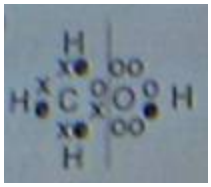
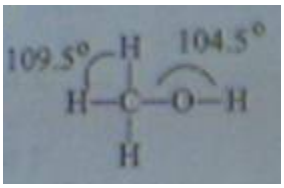
May 2002 Unit 2

1)a) 

(1) (1)

b) 

1 mark for each angle

c) $CH_4O/CH_3OH(l) + 1.5O_2(g) \rightarrow CO_2(g) + 2H_2O(l)/(g)$ OR doubled
ALL four state symbols needed
Formulae (1)
Balancing, state symbols (1)

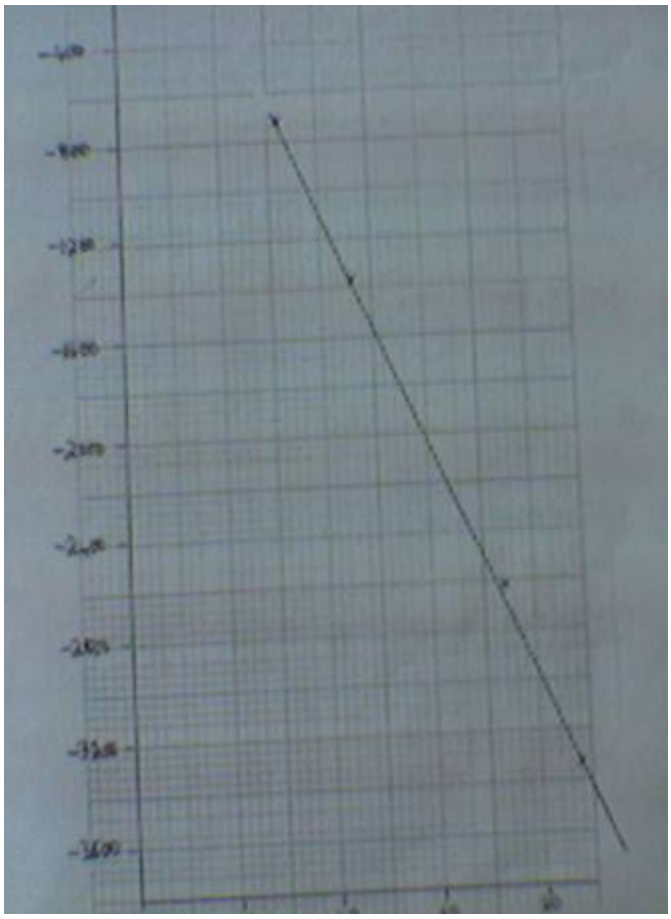
d) Bonds broken
3 x C-H = +1239
1 x C-O = +358
1 x O-H = +464
1.5 x O=O = +747 } (1)
TOTAL = +2808 KJ mol (1)

Bonds made
2 x C=O = -1610
4 x O-H = -1856 } (1)
TOTAL = -3466 KJ mol (1)

$\Delta H^+ = -3466 + 2808 = -658$ KJ mol (1)

Bond energies only averages
Water/Methanol is a liquid (bond energies refer to gaseous state)
Intermolecular forces not taken into account in (d)

2)a) i)



Axes labelled correctly with suitable scales (1)

- Vertical axes must be ΔH^{e},
- Must have –ve values going downwards
- Must cover half the graph paper
- Must be linear scaled

Points plaotted correctly with appropriate straight line (1)

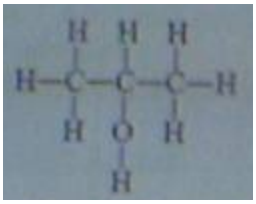
ii) 60 g mol

iii) between -2000 and -2050 KJ mol

iv) Linear because each molecule differs by the same amount(CH_2)
The larger the molecule the more energy released

b) i) Hydrogen bonding
Dipole-dipole interactions

Van der Waals forces

ii) 

iii) Van der Waals forces
Lower boiling point
Forces weaker because of branched chain/less contact between molecules

3)a) i) Unsaturated substances (tetrafluoroethene) contain a C=C/double bond (1)

Saturated substances (dichlorofluoromethane) contain only single bonds (1)

2 marks

ii) Add bromine (water) (1)

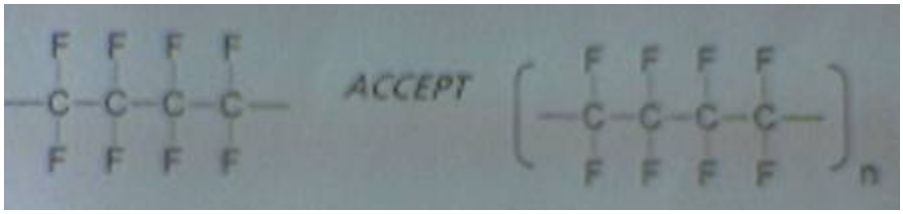
The unsaturated substance (tetrafluoroethene) would decolourise the bromine (water) (1)

ACCEPT Acidified $KMnO_4$ purple to colourless (2) 2 marks

b) i) $CCl_4 + 2HF \rightarrow CCl_2F_2 + 2HCl$
Formulae (1)
Balancing (1) 2 marks

ii) An atom/group of atoms/species/substance with an unpaired/odd/uneven (number of) electron. (1)

$CCl_2F_2 \rightarrow CClF_2\bullet + Cl\bullet$
(1) (1) (2)

c) i) 

Carbons (1)
Fluorines (1)

ii) Contains C-F strong bonds

4)a) Sodium ion

b) i) iodine ion

ii) $Ag^+(aq) + I^-(aq) \rightarrow AgI(s)$
Formula (1)
State symbols (1)

c) i) Iodine / I_2 or I_2^-

ii) -1

iii) $2I + H_2O_2 + 2H^+ \rightarrow I_2 + 2H_2O$
Formulae (1)
Balancing (1)

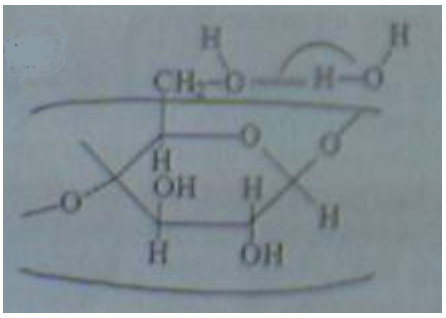
d) Hydrogen iodide
Hydrogen sulphide

5)a) i) Alcohol (1)
Aldehyde (1)
2 marks

ii) H_2O/ water 1 mark

b) i) OH groups OR lone pairs available on oxygen
OR hydrogen atoms attached to (electronegative) oxygen

ii) eg



(1) 180° (1)
Angle must be correctly shown.

2 marks

c) 30 1 mark

d) Answer up to 6 marks.

1. Cellulose fibres roughed up (in a machine like a blender) / fibrillated (1)

2. This provides more surface area to which the (waterproofing) chemicals can bond. (1)

3. Aluminium sulphate (precipitates) abietic acid from rosin (1)

4. which is a water repellent substance (1)

5. Alkaline agents used are alkyl kentene dimers and (alkyl) succinic (1)

6. (waterproofing) chemical bonds to the cellulose preventing the formation of hydrogen bonds with water (1)

7. so sealing the surface pores (1)

8. Alkaline agents consist of hydrophilic groups that chemically bond to cellulose fibres with hydrophobic groups on the other end (1)

9. Alkaline preferred because paper lasts longer NOT just reference to acidic method (1)

Any six