**Kenya Certificate of Secondary Education 2017**

**Form four evaluation examination**

**1** Added to common salt to for m iodized salt for proper functioning of the thyroid gland // 1 a solution of 2% iodine in ethanol is used as an antiseptic // to make iodoform which is used as an antiseptic

**2 magnetic** separation // addition of water followed by decanting1

**3**

|  |  |
| --- | --- |
| SOLUTION | **PH  VALUE** |
| Distilled water | 7.0 1 |
| wood ash solution | 9.0 1 |

( b) rain water dissolves atmospheric carbon IV oxide to form weak carbonic acid 1

**4** (a) it contains lead II ions and bromide ions which are free to move and carry charge 1

(b) it contains delocalized electrons which are able to carry charge 1

**5.(a)** Saturated hydrocarbon is a hydrocarbon in which only single covalent bonds are present in the molecule. 1

600- 700 ®C

(b) 2CH3  CH2  CH3  CH4 + CH2 CH2  + CH3 CHCH2  +H2 1

(C ) As a source of hydrogen in large scale // increases quality of fuels for internal combustion engines. 1

**6.** (a)(i) Zn(s) +4 HNO3(aq)  Zn(NO3 )2(aq) +2 NO2(g)  + 2H O(l) 1

(ii) 4 HNO3(aq)  +4 NO2(g)  + 2H O(l) + O2(g) 1

(b) nitric V acid is reduced to brown nitrogen IV oxide by H2 S, which is oxidized to the yellow sulphur 1

**7.** 0.08g of oxygen= 0.08/32 X 24000 cm3

= 60 cm3

R O2 =60/10 =6 cm3 / sec 1

RCl 2 = 100/30 =3.33 cm3 /sec

= 1

=6/3.33 = x= 4.06g/cm3 1

**8**  (a) Zn2+ (aq) + Na2 CO3(aq)  Zn CO3(aq)  + 2Na+ (aq)  1

(b) precipitation// double decomposition 1

**9(**a) a non –electrolyte is a substance that does not conduct and electric current in solution or as a melt. 1

(b) plastic material// PVC//glass,1 used as electrical insulators 1

**10.** P1 V1 = P2 V2

P2 = 1 = 1.4758 X 105  Pascals 1

**11 .** (a) platinum 1 /2 and palladium.1/2

(b)

|  |  |  |
| --- | --- | --- |
| Molecular formula | Molecular mass | Boiling point ( K) |
| C2 H2 | 26 | 189 |
| C3 H4 | 40 | 250 |
| C4 H6 | 54 | 289 |
| **C 5 H8** 1 | **68** 1 | 312 |

**(ii)** the boiling points of these molecules increase with increase in molecular mass 1 due to increase in the strengths of van der waals forces.1

**12**(a)  **D** 1

**(b) liquid** 1

**(c)** add chloroform to the mixture to dissolve B1/2 . Filter and evaporate the mixture to obtain B 1 /2 . Add water to the residue to dissolve C1 /2 , filter and evaporate the mixture to obtain. Dry the residue to obtain E. 1 /2

**13.** = 1

V= 40 cm3  1

**14.** mass of Mg= 3.6g

Mass of Cl =14.25-3.6 =10.65g 1 /2

Element Mg Cl

Mass 3.6 10.65

Mole ratio 3.6/24 =0.15 10.65/35.5 = 0.3 1 /2

Ratio of atoms 0.15/0.15 =1 0.3/0.15 = 2 1 /2

E. formula Mg Cl2  1 /2

**15** add excess copper turnings to conc. Nitric V acid 1to then filter√ ½to obtain copper II nitrate solution as filtrate. To the filtrate add sodium carbonate √ ½ solution to precipitate copper II carbonate √ ½. Filter, wash and dry the residue between filter papers. √ ½ 1 //add excess copper turnings to conc. sulphuric VI acid to then filter to obtain copper II sulphate solution as filtrate. To the filtrate add sodium carbonate solution to precipitate copper II carbonate. Filter, wash and dry the residue between filter papers

**16.** (a) iron II chloride 1

(b) Chlorine 1

(c ) iron III Chloride 1

(d) 3OH- (aq)  + Fe3+ (aq) Fe(OH)3 (s) 1

**17 . C,B,D,A** 2 within a group of metals first ionization energy decreases down the group 1

(b) A 1

**18**  (a) calcium is denser than water 1

(b) hydrogen 1

(c ) a white suspension of calcium hydroxide 1 is formed since it is slightly/sparingly soluble.1

**19.** CFCs form free radicals in the atmosphere which break down ozone.1  Depletion of the ozone layer reduces its ability to prevent UV radiation from reaching the earth’s surface causing adverse effects on plants and animals1 .

(b) 6KOH(aq) + 3Cl2(aq) 5 KCl (aq) + KClO3(aq) + 3 H 2 O(l) 1

**20. (a**) = =1.47 1

Ratio of diffusion of NH3  to that of HCl =1.47 : 1 1

Position of white ring = X 59.5 = 40.5 cm 1

(b) Earlier 1 , gas particles diffuse faster at higher temperature1

**21** (a)bee sting contains methanoic acid( weak acid) which irritates1 , the acid is neutralized by sodium hydrogen carbonate.1

(b) aluminium utensils have a tough aluminium oxide coat on the surface 1 that protects the metal beneath, wood ash is alkaline and reacts with amphoteric Al2 O 3  coat removing it thus exposing the metal to corrosion.1

**22** (a) concentrated sulphuric VI acid1  reject sulphuric acid

(b) silvery//grey solid 1/2 at the location of leadII oxide and the white anhydrous 1/2

copperII sulphate turns blue.

**23.** (a) to dry hydrogen gas 1

(b) Al( g)  + 6HCl( g) 2AlCl3 (g) + 3H2 (g) 1

(c ) AlCl3 sublimes 1

(d) no reaction 1/2 would take place between copper and HCl, copper is below hydrogen in the activity series. 1/2

**24** (a) water of crystallization is a fixed amount of water that is contained in the crystal structure of most salts. 1

(b) hygroscopy is the taking up water vapour from the atmosphere by a salt.1

**25. (a)** (i)Sodium nitrite 1

(ii) 2 NH4 Cl (aq) + 2 NaNO2(aq)   **2**N2 (aq) + 4H 2O + 2 NaCl(aq)

(b) 6Na (s ) + N2 (g ) 2 Na 3N (s ) 1

**26**  it provides inert atmosphere1 to prevent re-oxidation of the hot metals by air.1

**27** a mixture of hydrogen and air is highly explosive which may lead to serious

accidents. 1

**28.** moles of T = 2.34/69 = 0.0339

moles of copper = 3.20/63.5 =0.05039 1

ratio of atoms T : Cu =1 : 1.5

= 2 : 3

Charge on metal T is +3 1

**29**  electroplating to protect an object from corrosion 1 / make it attractive// extraction of more reactive metals e.g sodium