**KENYA HIGH**

***Kenya Certificate of Secondary Education***

**233/2**

**CHEMISTRY**

**PAPER 2**

**THEORY**

**MARKING SCHEME**

**Question one**

1. A (√*1mk)* elements in group (vi) have 6 electrons in the outermost energy level, they react by gaining 2 electrons.√*1mk*
2. Amphoteric Oxide √*1mk*
3. Element E is more reactive than H (√*1mk)* Elements E and H are non - metals in group (VII) and reactivity decreases down the group √*1mk* / E is smaller than H and hence has a higher electron affinity therefore more reactive.
4. B(s) + Cl2(g) BCl2(s) *1mk*
5. (i) The atomic radius of element F is greater than that of G √*1mk* / Across period number of protons (nuclear charge increases increasing effective nuclear charge.

(ii) The atomic radius of element G is greater than that of B. √*1mk*

1. Solution of oxide of B changes red litmus paper blue and has no effect on blue litmus paper *1mk* while solution of oxide of D changes blue litmus paper red and has no effect on red litmus paper. *1mk*
2. 2IOH (aq) + H2SO4 (aq) I2SO4(aq) + 2H2O(l) √*1mk*

 2 : 1

Moles of H2SO4 17.5 x0.5 = 0.00875moles √*½ mk*

 1000

 Moles of IOH 0.00875 ÷ 2 = 0.004375 moles √*½ mk*

 Molarity of IOH = 1,000 x 0.004375

 20

 = 0.21875M √*1mk*

 Concentration = 0.21875 moles/litre √*½ mk*

**Question Two**

(a) Heating copper (ii) oxide √*1mk*

(b) Black solid would turn brown √*1mk*

(c) CuO(s) + CO (g) Cu(s) + Co2(g) √*1 ½ mk*

(d) 2CO (g) + O2(g) 2CO2(g) √*1 ½ mk*

(e) It is poisonous √*1mk*

(f) (i) Reducing agent - Carbon(ii) oxide √*1mk*

 (ii) Oxidisingagent -Copper (ii) oxide √*1mk*

(g) Hydrogen / ammonia gas (Any one) √*1mk*

(h) There would be no observable change √*1mk.* This is because sodium is higher than carbon in the reactivity series and therefore has higher affinity of oxygen √*1mk*

 **Question three**

1. (i) Crystalline forms of sulphur √*1mk*

Or

 Existence of sulphur in more than one form in the same physical state.√*1mk*

 (ii) Transition temperature √*1mk*

1. (i) X - dilution chamber √*1 ½ mk*

Y- Heat exchanger √*1 ½ mk*

 Z - Burner √*1 ½ mk*

 (ii) Vandalism (v) catalyst √*1 ½ mk*

 Temperature – 5000C √*1 ½ mk*

 Pressure – 200atm √*1 ½ mk*

1. I – To remove dust particles and water vapour that could otherwise poison the catalyst √*1mk*

 II- Lose heat and pre-heat incoming gases √*1mk*

1. Step 2; 2SO2(g) + O2(g) 2SO3(g) √*1mk*

Step 3: SO3(g) + H2SO4(l) H2S2O7 (l) √*1mk*

 Step 4: H2S2O7(l) + H2O(l) 2 H2SO4(l) √*1mk*

1. H2SO4(l) + SO3(g) H2S2O7(l) √*½ mk*

 1 : 1 : 1

 1 mole of oleum = 178,000 = 1,000moles

 178

 1 mole at s.t.p = 22.4L

 1,000moles = ? √*½ mk*

 = 1000 x 22.4 = 22,400 litres √*1mk*

 **Question Four**

1. (i) Nitrogen √*1 ½ mk*and Hydrogen √*1 ½ mk*

 (ii) Platinum √*1mk*

 (iii) 4 NH3(g) + 5O2(g) platinum 4NO(g)+ 6H2O(g) √*1mk*

(iv) Neutralization reaction √*1mk*

 (v) S (s) + 6 HNO3(l) H2SO4(l)+ 6NO2(g)+ 2H2O(l)√*1mk*

 (vi) Any metal above copper in the reactivity series but below sodium √*1mk*

 (vii) (a) I - J – NH4NO3

 (ii) Molar mass of NH4 NO3= 28 + 4 + 48 = 80g √*1mk*

 80g contain 28g of Nitrogen

 ? = 14g

 1

 = ~~14~~ x 80 = 40g√*1mk*

  ~~28~~ 2

(b) It is less soluble and therefore not easily leached √*1mk*

Or

It provides the plant with nitrogen and phosphorous *any one*

**Question five**

1. Concentrated sulphuric (vi) acid √*1mk*
2. It is denser than air √*1mk*
3. It turns red then white. *√1mk*

 It turns white / it gets bleached √*1mk*

1. Cl2(g) + H2O(l) HOCl(aq)+ HCl(aq) √*1mk*
2. PCl3 √*1mk*

 PCl5 √*1mk*

1. A yellow deposit of sulphur is formed / seen √*1mk*

 Chlorine oxidizes sulphideions to solid sulphur √*1mk*

- Manufacture of hydrochloric acid √*1mk*

* Manufacture of bleaching agents such as chlorate used in the cotton and paper industries
* Chlorine is used in the treatment of water and sewage plants
* Manufacture of chloroform as an anaesthetic
* Manufacture of solvents such as trichloroethane

 *Any one*

**Question six**

1. A - Filtration √*1 ½ mk*

B - Absorption √*1 ½ mk*

 M - Isolation of water √*1 ½ mk*

 D - Cooling √*1 ½ mk*

1. Liquids – NaOH (aq) / KOH (aq) √*1mk*

 Substance T – Ice / water √*1mk*

1. To increase surface area forcooling √*1 mk*
2. (i) Oxygen is used to remove impurities during steel making √*1 mk*

 (ii) Is used in cutting and welding of metals √*1 mk*

1. 2H2O2(l) MnO2(S) 2H2O(l)+ O2(g) √*1 mk*
2. (i) R -Rusting occurred *√1 ½ mk* because of air and water being present √*½ mk*

 S - No rusting *√½ mk* Water is absent √*½ mk*

 T - No rusting √ *½ mk* Air is absent *√½ mk*

 (ii) To prevent rusting *√1mk*

 To increase aesthetic value of the metal

  *Any one*

**Question seven**

1. Reagent : Hydrogen gas √*1mk*

 Conditions: - Nickel catalyst √*1mk*

 - I50-2500C (temperature) √*1mk*

1. H H H

 H C C C H

 Br H H

 I – Bromopropane √*1mk*

1. Polypropene √*1mk*
2. Y decolourisesbromine water √*1mk* while the product formed after step I has taken place does not √*1mk*
3. Step II – dehydration √*1mk*

 Step III – substitution √*1mk*

1. (i) A hydrocarbon is a compound that contains carbon and hydrogen only √*1mk*

(ii) H H H

 H C C C H

 Br Br H √*1mk*