K.C.S.E. 2008 CHEMISTRY PAPER 2
MARKING SCHEME

1. (a) (i) Contain methane which is fuel. (1 mark)

(ii) Pass a known volume of biogas through dissolved NaOH or KOH/$Ca(OH)_2$. CO_2 will be absorbed or CH_4 will not be absorbed. Measure volume of CH4.

$$\frac{\text{Volume of Methane}}{\text{Volume of Biogas}} \times 100$$

(3 marks)

(b) (i) No. of moles of methane $= \frac{35.2 \times 5 \times 1000}{100 \times 16}$

$= 110$ (2 marks)

(ii) $CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$

$110 \times 24 = 2640$ (2 marks)

(c) (i) global warming (1 mark)

(ii) I - Ammonium nitrate (1 mark)
II - Aerosals, propellent (1 mark)

2. (a) (i) $2KNO_{3(s)} \xrightarrow{\text{heat}} 2KNO_{2(s)} + O_{2(g)}$ (1 mark)

(ii) $2AgNO_{3(s)} \xrightarrow{\text{heat}} 2Ag_{(s)} + 2NO_{2(g)} + O_{2(g)}$ (1 mark)

(b) (i) Period 2
Two energy levels (2 marks)

(ii) I Across the period from left to right nuclear charge increases.
Exert greater pull on electron hence reduction in size. (2 marks)

II A_4 gains an electron. Incoming electron is repelled by existing electron (2 marks)

(iii) A_2 (1 mark)

(iv) $[A_1]^+$ $\left[\begin{matrix} \times & \times \\ \times & A_4 & \times \\ \times & \times \end{matrix}\right]^-$

3. (a)
- Filter the air/electrostatic precipitation/purify the air
- Pass air through NaOH or KOH to remove CO_2.
- Cool to remove water vapour
- Cool the remaining gases to form a liquid air.
- Perform fractional distillation of liquid air.
- Nitrogen is collected as -196°C. (4 marks)

(b) (i) Nitrogen II oxide (NO) (1 mark)

(ii) $4NH_{3(g)} + 3CuO_{(s)} \longrightarrow 2N_{2(s)} + 3H_2O_{(l)} + 3Cu_{(s)}$ (2 marks)

(iii) $NH_4NO_{3(s)} \longrightarrow N_2O_{(g)} + 2H_2O_{(l)}$ (1 mark)

(iv) Fertilizer/explosive (1 mark)

(c) (i) G or G^{2+} (1 mark)

(ii) $E^{2+}_{(aq)} + 2OH^-_{(aq)} \longrightarrow E(OH)_{2(s)}$ (1 mark)

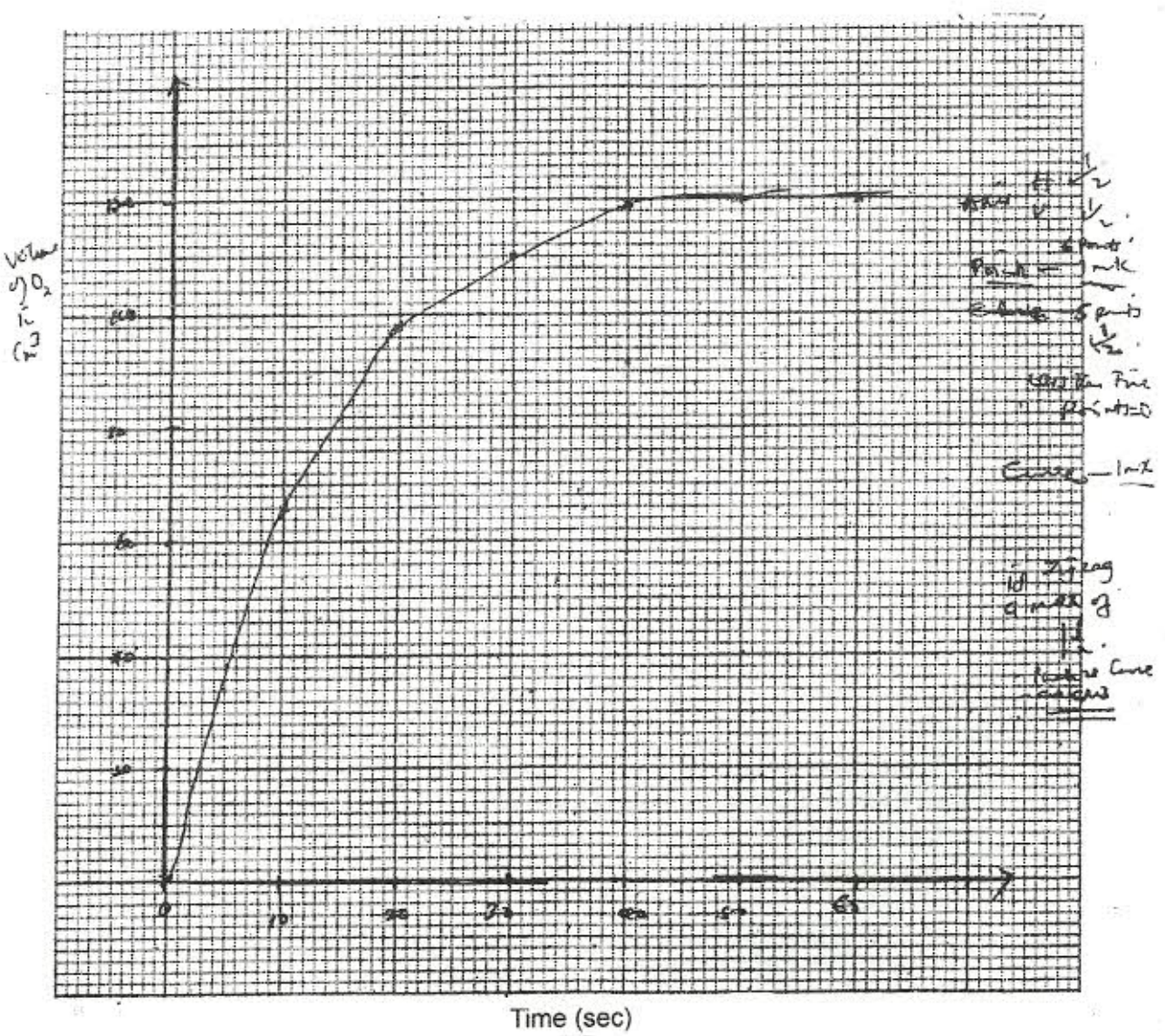
4. (a) (i) When a change is made to a system in equilibrium the system moves so as to oppose the change. (1 mark)

