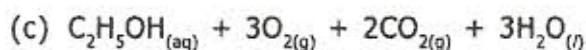## K.C.S.E. 2007 CHEMISTRY PAPER 233/2 MARKING SCHEME

1. (a) - The type of flame produced
   - Amount of heat energy produced

   (b) (i) Heat produced $= MC\Delta T$
   $\Delta T = 46.5 - 25 = 21.5^0C$
   $\Delta H = 450 \times 4.2 \times 21.5 = 40635$ Joules

   (ii) Moles of ethanol $= \dfrac{1.5}{46} = 0.0326$

   Molar heat $= \dfrac{40635}{0.0326} = 1246472.392$ Joules

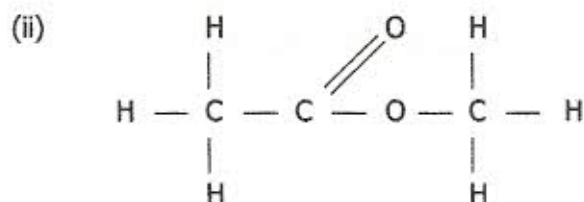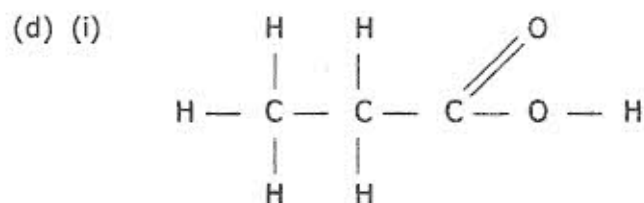   (c) $C_2H_5OH_{(aq)} + 3O_{2(g)} + 2CO_{2(g)} + 3H_2O_{(l)}$

   (d) - Heat less by radiation, conduction and convectional current.
   - Experimental errors when reading thermometer.

2. (a) (i) 2 - Methyl-prop-i-ene
   Pent-i-yne

   (b) (i) Change from orange to green
   (ii) Effervescence and a colourless gas which burn with a 'pop' sound produced.

   (c) Step I
   Fermentation: glucose solution is mixed with yeast. The enzyme zymase from yeast convert glucose to ethanol.

   Step II
   Dehydration: Ethanol is mixed with concentrated sulphuric acid and heated in presence of Al_2O_3 as a catalyst.

   (d) (i)

   ```
         H   H      O
         |   |     //
   H — C — C — C — O — H
         |   |
         H   H
   ```

   (ii)

   ```
         H       O   H
         |      //   |
   H — C — C — O — C — H
         |           |
         H           H
   ```

   (e) Produced CO_2 which causes global warming.
   Produces acidic - compounds which causes acidic rain.

3. (a) (i) - Effervescence and browning gas produced
   - Blue solution formed

   (ii) Dilute HC*l* is not an oxidizing agent

   (iii) I $Cu_{(s)} + 4HNO_{3(aq)} \longrightarrow Cu(NO_3)_{4(aq)} + 2NO_{2(g)} + 2H_2O_{(l)}$
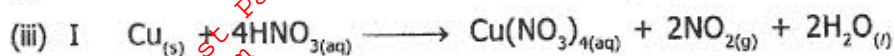
   II Moles of Cu $= \dfrac{0.5}{63.5} = 0.007874$

   Moles of $HNO_3 = 0.0067874 \times 4 = 0.31496$

   Volume of $HNO_3 = \dfrac{0.031496 \times 1000}{3} = 10.49 \text{ cm}^2$

   (b) Step 4 - Neutralization
   Step 5 - Displacement

   (c) Resistant to corrosion
   It is tough, 1 strong metal

4. (a) (i) Forward reaction is faster than the reverse reaction.
   (ii) I Production will reduce since equilibrium will shift backward so as to raise the pressure.
   II No change in amount of methanol since a catalyst will help reaction to come to equilibrium.
   (iii) I Negative: the reaction is exothermic since it requires low temperature to be fast.
   II To ensure that the reacting particles possesses more activation energy.

   (b) (i) No. of seconds $= 2 \times 60 = 120$ sec

   Moles of H_2O_2 decomposed
   $= 120 \times 6.0 \times 10^8 = 7.20 \times 10^6$

   Concentration of H_2O_2 may be higher since concentration increases the rate of reaction.
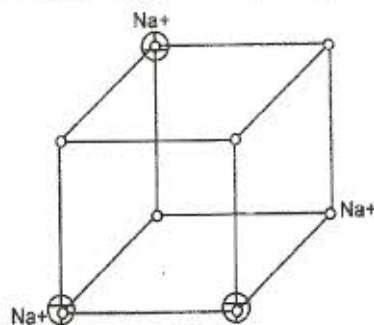
   (ii) The ions are not free at 25°C since the salt is in solid state but between 801°C and 1413°C the ions are free since electrostatic forces between the ions is overcomed.

   (b) Ammonia react with water to form ammonia solution.

   (c) Dative / co-ordinate bond

   (d) (i) Allotropes
   (ii) Add salt to methylbenzene, fullerence dissolves. Filter the mixture to remove the residue. Heat the filtrate to make it concentrated cool the solution slowly to get crystals.

