CHEMISTRY PAPER 2

ANSWERS

KCSE 2010

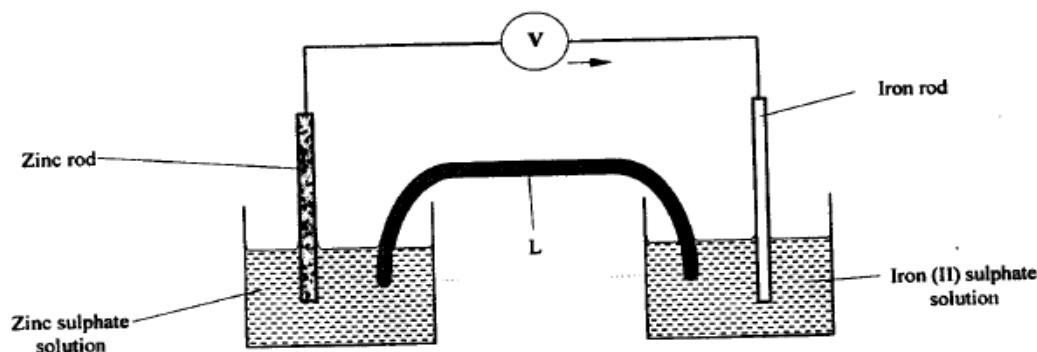## 30.6.2 Chemistry Paper 2 (233/2)

1. (a) Ammonia (½) and Copper (II) chloride (½).
   This is because they form ions or ionise when they dissolve in water (1)

   (2 marks

   (b) (i)

   (1 mark

   (ii) Potassium nitrate solution, potassium chloride solution
       Any soluble salt of potassium or sodium. Salt.   (2 marks)
       ½ mark for mentioning the salt without the taste.

   (c) (i) To improve its appearance/make it attractive
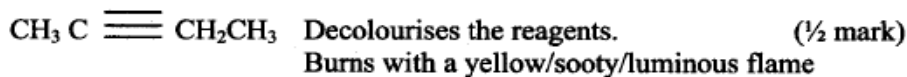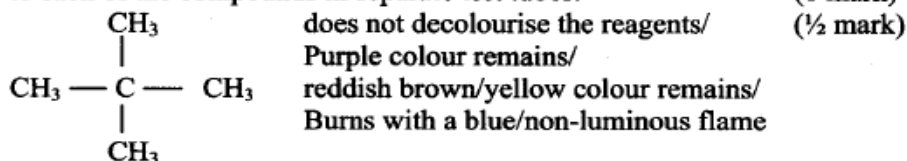   To prevent it from rusting/corrosion   (2 marks)

   (ii) $Q = It$

   $$Mass = \frac{R.A.M. \times It}{nF}$$ (1 mark)

   $$= \frac{108 \times 0.5 \times 60 \times 60}{1 \times 96500}$$ (1 mark)

   $$= 2.01\ g$$ (1 mark)

2. (a) (i) 2, 2 - dimethyl propane/dimethylpropane   (1 mark)
       (ii) pent - 2 - yne   (1 mark)

   (b) Add acidified Potassium Manganate (VII) or bromine
       to each of the compounds in separate test tubes.   (1 mark)

 does not decolourise the reagents/   (½ mark)
       Purple colour remains/
       reddish brown/yellow colour remains/
       Burns with a blue/non-luminous flame

$CH_3 C \equiv CH_2CH_3$ Decolourises the reagents.   (½ mark)
       Burns with a yellow/sooty/luminous flame

   (c) (i) I $-CH_3\overset{O}{\overset{||}{C}}OCH_2CH_3$ Ethylethanoate   (1 mark)

       II CH_3CH_3 Ethane   (1 mark)

