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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)

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(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)

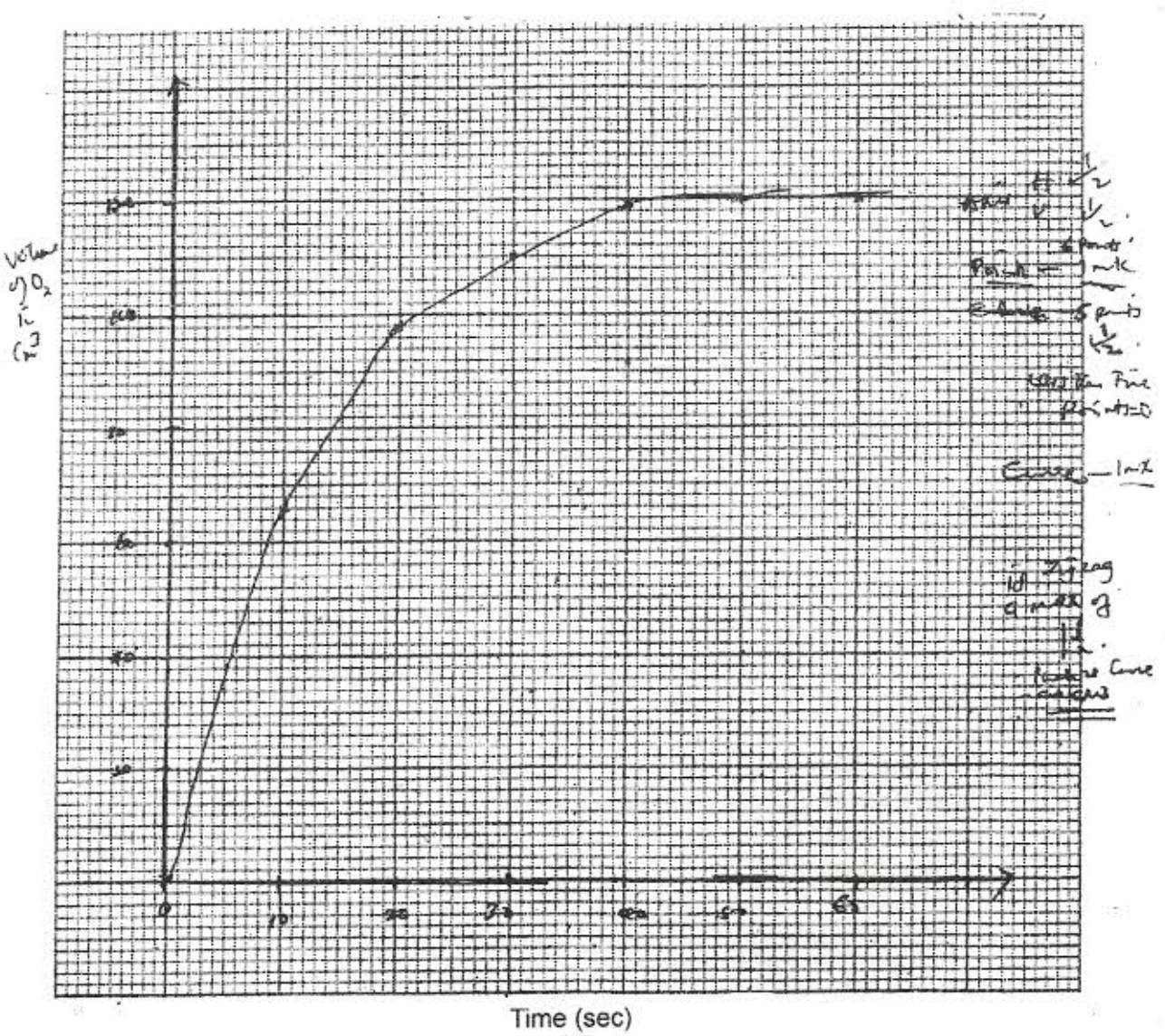
4. (a) (i) When a change is made to a system in equilibrium the system moves so as to oppose the change. (1 mark)

(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)



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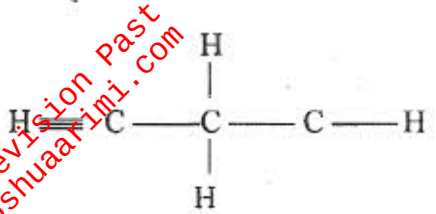
(iii) Draw tangent at any time above 24 sec. / between 24th sec. and 40th sec. (2 marks)

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

5. (a)

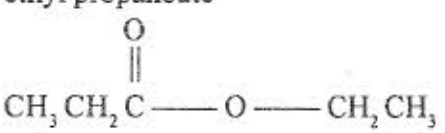


$CHCCH_3$ (1 mark)

(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)

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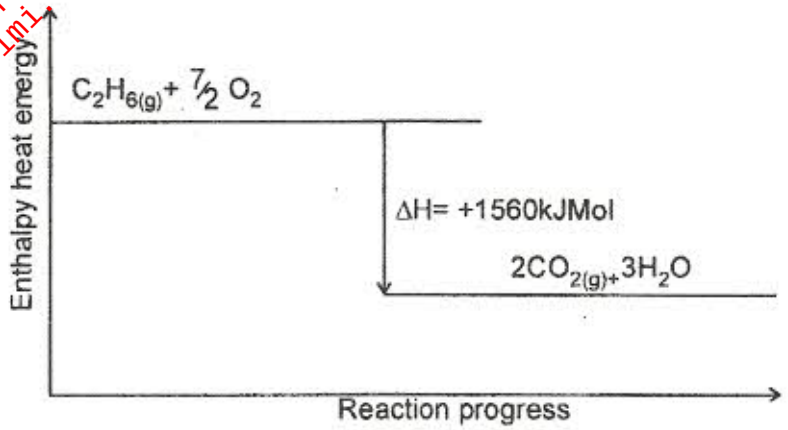
7. (a) The heat change when mole of substance is formed from its constituent elements. (1 mark)

(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)

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