CHEMISTRY PAPER 233/1 K.C.S.E 2002
MARKING SCHEME

1. It is uncreative
2. Oxygen exists as discrete molecules (O_2) with only weak van der wall forces between them. While sulphur exists as S_8 rings and chains which are bulky
3. A sulphur, carbon, nitrogen
   B Sodium potassium, lithium
4. (a) The hypochlorous acid decomposes to form (atomic oxygen)
   The atomic oxygen attacks and bleaches the blue flower
   (b) $2HOCl(aq) \rightarrow O_2(g) + 2HCl(aq)$
5. (a) calcium 2.8.8.2
   Beryllium 2.2
   (b) Both elements are in the same group but the two valence electrons of calcium are further away (1) They are not strongly held by the nucleus, hence are readily released. (1) (3 mks)
6. (a) Oxygen (1)
   (b) Decomposition (1) (2 mks)
7. Use zinc powder (1), which has a larger surface area (1) (2mks)
8. (a) C_2 = Fes, Zns (1)
   (b) It is soluble in cold water (1)
   (c) it turns black (1)
9. (a) Displacement (1)
   (b) DGEF (1)
   (c) $G(s) + 2F^+(aq)$
10. (a) Alpha or He (10)
    (b) $^{210}_{81}J \rightarrow {}^{210}_{82}k + {}^{e}_{-1}$
    (c)K and M
11. SO reacts with water to form $SO^{2-}{}_3$/ sulphurous acid (10 which then is oxidized by chlorine to $S)^{2-}{}_4$/sulphur acid (1). $SO^{2-}{}_4$ reacts with Ba^{2+} to form insoluble $BaSO_4$(l)
12. Concentrated nitric acid is a strong oxidizing agent (½). It oxidizes pale iron (II) (½) to yellow iron (III) (½) and it is reduced to nitrogen dioxide (1) which is brown (½) 3 mks
13. (a) Lattice energy (a)
    (b) Let the heat be H_3
    $H_{3-} - 701 = 15$ (l)
    $H_3 = 686$ kJ mol -1 (2mks)
14. (a) Fe_2O_3, Fe_3O_4 (l)
    (b) $CaO(s) + SiO_2(s) \rightarrow CaSiO_3(s)$ (l)
15. (a) $Ca(OH)_2(aq) + CO_2(g) \rightarrow CaCo_3(s) + H_2O(l)$
    (b) White PPt dissolves (l) because the insoluble $CaCO_3$(½) is changed into soluble calcium hydrogen carbonate. (½)
16. Covalent bonds exist between two iodine atoms(½) in an iodine molecule (1 white Van der waals forces exists between two or more molecules of iodine (1) covalent bonds are strong than Van der walls forces

17. a) Perspex(10

b)As a substitute for glass in the manufacture of

- safety screens
- plastic lenses
- Wind screen Accept any other correct use.

18. Add excess zinc oxide (½) to dilute HCL, HCl, H2SO4, HNO3 (½) Filter to the filtrate, add aqueous Na2CO3 K2CO3(½) to precipitate znCO3(½)filter (½)

20. I Conducts (1)
II Ionic (I)
III Covalent (i)

21. a) 2Na OH(aq) + H2SO4(aq) Na2SO4(aq) +H2O(l) (l) (3 marks)

b) Blue litmus paper turn remains red

(c) The acid was in excess (l)

22. a) Manganese (IV) oxide (1)

b) -Welding (l)
- Fuel in rockets
- Breathing aid / hospitals
- Steel making (3mrks)

Accept any other correct ans

23 $Pb(X O_3$ (aq) + 2NaCl(aq) +2$NaNO_3$(aq)(l)

R.F.M NaCl = 58.5

R.F.M PBCl2 = 278(½)

Moles of pbCl2 = $\frac{2.56}{278}$

Moles of NaCL = 2.56 x2 (½)
= 278

Mass of NaCl = 0.04 x 58.5
= 2.34g

24. a) Being acidic, it would react with the basic ammonia(l) (2mks)

b) CaO (i)

25 a) Butane (l)

b) Hardening of oils in the (a) manufacture of margarine (2 marks)

26. a) Ag+(aq) + e Ag(s) (l)

b) Anode decreases in size/mass
It dissolves/ions to release elections (l)
(3marks)

27. a) pb^{2+} or Ag+ Hg2+ Absent(i)

b) Zn^{2+} (l)

c) Zn^{2+} (aq) + CO_3^{2-} (aq) → $ZnCO_3$(s)(l) (3 mks)

CHEMISTRY PAPER 233/2 K.C.S.E 2002
MARKING SCHEME

1. (a) Distillation/ Fractional distillation

(b) (i) Add water to the mixture; sodium chloride being an ionic compound dissolves. Filter the mixture to remove sulphur as a residue. Sulphur being a molecule substitute does not dissolve. Evaporate the filtrate to obtain sodium chloride.
(ii) Determine the melting point, If it sharp then it is pure. Narrow range/ fixed/113^{0}C/Content/ Definite.