(ii)

$$-\overset{\displaystyle H}{\underset{\displaystyle H}{\overset{|}{\underset{|}{C}}}}-\overset{\displaystyle H}{\underset{\displaystyle H}{\overset{|}{\underset{|}{C}}}}-\overset{\displaystyle H}{\underset{\displaystyle H}{\overset{|}{\underset{|}{C}}}}-\overset{\displaystyle H}{\underset{\displaystyle H}{\overset{|}{\underset{|}{C}}}}-$$
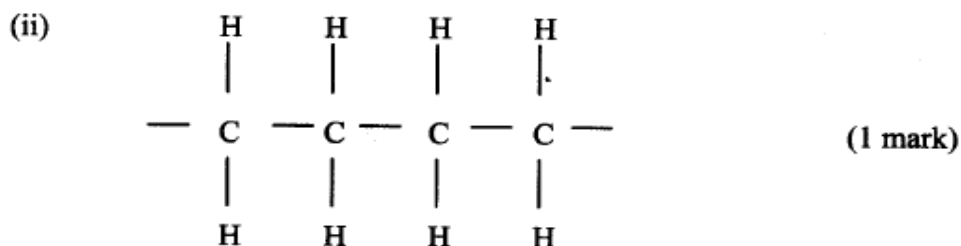
(1 mark)

(iii)   Water/steam and Conc. Sulphuric (VI) acid catalyst   (1 mark)
Phosphoric acid, conditions. Heat, pressure 60-80,
temperature 300^0 C.

(iv)   I   -   Esterification/condensation   (1 mark)
II   -   Substitution   (1 mark)

(d)

$$Cl-\overset{\displaystyle H}{\underset{\displaystyle Cl}{\overset{|}{\underset{|}{C}}}}-\overset{\displaystyle H}{\underset{\displaystyle Cl}{\overset{|}{\underset{|}{C}}}}-Cl \text{ and } Cl-\overset{\displaystyle H}{\underset{\displaystyle H}{\overset{|}{\underset{|}{C}}}}-\overset{\displaystyle Cl}{\underset{\displaystyle Cl}{\overset{|}{\underset{|}{C}}}}-Cl$$

(2 marks)
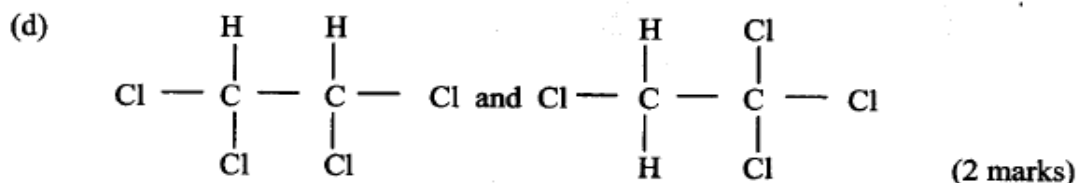
3.   (a)   (i)   Metallic bonds in S are stronger than in R.   (1 mark)

(ii)   V is monoatomic (independent) hence weaker (1)
van der waals forces while U is diatomic hence stronger van der waals forces
V has less van der waals forces while U has more van der waal forces

(2 marks)

(b)   w reacts more vigorously/more reactive/reacts faster   (1 mark)
-   reactivity of group 1 elements increases down the group/
Ionisation energy is less than that of R
-   easier to lose outer electron in W than in R
W is more electropositive than R   (1 mark)

(c) $4T(s) + 5O_2(g) \longrightarrow 2T_2O_5(s)/T_4O_{10\ (g)}$ (1 mark)

(d) $2R(s) + 2H_2O(l) \longrightarrow 2ROH(aq) + H_2\ (g)$ (1 mark)

Moles of gas $=$ $\dfrac{600}{24000} = 0.025$ Moles   (½ mark)

Moles of R $=$ 2×0.025 moles $= 0.05$ moles   (½ mark)

R.A.M. of R $=$ $\dfrac{1.15}{0.05} = 23$ (1 mark)

(e)   Used in fluorescent tubes/bulbs/lamps   (1 mark)
∴ used in arch welding/fire extinguisher/preservatives in
museums

4.   (a)   (i)   B   A   Copper and C (1)