(iii)   12 n = 720:
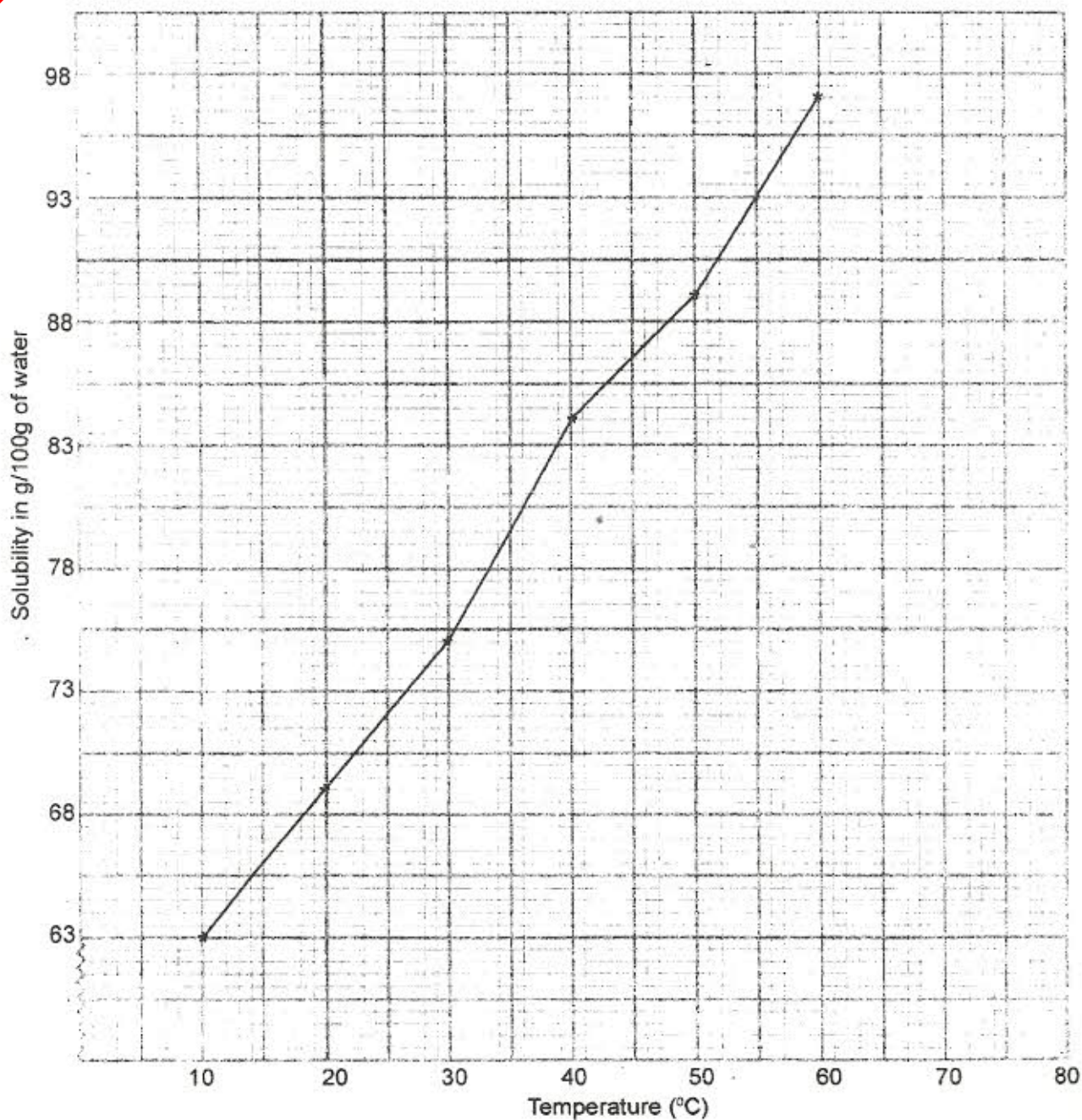
$$n = \frac{720}{12} = 60$$

m.f = C_{60}

6. (a) (i)   Put the mixture in a test tube and fresh prepared iron (II) sulphate solution.
Then add concentrated sulphuric acid to form a brown ring.

(ii)   RMM of $(NH_4)_2 HPO_4 = 132$

Percentage of (N) $= \dfrac{28 \times 100}{132} = 21.212\%$

Mass of (N) $= \dfrac{21.212 \times 25}{100} = 5.303 kg$

(b) (i)

253

(ii) 71g /100mm of water

(iii) 1. A solution which has dissolved a lot of solute till it can dissolve no more.

II. Mass of solution at 25^0C = 100 + 71 = 171g

$$\text{Mass in (g)} = \frac{1000 \times 71}{171} = 41.52g$$

(c) (i) Put soil in water in a beaker. To the mixture add a universal indicator.
Compare the colour change to the pH chart
(ii) Addition nitrogenic fertilizers which are acidic.

7. (a) Carry experiment in a fume cupboard
Chlorine should not be allowed to escape to the atmosphere

(b) Mno_2 or $K_2Cl_2O_7$

(c) General chlorine and drive out air which may combine with heat aluminium foil.

(d) Aluminium chloride sublimes when heated.

(e) (i) $2Al_{(s)} + 3Cl_{2(g)} \longrightarrow 2AlCl_{3(s)}$

$$\text{Moles of } Al = \frac{1.08}{27} = 0.04$$

$$\text{Moles of } Cl_2 = 0.04 \times \frac{3}{2} = 0.06$$

$$\text{Mass of } Cl_2 = 0.06 \times 71 = 4.26g$$

(ii) $\dfrac{3.47}{4.26} \times 100 = 81.45\%$

(f) Pass the vapour of phosphorous trichloride through a liebig condenser to condense it.