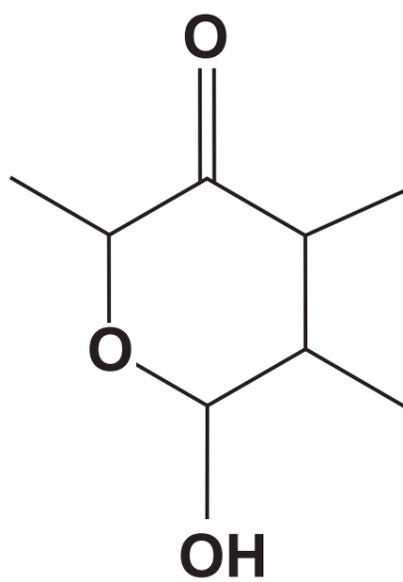
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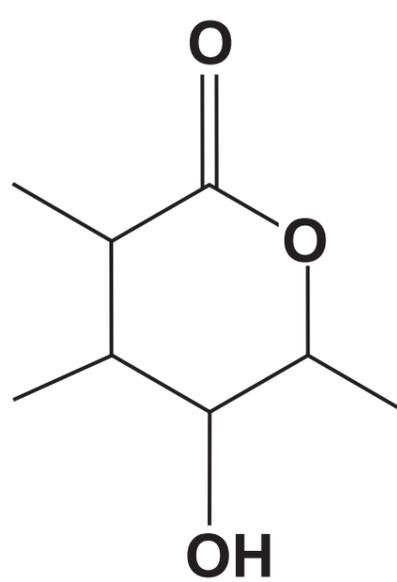
Structure B



Structure C

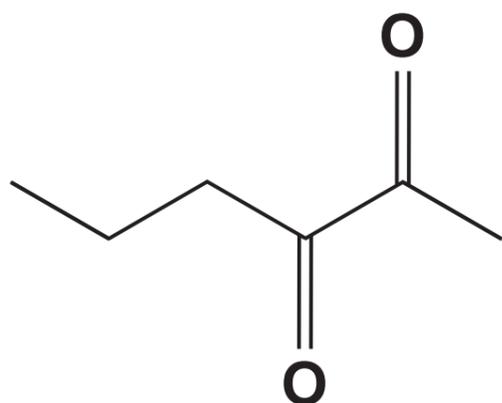


Structure D

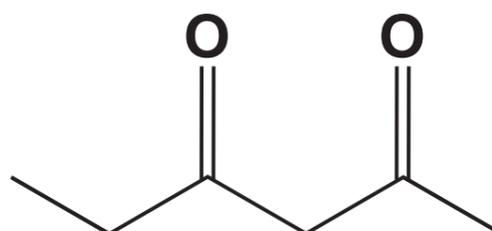


Question 6(b)

