KENYA NATIONAL EXAMINATION COUNCIL

KCSE 2007

CHEMISTRY
PAPER 2
MARKING SCHEME

Coordinated by KENPRO,
Macjo Arcade, 4th Floor, Suite 15E,
Off Magadi Road, Ongata Rongai |Tel: +254202319748 |
E-mail:infosnkenya@gmail.com | Website:www.schoolsnetkenya.com

24.6.2 Chemistry Paper 2 (233/2)

1. (a)
   - Cost.
   - Availability.
   - Effects to the environment.
   - Heating value.
   - Ease of storage. ***(2 marks)***

   (b) (i) Mass of water 450 x 1 = 450g
   $\Delta T = 46.5 - 25.0 = 21.5^0C$
   Heat evolved =450 x 4.2 x 21.5
   =40635 Joules ***(3 marks)***

   (ii) Mass of ethanol used = 125.5 – 124.0
   = 1.5g
   R.M.M. of ethanol = 46
   1.5g of ethanol produces 40635
   Therefore, 46g of ethanol produces $\frac{40635}{1.5} \times \frac{46}{1000}$
   $= 1246.14 kJ\ mol^{-1}$ ***(2 marks)***

   (c) $C_2H_5OH_{(l)} + 3O_{2(g)} \rightarrow 3H_2O_{(l)} + 2CO_{2(g)}$ ***(1 mark)***

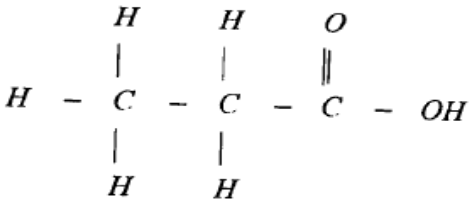
   (d)
   - Heat lost to the surroundings.
   - Error in reading the temperature or mass. ***(2 marks)***

2. (a) (i) 2- Methyl Prop-I-ene ***(1 mark)***
   (ii) Pentan-I-yne ***(1 mark)***

   (b) (i) The solution changes from orange to green. ***(1 mark)***
   (ii) A colourless odourless gas bubbles out. ***(1 mark)***

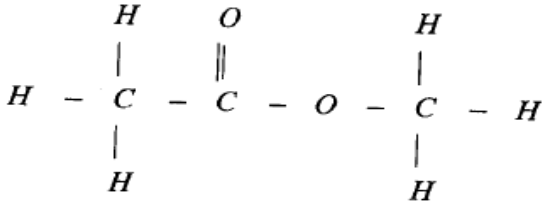
   (c) ***Step 1***: Fermentation.
   Process: Glucose is mixed with yeast at about 30^0C. It is changed to ethanol and CO_2 bubbles out. ***(1½ marks)***
   Step 2: Dehydration.
   Process: Ethanol is heated to 180^0C in the presence of sulphuric acid when it is dehydrated to ethene. ***(1½ marks)***

(d) (i)



(1 mark)

(ii)



(e) *(1 mark)*

- They produce poisonous gases to the environment.
- Produce gases with unpleasant smell.

(2 marks)

3. (a) (i) Brown gas.
Blue solution.

(2 marks)

(ii) It is not an oxidising agent and therefore has no effect on copper.

(1 mark)

(iii) I $C_{u(s)} + 4HNO_{3(aq)} \rightarrow Cu(NO_3)_{2(aq)} + 2NO_{2(g)} + 2H_2O_{(1)}$

(1 mark)

II Moles of $C_u = \frac{0.5}{63.5} = 0.007874$

Moles of $HNO_3 = 4x\ 0.007874 = 0.03149$

$\frac{3XV}{1000} = 0.03149$

$V = \frac{0.03149 \times 1000}{3}$

$= 10.5cm^3$

(3 marks)

(b) Step 4: Neutralisation.
Step 5: Displacement.

(1 mark)

(c)

- It does not corrode easily.
- It is ductile and has a high melting point.

(2 marks)

4. (a) (i) The rate of forward reaction is the same as that of the backward reaction or they are the same.

(1 mark)

(ii) I Reduction in pressure shifts the equilibrium to the left hence the yield of methanol decreases.

(2 marks)

II The yield remains the same. Catalysts only change the rate of attainment of equilibrium and not the amounts of species in the equilibrium mixture.
(2 marks)

(iii) I ΔH is negative. When temperature is lowered, the system shifts in the direction in which heat is evolved, that is, towards the right. ***(2 marks)***

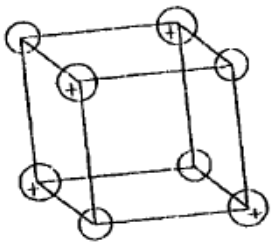
II At 500k, the rate of the reaction is lower than at 700k. ***(1 mark)***

(b) (i) Time = 60 x 2
= 120 sec
No of moles dm^{-3} = $6 \times 120 \times 10^{-8}$