(ii) Pressure has no effect to equilibrium. The moles/volume/molecules of gases in reactants and product are equal. (2 marks)

(iii) ΔH -ve (negative). Since lowering of temperature moves to equilibrium to direction which heat is produced. Decrease in temperature favours exothermic reaction. (2 marks)

(b) (i) Manganese IV Oxide

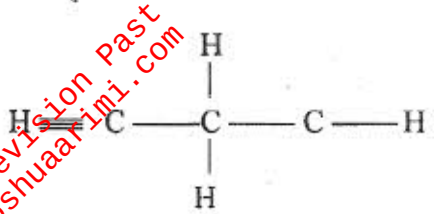
(ii)



(iii) Draw tangent at any time above 24 sec. / between 24th sec. and 40th sec. (2 marks)

(iv) The reactants has been used up (1 mark)

5. (a)

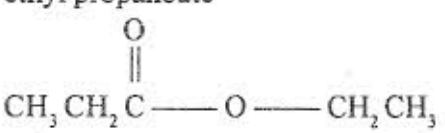


$CHCCH_3$ (1 mark)

(b) (i) - Heat
- Catalyst (1 mark)

(ii) Ethane, CH_3CH_3, C_2H_6 (1 mark)

(iii) I - pollutes environment/produces poisonous gases when burnt (1 mark)
II - hydration (1 mark)
III - ethyl propanoate



(2 marks)

(c) (i) M or C_3H_6
- M is unsaturated/M is alkene (2 marks)

(ii) N is an acidic compound/alkanoic acid (2 marks)

6. (a) (i) OH^- migrate to anode, OH^- discharged to form oxygen.
OR
$4OH^-_{(aq)} \longrightarrow 2H_2O_{(l)} + O_{2(g)} + 4e^-$
OH^- oxidised to produce oxygen gas (2 marks)

(ii) - Copper anode could dissolve to give Cu^{2+}.
- Oxidation of copper is more energetically favourable than oxidation hydroxide ions. (2 marks)

(b) (i) copper pyrite (1 mark)

(ii) $Cu^{2+}_{(aq)} + 2e^- \longrightarrow Cu_{(s)}$ (1 mark)

(iii) $Q = IT \quad 0.5 \times 18 \times 60 = 540c$

$$\frac{108 \times 540}{96500} = 0.604g$$

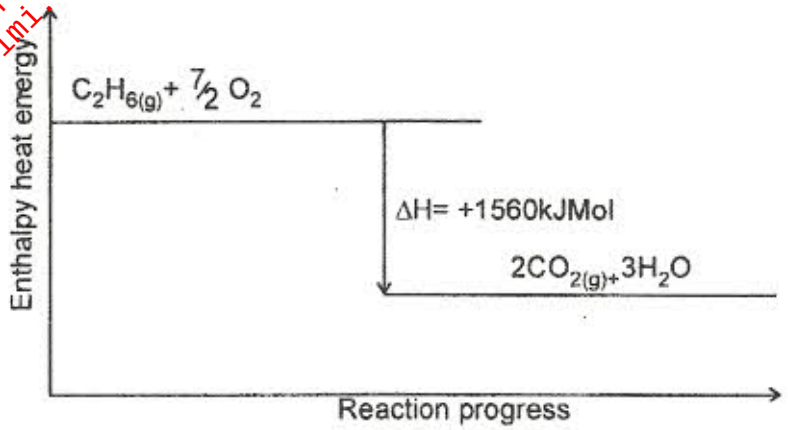
(3 marks)

(iv) - prevent corrosion
- decoration/improve appearance
- prevent turning of metals (2 marks)

7. (a) The heat change when mole of substance is formed from its constituent elements. (1 mark)

(b) (i) - Heat of combustion of hydrogen
- Heat of formation of water/steams (2 marks)

(ii)



(3 marks)

(iii) $2CO_{2(g)} + 3H_2O_{(l)} \longrightarrow C_2H_{6(g)} + \frac{7}{2}O_{2(g)} \quad \Delta H = 1560kJ/mol$

$2C_{(s)} + 2O_{2(g)} \longrightarrow 2CO_{2(g)} = -788kJ$

$3H_2 + \frac{3}{2}O_{2(g)} \longrightarrow 3H_2O_{(g)} = -858kJ$

$2C_{(s)} + 3H_{2(g)} \longrightarrow C_2H_{6(g)} \; -86kJ/mol$ (2 marks)

(iv) I Heat produced $= \frac{500 \times 21.5 \times 4.2}{1000}$

$= 45.15$ (2 marks)

II Moles of ethene $= \frac{45.15}{1560} = 0.02894$

$= 0.02894 \times 30$

$= 0.868$ (2 marks)