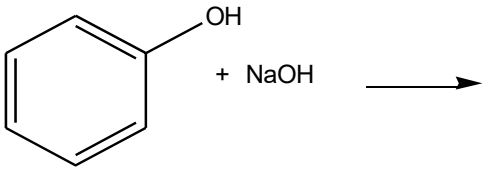
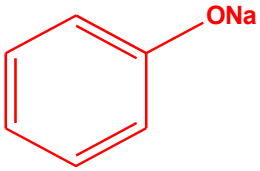
Q12 Alcohols, amines, related compounds **[1 + 4 + 2 = 7 marks]**

a) Draw the organic product of the following reaction:

[1 mark]

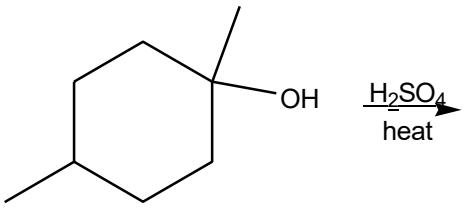


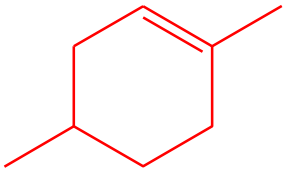


Water does not have to be shown
It is acceptable to show just the phenoxide ion without the sodium ion

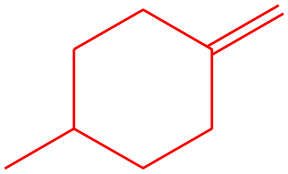
b) i) Draw the structure of the major organic product of the reaction of the following compound as indicated. You do not have to name the products.

[2 marks]





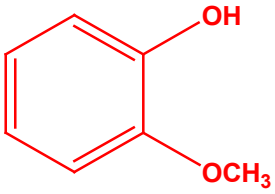
2 marks for structure of major product



1 mark for structure of minor product

ii) Draw a line structure for the following compound:

[1 mark]

2-methoxyphenol	

1 mark if completely correct
½ mark any phenol

Q12 (continued) Alcohols, amines, related compounds **[1 + 4 + 2 = 7 marks]**

c) Assign the appropriate boiling point to each of the compounds shown below.

The boiling points are – 42 °C, – 24 °C, 78 °C and 118 °C

Explain why you chose these boiling points.

[2 marks]

CH_3CH_2OH	CH_3OCH_3	$CH_3CH_2CH_3$	CH_3COOH
78 °C	**– 24 °C**	**– 42 °C**	**118 °C**

The alkane has only dispersion forces of attraction so will have the lowest boiling point.
The ether is slightly polar so will have dispersion and dipole-dipole forces of attraction.
The alcohol and the carboxylic acid will have dispersion forces, dipole-dipole and H-bonding forces of attraction, so will have higher boiling point that the ether.
The carboxylic acid has the highest boiling point because it can form more intermolecular H-bonds that the alcohol can.
(or similar statements about strength of intermolecular forces)

1 mark for correct choice, 1 mark for explanation

The textbook says:

As intermolecular forces and molecular size increases, so does the boiling point. Only dispersion forces are present in non-polar propane so this has the lowest boiling point. Dimethyl ether has additional dipole intermolecular forces so it has a higher boiling point than propane. Both ethanol and acetic acid have intermolecular hydrogen bonding interactions, these being greater for acetic acid than for ethanol due to both oxygen atoms of the carboxylic acid functional group able to participate in intermolecular hydrogen bonding. Thus, acetic acid has the highest boiling point.