$= 7.2 \times 10^{-6}$ molsdm $^{-3}$ ***(2 marks)***

(ii) Warming. Kinetic energy increases. Therefore, frequency of high energy collisions increase hence rate increases. ***(2 marks)***

5. (a) (i)



(2 marks)

(ii) At 25^0C, sodium chloride is in solid state form; ions cannot move. Between 801^0C and 1413^0C, sodium chloride is in liquid state: ions are mobile.
(2 marks)

(b) Both ammonia and water are polar molecules and hydrogen bonds are formed.
(2 marks)

(c) N → H Co-ordinate bond. ***(1 mark)***

(d) (i) Allotrope. ***(1 mark)***

(ii) Add methylbenzene to soot in a beaker. Shake and filter. Warm the filtrate to concentrate it. Allow the concentrate to cool for crystals to form. Filter to obtain crystals of fullerene. ***(3 marks)***

(iii) $\frac{720}{12} = C_{60}$ ***(1 mark)***

6. (a) (i) Dissolve the sample in water. Add aqueous iron (II) sulphate. Then add concentrated sulphuric down the side of the test tube. Formation of a brown ring confirms presence of nitrate ion.

OR

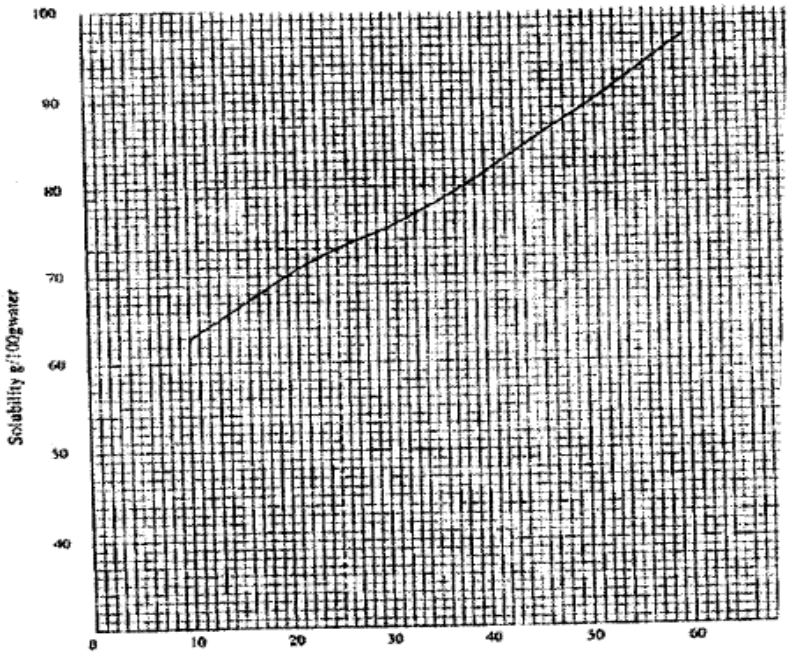
Dissolve a sample of the fertilizer in water. Add a piece of aluminium foil then a little $NaOH_{(aq)}$. Warm, then test gas with red litmus paper. The paper turns blue
(2 marks)

(ii) Molar mass of $(NH_4)_2HPO_4$ = 132

Mass of Nitrogen $= \frac{38}{132} \times 25$

$= 5.3\text{kg}$ ***(2 marks)***

(b) (i)



(3 marks)

(ii) 72 ± 1g/100g water ***(1 mark)***

(iii) I A solution which contains the maximum amount of solute at that temperature. ***(1 mark)***

II At 25^0C, 73g of AP dissolve in 100g of water.
Therefore, 173g of saturated solution contain 73g
Therefore, 100g of saturated solution contain $\frac{73}{173} \times 100$

$= 42.196$g ***(2 marks)***

(c) (i) Add distilled water to soil and stir. Dip Universal indicator paper to the mixture and compare with pH chart. ***(2 marks)***

(ii) Extensive use of ammonium fertilizer (acidic fertilizers) or pollution by acid rain etc. ***(1 mark)***

7. (a)

- Wear gloves.
- Use safety goggles.
- Use a fume cupboard. ***(2 marks)***

(b)

- MnO_2
- $K_2Cr_2O_7$ ***(1 mark)***

(c) To displace air from the apparatus. Heated aluminium may react with oxygen to form an impurity. (Al_2O_3) ***(2 marks)***

(d) Sublimes. ***(1 mark)***

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

$2 \times 27 \qquad 2(27 + 35.5 \times 3)$

$54 \qquad = 267$

$54g$ of Al $= 267$ of $AlCl_3$

Therefore 1.08 produces $= \frac{267 \times 1.08}{54}$

$= 5.34(g)$ ***(3 marks)***

(ii) $\%\ \text{yield} = \frac{3.47}{5.34} \times 100$

$= 65\%$ ***(1 mark)***

(f) Replace receiver with a flask in ice-cold water. ***(1 mark)***