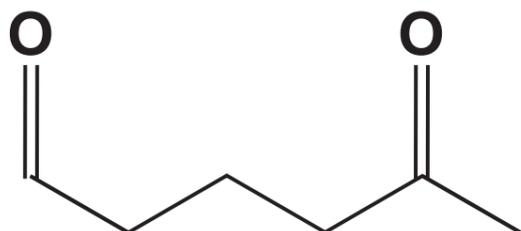
Structure A



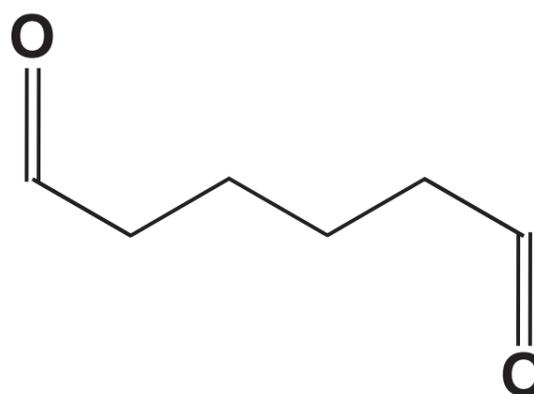
Structure B



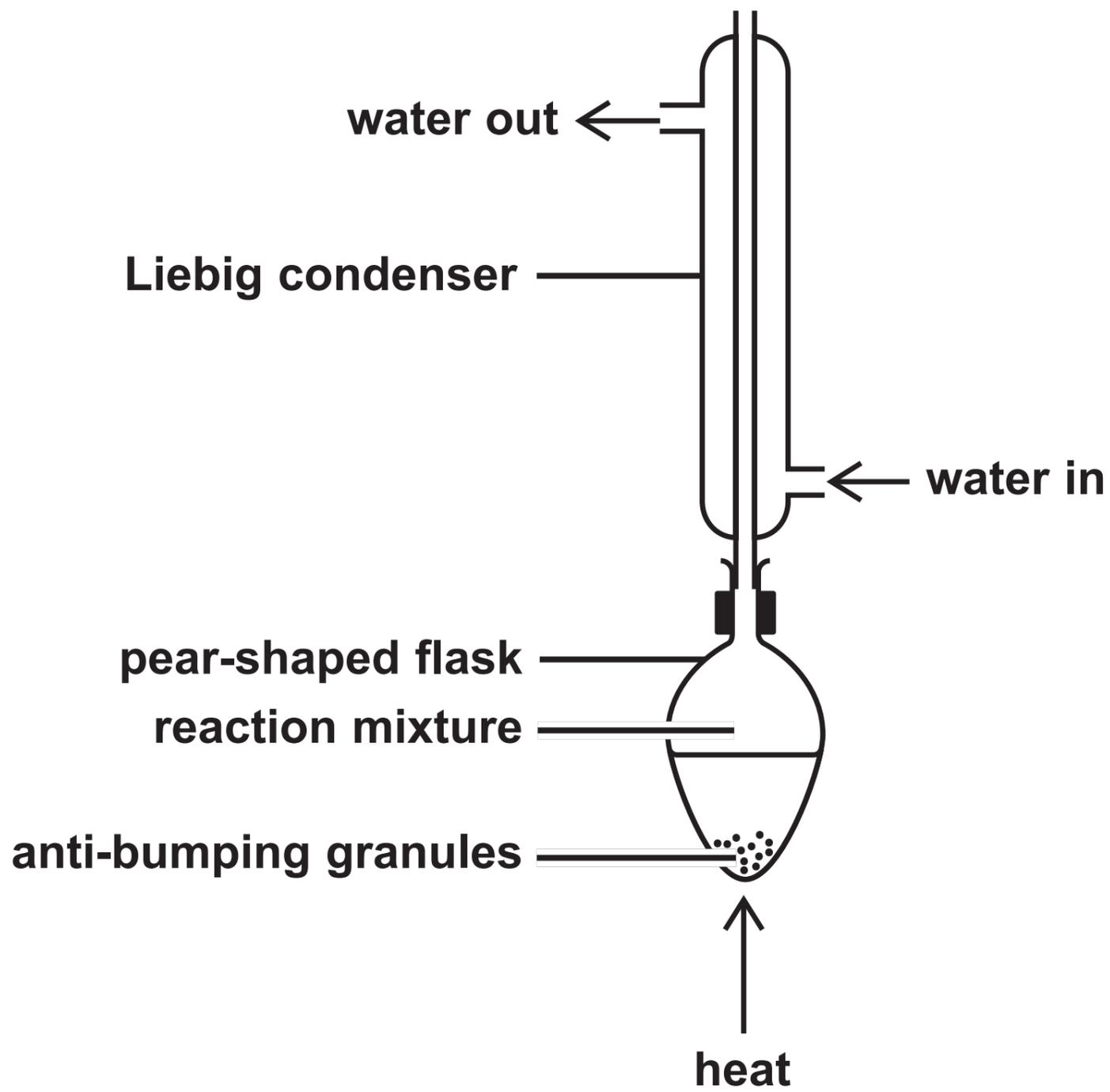
Structure C



Structure D



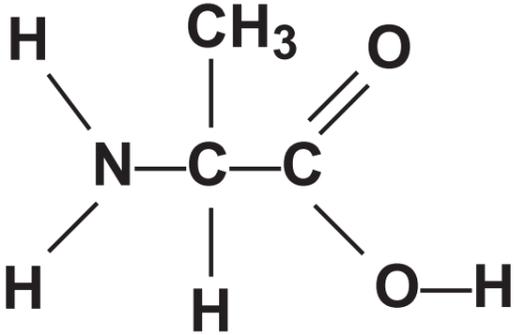
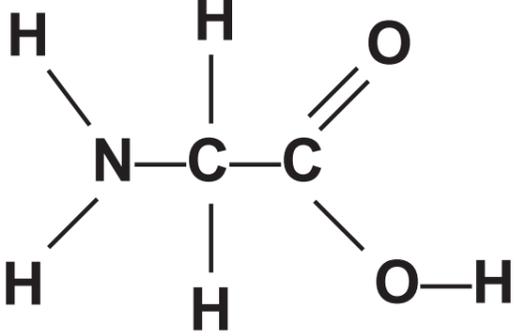
Question 6(c)(i)



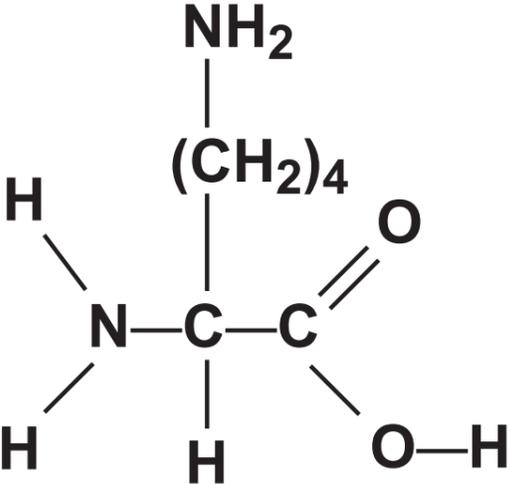
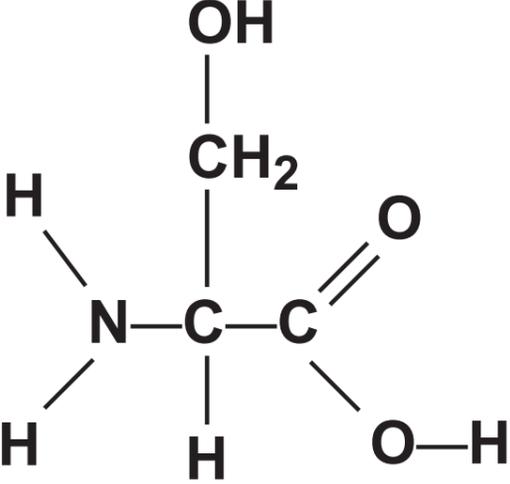
Question 6(d)

