OCR
Oxford Cambridge and RSA

AS Level Chemistry A

H032/01 Breadth in chemistry

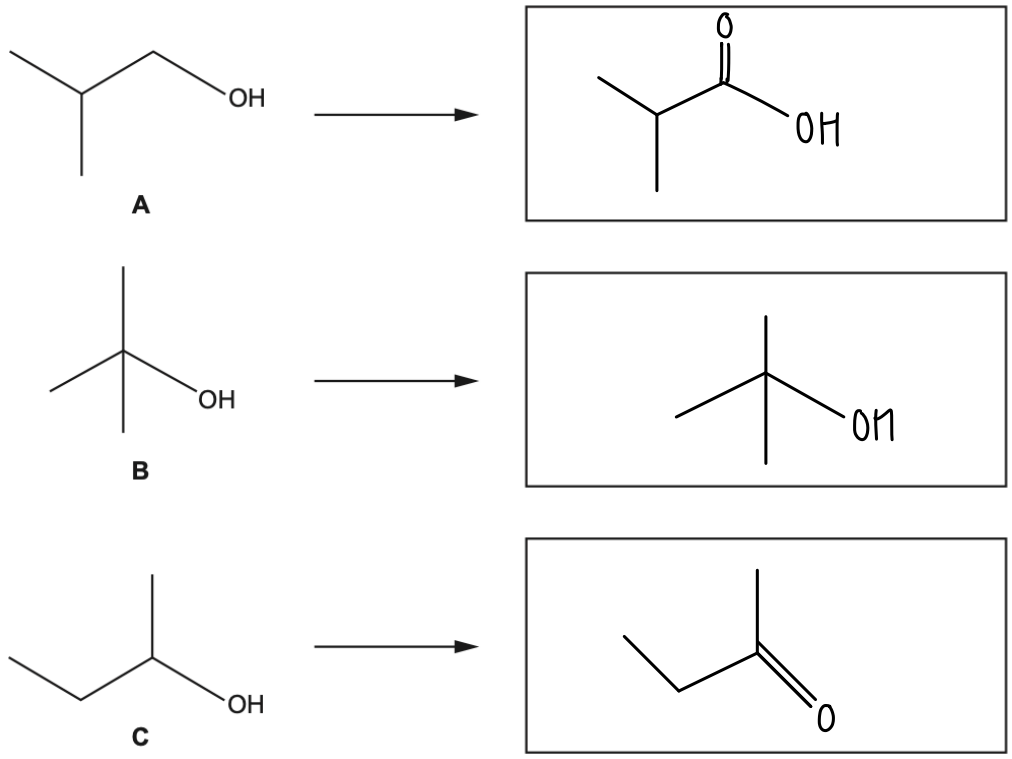
Question Set 22

1. This question is about alcohols and alkanes.

(a) Three alcohols **A**, **B** and **C** are structural isomers of $C_4H_{10}O$.

Each alcohol is refluxed with acidified potassium dichromate(VI), $H^+/Cr_2O_7^{2-}$.

(i) Draw the structures for the organic products.
If there is no reaction, write '**NONE**'.



[3]

(ii) Write the systematic name for alcohol **C**. butanone

[1]

(iii) Complete the equation below for the complete combustion of alcohol **A**.

$C_4H_{10}O$ ..... + $6O_2$ ..... → ..... $4CO_2$ ..... + ... $5H_2O$ .....

[1]

(b) Under suitable conditions, butane, C_4H_{10}, reacts with chlorine by radical substitution.
A mixture of organic compounds is formed, including C_4H_9Cl, and compounds **D** and **E**.

(i) Complete the table below to show the mechanism for the initiation and propagation stages of the reaction of C_4H_{10} with chlorine to form C_4H_9Cl.

Initiation	Equation $Cl_2 \longrightarrow 2Cl\bullet$ Conditions UV light
Propagation	$C_4H_{10} + Cl\bullet \rightarrow \bullet C_4H_9 + HCl$ $\bullet C_4H_9 + Cl_2 \rightarrow C_4H_9Cl + Cl\bullet$

In your equations, use molecular formulae and 'dots' (•) with any radicals. **[3]**

(ii) Organic compound **D** is formed by substitution of **all** the H atoms in butane by Cl atoms.

Write the equation for the formation of compound **D** from butane.Use molecular formulae. $C_4H_{10} + 5Cl_2 \longrightarrow C_4Cl_{10} + 5H_2$ **[1]**

(iii) Organic compound **E** is formed by the substitution of **some** of the H atoms in butane by Cl atoms.

A chemist found that 0.636 g of compound **E** has a volume of 78.0 cm^3.Under the conditions used, the molar gas volume is 32.5 $dm^3\,mol^{-1}$.

↳ 0.078 dm^3

Determine the molecular formula of compound **E**. **[3]**

iii) 1 mole of any gas at RTP occupies $24\,dm^3$.

$32.5\ dm^3 = 1$ mole

$1\ dm^3 = \frac{1}{32.5}$ moles

$0.078\ dm^3 = 2.4 \times 10^{-3}$ moles

$\text{moles} = \frac{\text{mass}}{Mr} \Rightarrow Mr = \frac{\text{mass}}{\text{moles}} = \frac{0.636}{2.4 \times 10^{-3}} = 265$

$\rightarrow Mr = 265$

Mr of $C_4H_8Cl_2 = 127$

$C_4H_6Cl_4 = 196$

$C_4H_4Cl_6 = 265$ → $C_4H_4Cl_6$

Total Marks for Question Set 22: 12