(c) (i) potassium bromide/ KBr
(ii) 60 – 55 = 5g
(iii) Fractional crystallization
(iv) Extraction of salts/Na_2CO_3/Solvay process
Production of salts
Solving process

2. (a) (i) Sodium hydroxide (1 mk)
(ii) ethne/C_2H_2 //H – C = C-H (1 mk)

(b) Polymerization // Addition polymerization (1mk)

(c) - making artificial leather/ rain coats/ manufacture of cromophone
- making plastic water pipes
- Making electrical insulators (1 mk)

(d) $2Cl^-(aq) \rightarrow Cl_2(g) + 2e$
$2Cl(aq) – 2e \rightarrow bCl_2(g)$

(e) Deep brown solution // dark black brown solid is formed. Chlorine is more reactive than iodine, it displaces if formed.

(f) (i) $2NaOH(aq) + Cl_2(aq) \rightarrow NaCl(aq) + NaOCl(aq) + NaOCl(aq) + H_2O(l)$//
$2OH^-(aq) + Cl_2(aq) \rightarrow OCl^-(aq) + Cl^-(aq) + H_2O(l)$

(ii) Moles $\frac{2 \times 15000}{1000} = 30$ or $2 \times 15 = 30$
R.F.M NaOCl = 23 + 16 + 35.5 = 74.5
Molar mass = 3 + 16 + 35.5 = 74.5
Moles of NaOCl $= 30 \times \frac{1}{2} = 15$
Mass of NaOCl $= \frac{15 \times 74.5}{1000} = 1.1175$
Mass in kilograms of the sodium hypochlorite produced = 1.1175

3. (a) Exothermic reaction – heat energy given out to surrounding
Endothermic reaction – heat energy is absorbed from the surround

(b) (i) Vaporization// melting// evaporation// boiling
(ii) Condensation // freezing
Sublimation must be given with the solid that sublimes

(c) The water is undergoing a change of state. The heat supplied is used in breaking the inter particle forces between molecules of water OR intermolecular bonds

(d) (i) Heat of formation of $FeCl_2$

(ii) $\Delta H_1 + \Delta H_2$ OR $\Delta H_1 = \Delta H_3 - \Delta H_2$ OR $\Delta H_2 = \Delta H_3 - \Delta H_1$

(e) Butane because more bonds are formed on combustion of butane hence more heat released OR Butane has a large molecular mass / carbon atoms OR Butane has highest percentage of carbons.

4. (a) E; its ions have the greatest tendency (+ 0.85Y) to accept electrons// has reduction potential // strongest oxidizing agent

(b) (i)

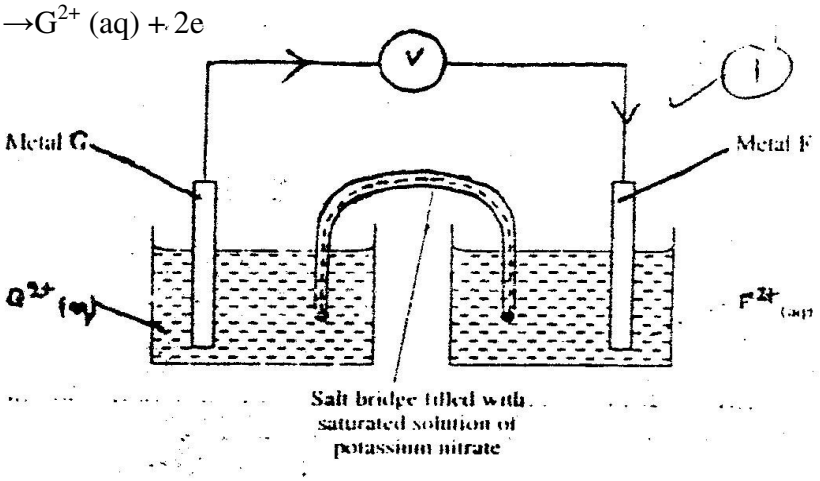
F

$F^{2+}(aq) + 2e \rightarrow F(s)$

G

$G(s) \rightarrow G^{2+}(aq) + 2e$

(ii)



