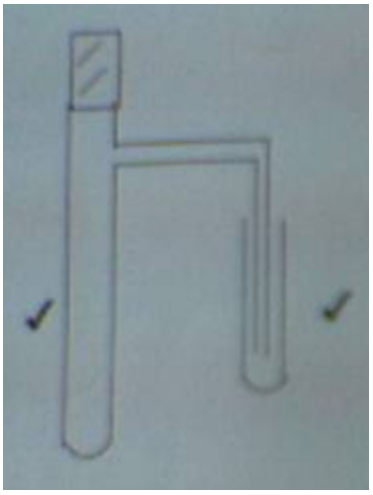
June 2001 Unit 2

1)a)



Left hand apparatus (1)
ACCEPT conical flask, if bung is missing lose mark
Gas collection/good drawing(1)
Delivery tube must be in test-tube
ACCEPT Syringe
Collected over water(0)
Totally closed(0)

b) i) **White** fumes/gas/clouds/smoke/solid/vapour

ii) NH_3 + HBr □ $NH_4Br/NH_4^+Br^-$

c) Yellow/red/brown/orange/
vapour/gas/fumes/liquid

d) i) C_6H_{10} + HBr □ $C_6H_{10}Br$
(1) (1)

ii) Cyclohexene/liquid/rises/sucked up the tube

e) i) Chlorine/Cl_2
Sodium chloride/NaCl
Silver chloride/AgCl
ACCEPT name or formula

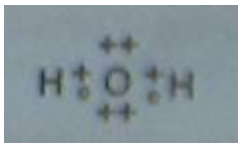
ii) $Ag^+(aq)$ + $Cl^-(aq)$ □ AgCl (s)

Entities (Ag^+ , Cl^-, AgCl)
States – only award if the entities are correct

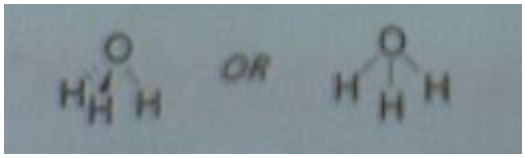
iii) Precipitate darkens OR colour changes to
silver/grey/purple/green/blue/violet/lilac/black

2)a) i)$H_2O(g)$ □ $2H(g) + O(g)$

ii) (+) 464 ($KJ\ mol^-$)

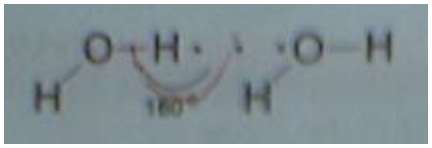
iii) 

b) i) Dative (covalent)

ii) 

iii) The bond angle (107°) is greater
as there is only one non-bonding pair of electrons/two bonding pairs in water

3)a) i) Hydrogen (bonds)

ii) 

Different bonds between O and H
180° with poor diagram is acceptable OR O … H-O in straight line

iii) Van der Waals
Instantaneous/flickering dipole/induced dipole
Forces/oscillating dipoles
OR
(permanent) dipole-dipole (forces)
Polar C-Br bond/opposite charges on C-Br/Br is more electronegative

iv) Van der Waals forces in 1-bromobutane/hydrogen bonds in water are **too** strong/no strong interaction between water and 1-bromobutane

OR discussion of energy charges
OR reasonable alternative

b) i) Ethanol/heat/reflux

ii) $C_4H_9Br + H_2O$ □ $C_4H_9OH/C_4H_{10}O + HBr/H^+ + Br^-$

iii) Nucleophile

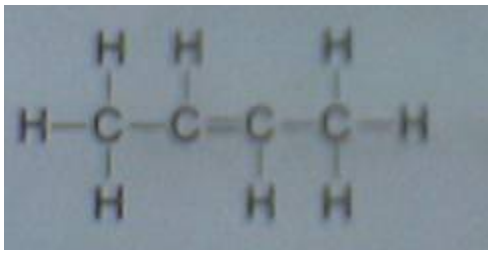
` iv) Substitution/Hydrolysis

4)a) i) Provides alternative routes
With lower activation energy.
Provides surface for the reaction

ii) Decreases/increases amount/yield $C_{12}H_{26}$
Increases/increase amount/yield C_4H_8/C_8H_{18}

b) i) $CH_3CH_2CHCH_3$ OR $CH_3\text{-}CH_2\text{-}CH{=}CH_2$

ii)



Trans but-2-ene (correct name for isomer)
OR cis isomer

c) i) $C_2H_4 + H_2SO_4$ □ $CH_3CH_2OSO_3H/C_2H_6SO_4$

ii) H^+/ hydrogen ion/$H^+(aq)$/proton

iii) Alcohols/surfactants/detergents

d) i) +2
ii) -2
-1

iii) Look for transfer of ten electrons/change of ten units of oxidation number

5)a) To condense (alternatives possible, must be clear eg cool) (1 mark)

The spirit/whisky/vapour.

b) He showed that the temperature did not change when a liquid boiled or evaporated (1)
but heat was needed for the change/experiment/reaction (1)
to take place (2 marks)

c) Fixed air. (1 mark)

d) Both are carbonates.
OR both give off the **same** gas /**carbon dioxide** when
Heated/reacted with acids (1 mark)

e) $CO_2(g) + Ca(OH)_2(aq) \rightarrow CaCO_3 + H_2O$ (l)
(1) (1) (2 marks)

f) **Key Points**

1. He found that the same gas (can be implied)/carbon dioxide, was given off when **magnesia or chalk/2 of the group 2 carbonates** were added to acid

2. and when **magnesia or chalk** were **heated/thermally decomposed**

3. This gas combined with limewater/calcium hydroxide solution to form chalk.
NB: Limewater going milky is **not** acceptable

4. He **heated** a (known) **mass** (can be implied) of **chalk** to form **quicklime**.

   Slaked lime(formed by the addition of water to quicklime)reacted with **'fixed air'** to form (the starting mass/weight of) **chalk**(after driving off the water)
   MUST make chemical sense!

   'Fixed air' behaved as an acid neutralizing/reacting with an **alkali/sodium hydroxide/potassium hydroxide**

   It was formed when **charcoal** was **reacted with/heated in air/burned**

   And in experiments when **animals respire**/breathe (out).