B has the highest ΔT (1)
C cannot displace the ions of Cu from solution
there is no reaction (1)
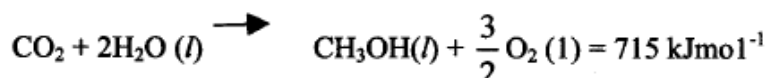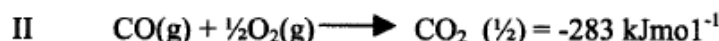A is more reactive than Cu because it displaces
its ions from solution   **(3 marks)**

            (ii)   Blue colour of solution disappeared brown deposit is formed

                                                                                           (1 mark)

    (b)   (i) $C(s) + 2H_2(g) + \frac{1}{2}O_2(g) \longrightarrow CH_3OH(g)\Delta H = -239kJmol^{-1}$
                                                                   (1 mark)

            (ii)   I   Yield increases/ will be higher
                        $\therefore$ Equilibrium shifts to the right/forward rxn is formed
                                                            (2 marks)

                      II $CO(g) + \frac{1}{2}O_2(g) \longrightarrow CO_2$ $(\frac{1}{2}) = -283$ kJmol^{-1}

                            $2H_2 + O_2(g) \longrightarrow 2H_2O(l)$ $(1) = -572$ kJmol^{-1}

                            $CO_2 + 2H_2O\,(l) \longrightarrow CH_3OH(l) + \frac{3}{2}O_2$ $(1) = 715$ kJmol^{-1}

                            Change in energy $= 715 - 283 - 572 = -140$ ($\frac{1}{2}$) kJmol^{-1}
                                                                            (3 marks)

            (iii)   DH$_j$ of CO was not included   **(1 mark)**

5.   (a)   (i)   Flask is slanting upwards
                      Water will condense into the hot flask and crack it
                      Method of collection is wrong
                      Ammonia is less dense than air
                      Moist reactants should not be used
                      The gas will be reabsorbed by water   **(3 marks)**

            (ii)   CaO   **(1 mark)**

            (iii) $2NH_4CL(s)+Ca(OH)_2(s) \longrightarrow 2NH_3(g)+2H_2O(l)$ (1) $+ CaCl_2(g)$
                                                                 (1 mark)
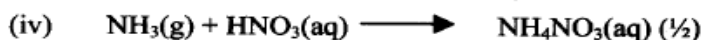
            (iv)   Pass dry HCl through ammonia/take a glass rod/ pass
                      it over a jar of ammonia and dip it in conc. HCl and white
                      fumes are formed ($\frac{1}{2}$)
                      Mixture forms white fumes ($\frac{1}{2}$)   **(1 mark)**

    (b)   (i)   Unit 1   **(1 mark)**

            (ii)   A = NO ($\frac{1}{2}$)
                      B = NO$_2$ ($\frac{1}{2}$)   **(1 mark)**

(iii) Nitrogen in (NH_3) has oxidation
State of -3 while it has oxidation state of +5 in HNO_3 (1)

Increase in oxidation state is oxidation (1)　　　　(2 marks

(iv) $NH_3(g) + HNO_3(aq) \longrightarrow NH_4NO_3(aq)$ (½)

Molar mass of NH_4NO_3 (½) = 80 g

Moles of NH_4NO_3 $= \dfrac{1000 \times 1000}{80}$ (½)

Moles of HNO_3 $= \dfrac{1000 \times 1000}{80}$ (½)

Molar mass of HNO_3 = 63

∴ mass of HNO_3 $= \dfrac{1000 \times 1000}{80} \times 63$ (½)

= 787.5 kg (½)　　　　(3 marks)

6. (a) (i) Zn S
(ii) So as to obtain ZnO which is easily reduced by CO to Zn(1 mark)

$2ZnS(s) + 3O_2(g) \longrightarrow 2Zn(s) + 2SO_2(g)$ (1)
　　　　(2 marks)

(b) (i) - Coke/carbon
- Limestone/$CaCO_3$　　　　(1 mark)

(ii) $2C(s) + O_2(g) \longrightarrow 2CO(g)$ (1)

$CO_2(g) + C(s) \longrightarrow 2CO(g)$ (1)　　　　(2 marks)