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

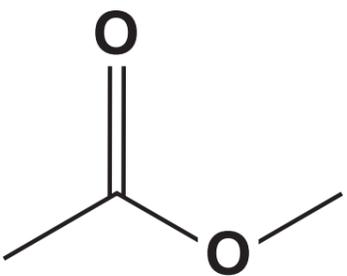
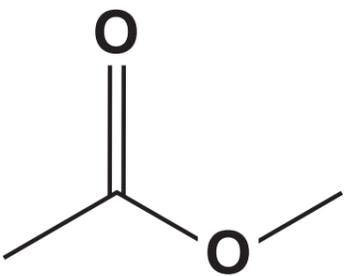
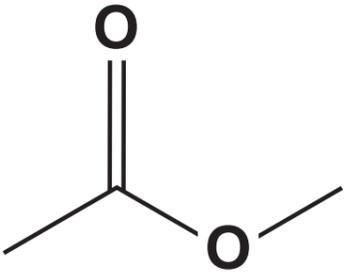
Question 7(c)

| Amino acid | Structure |
|------------|--|
| alanine |  <p>The structural formula of alanine shows a central alpha-carbon atom bonded to a hydrogen atom (H) on the left, a methyl group (CH₃) above, a hydrogen atom (H) below, and a carboxyl group (COOH) on the right. The nitrogen atom (N) is bonded to two hydrogen atoms (H), one above and one to the left, and is also bonded to the alpha-carbon. The carboxyl group consists of a carbon atom double-bonded to an oxygen atom (O) above and single-bonded to a hydroxyl group (OH) to the right.</p> |
| glycine |  <p>The structural formula of glycine shows a central alpha-carbon atom bonded to a hydrogen atom (H) on the left, a hydrogen atom (H) above, a hydrogen atom (H) below, and a carboxyl group (COOH) on the right. The nitrogen atom (N) is bonded to two hydrogen atoms (H), one above and one to the left, and is also bonded to the alpha-carbon. The carboxyl group consists of a carbon atom double-bonded to an oxygen atom (O) above and single-bonded to a hydroxyl group (OH) to the right.</p> |

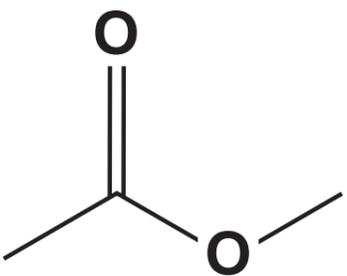
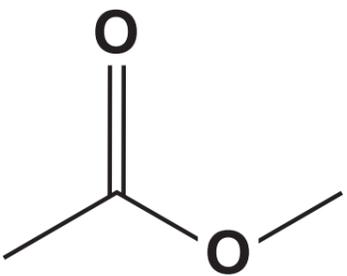
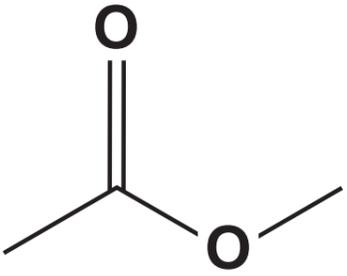
Question 7(d)

| Amino acid | Structure of amino acid |
|------------|--|
| lysine |  <p>The structure of lysine is shown as a central alpha-carbon atom bonded to a hydrogen atom (H) below, an amino group (NH₂) above, a carboxyl group (COOH) to the right, and a four-carbon side chain (CH₂)₄ above. The amino group is bonded to two hydrogen atoms (H) on the left. The carboxyl group consists of a carbon atom double-bonded to an oxygen atom (O) above and single-bonded to a hydroxyl group (OH) to the right.</p> |
| serine |  <p>The structure of serine is shown as a central alpha-carbon atom bonded to a hydrogen atom (H) below, an amino group (NH₂) above, a carboxyl group (COOH) to the right, and a hydroxymethyl group (CH₂OH) above. The amino group is bonded to two hydrogen atoms (H) on the left. The carboxyl group consists of a carbon atom double-bonded to an oxygen atom (O) above and single-bonded to a hydroxyl group (OH) to the right.</p> |

Question 8(f)(i)



Question 8(f)(i)



Question 9(c)

| Time / s | Concentration of ethanal / mol dm⁻³ |
|-----------------|---|
| 0 | 0.72 |
| 420 | 0.36 |
| 1260 | 0.18 |

Question 9(e)

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

Question 9(e)

| Temperature (T) / K | 1 / Temperature (1/T) / K ⁻¹ | Rate constant (k) / units in (b) | ln k |
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