(iii) To complete the circuit // maintain charge balance // Enable ions to move to cell too

(c) (i) The blue green colour of the solution fades; Cu^{2+} are removed from the Solution

(ii) The two gases are chloride and oxygen; initially Cl^- are at a more higher Concentration of Cl^- goes hence the OH^- is discharged reading to production of oxygen gas

$2Cl^-(aq) \rightarrow Cl_2(s) + 2e$

$4\ CH^-(aq) \rightarrow 2\ H_2O_{(4)} + O_2(g) + 2$ //e

(iii) J; Negativity charged ions (aq – and not OH – can only move to the anode // anode is the charged hence attract Cl^- and HO

5. (a) (i) Hydrogen // H

(ii) carbon //C

(b) (i) Extinguishes // put off // goes off // want out // Die; CO_2 and Water vapour, which do not support combustion, accumulates around the supply of oxygen

(ii) Mass increases; water vapour reacts with CaO and forms Ca (OH)

$Ca(OH)_2$ reacts with Co_2 to produce $CaCO_3$

$CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(s) \rightarrow$ CaO reacts with moist CO_2

$Ca(OH)_2 + CO_2(g) \rightarrow CaCO_3(s) + H_2O$

(iii) Oxygen and Nitrogen Helium, Neon argon; Accept a name of inert gas

(iv) To absorb excess water vapour // moisture

(v) Sodalime // $NaOH^-$ and CaO // KOOH // Caustic potash // caustic soda

6. (a) Milachile // Copper pyrites // Chalcasite // Chalcopyrite // Bonile // a zurile

(b) (i) Hydrogensulphide // H_2S

Reagent Q (1 mk)

Sodium Carbonate // $NaCO_3$ // $NaHCO_3$ // Potassium carbonate //

Solid R

Copper (ll) Oxide // CuO

(ii) $CuCO_3(s) \rightarrow CuO(s) + CO_2$

Step 4

- Green solid dissolves to form blue solution
- There is effervescence // bubbles

Step 7

- Black solid dissolves to form a blue solution

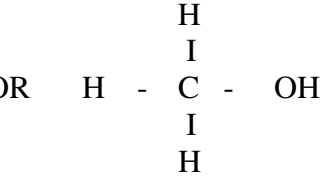
(c) (i) Tin // Sn

(ii) Ornaments // medals // metal bearings in machines // jewels // spear head // making coins // gear wheels // rims of car // clocks springs // electric contact.

7. (a) Write the structural formula of:

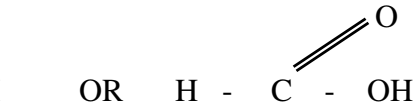
(i) Methanol (1 mk)

CH_3OH OR



(ii) Methanoic acid (1 mk)

HCOOH OR



(b) Write the equation for the reaction between methanoic acid and aqueous sodium hydroxide (1 mk)

$NaOH(aq) + HCOOH(aq) \rightarrow HCOONa(aq) + H_2O(aq)$

(c) (i) Name the product formed when methanol reacts with methanoic acid

Methylmethanoate // $HCOOCH_3$ // H – C – O – CH_3

(ii) State one condition necessary for the reaction in © (i) above to take Place

- add conc. H_2SO_4
- Heat to 180^0C // warm // heat

(d) (i) Describe one chemical test that can be used to distinguish between hexane and hexane

- Use a bromine water // acidified potassium permanganate
- If hexane they will be decoloured
- If hexane no decolourisation

(ii) State one use of hexane

Fuel // solvent // manufacture hexanol // hexanoic acid, hexanol

(iii) Hydrogen gas reacts with hexane form hexane. Calculate the volume or hydrogen gas required to convert 42g of hexane to hexane at S.T.P (C = 12.0, H = 1.0, Molar gas volume at S.T.P is = 22.4 litres). (4 mks)

$C_6H_{12} + H_2 = C_6 H_{14}$ mole ratio = 1:1

R.MM of hexane = 42/84 = 0.5

Moles of hydrogen = 0.5

Volume of hydrogen = 0.5 x 22.4 = 11.2 litres of 11 dm^3