(iii) Vapour/gas, temperature is above boiling point of Zinc. (1 mark)

(iv) 600° C it is condensing/temperature is below boiling
point of Zinc　　　　(1 mark)

(v) Formation of gullies (1) due to scooping of soil containing
the ore/ CO2 leading to global warming (1).　　　　(2 marks)

(vi) - making brass
- Making –ve terminal in dry cells
Galvanization of iron sheets　　　　(1 mark)

7. (a) Curve I (1)

The concentration of products are increasing
The rate of rxn is increasing. (1)　　　　(2 marks)

At time x equilibrium has been established, the rate of forward
reaction is equal to the rate of reverse reaction (1) and this has a
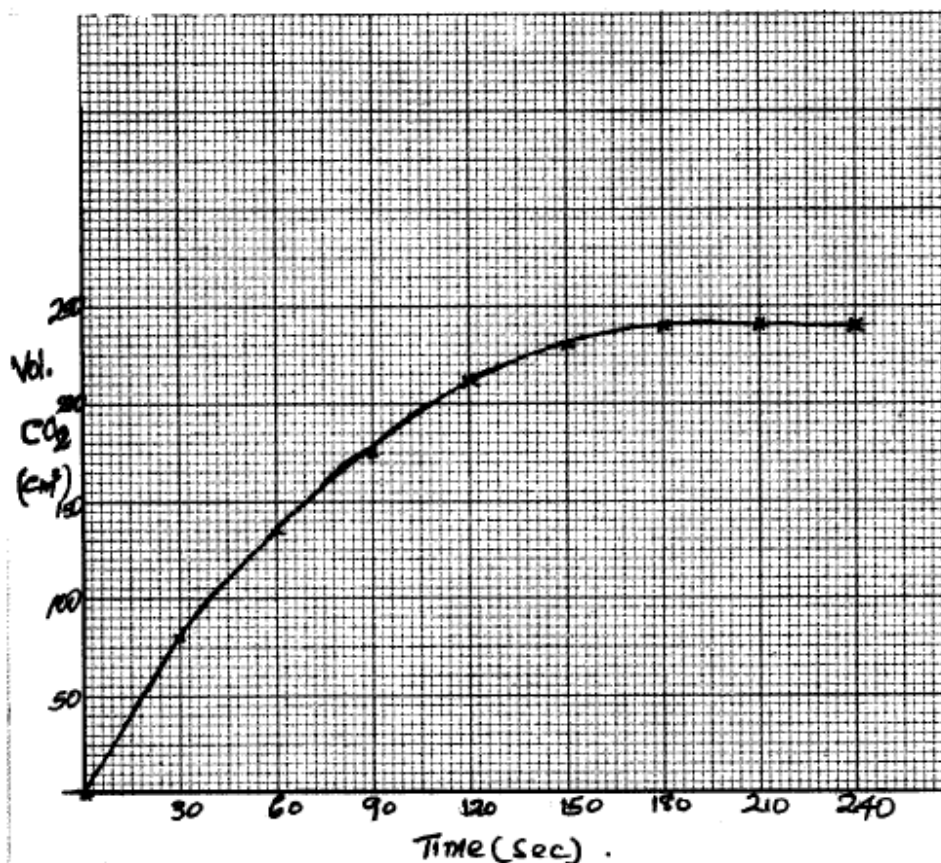value of Y. (1)　　　　(2 marks)

(b) (i) Increasing pressure increases rate of reaction. (1)
Molecules are brought closer, more collision of gases

particles. (1)   (2 marks)

(ii)   Increasing pressure has no effect on liquids.   (1 mark)

Time (sec).

(c)   Graph

    (i)   Labelling axes   (1 mark)
            Showing points correctly   (1 mark)
            Smooth curve through the points   (1 mark)

    (ii)   I   at 15s, (tangent drawn and used correctly)   (1 mark)
            II   at 120s, (tangent drawn and used correctly)   (1 mark)
            III amount of $BaCO_3$ is decreasing with time
                  at 15s the value is higher than at 120s.   (1 mark)