**PAVEMENT FORM 4 EXAMINATION 2022**

**Kenya certificate of secondary education (K.C.S.E**

**MARKING SCHEME CHEMISTRY PAPER 2 232/2**

**OPENER EXAM**

1. (i) Platinum ✓ 1

(ii) H2S gas is bubbled through a solution of HNO3✓1. A pale yellow deposit of sulphur is deposited. ✓1

(iii) Neutralization ✓1

(iv) NH4NO3(aq) ✓ 1

(v) RFM = 14 + 1 x 4 + 14 + 3 x 16

 = 80✓ ½

$\frac{28}{ 80}$ x 100% = 35% ✓ ½

(b) (i) To liberate ammonia gas rapidly ✓ 1

(ii) Green – yellow ✓ 1

(iii) 2NH3(g) + 3O2(g) 2N2(g) + H2O(l) ✓ 1

UB eqn = zero mk

Penalise ½ mk for wrong or missing S.S.

(c)it readily decomposes in prescence of sunlight✓1mk

(d)-used for manufacture of ammonia in the Haber process✓1mk

-liquid nitrogen is used as arefrigerant in the storage of semen and biological tissue specimens

-it is used to provide an inert atmosphere eg in preservation of packed foods

1. (a) To absorb excess carbon (iv) oxide or gas B ✓1mk

 To absorb unreacted carbon (iv) oxide

 ii) any carbonate /hydrogen carbonate and acid

 b i) CO 2 (g) + C(s) 2CO(g) ✓1mk

KOH (g) + CO2 KHCO3 (aq)

 c) use of Ca (OH)2: CO does not form white precipitate with Ca(OH)2 while CO2 does

 burning : CO burn s with a blue flame while CO2 does not support combustion ✓1mk

 d) brown fumes produced✓1mk

 black substance dissolves

 ii) C(s) + 4HNO3 (aq) CO2 + 4NO23(g) + 2 H2O (l)

e) Concentrated sulphuric (iv) acid acts as dehydrating agent

 ii) - reducing agent in the extraction of metals from their ores

* used as fuels
* manufacture of hydrocarbons

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | (a) | (i) | Element | % by mass | RAM | No of moles | Ratio of atoms |  |
|  |  |  | C | 85 | 12 |  | 1 | 🗸½ |
|  |  |  | H | 15 | 1 |  | 2 | 🗸½ |

 EF = CH2

 MF = (EF)n = 68

 (CH2)n = 68

 (12 x 2 x 1)n = 68

 14n = 68

 n = 4.8

 n ≈ 5 🗸½

 M.F C5 H10 🗸½

(ii) H H H H H H 🗸 H H H H H 🗸

 ⏐ ⏐ ⏐ ⏐ ⏐ ⏐ ⏐ ⏐ ⏐ ⏐ ⏐

 H ⎯ C ⎯ C = C ⎯ C ⎯ C ⎯ C ⎯ H and C = C ⎯ C ⎯ C ⎯ C -H

 ⏐ ⏐ ⏐ ⏐ ⏐ ⏐ ⏐

 H H H H H H H

 (iii) H H H H H 🗸 H H H H H 🗸

 ⏐ ⏐ ⏐ ⏐ ⏐ ⏐ ⏐ ⏐ ⏐ ⏐

 H ⎯ C ⎯ C = C ⎯ C ⎯ C ⎯ H + Cl2 → H ⎯ C = C ⎯ C ⎯ C ⎯ C

 ⏐ ⏐ ⏐ ⏐ ⏐ ⏐ ⏐ ⏐

 H H H H Cl Cl H H

2, 3 - dichloro pentane 🗸

 H H H

(b) (i) I Esterification CH3CH2 CH2 OH OR ⏐ ⏐ ⏐

 H ⎯ C ⎯ C ⎯ C ⎯ OH 🗸½

 ⏐ ⏐ ⏐

 H H H

 II Esters 🗸½mk

 O

OH

OH

 (ii) CH3 CH2 C OR H H

 ⏐ ⏐ O

H ⎯ C ⎯ C ⎯ C 🗸½

 ⏐ ⏐

 H H

 Propanoic acid 🗸½mk

 (c) (i) A – Polyethene 🗸½

 C – Ethanoic acid 🗸½

 D – Ethy/propanoate 🗸½

 E – ethan – 1, 2 – diol 🗸½

 (ii) Process: I Hydrolysis 🗸½

 II Polymersation 🗸½

 IV Hydrogenation 🗸½

 (iii) Reagent P – Water 🗸½ each

1. (a)(i) U- has higher or greater m.p than S√1. U has stronger metallic bonds than S √1

 (ii)R-√- -loses electrons readily √1

 (iii)T has a smaller atomic radius than R√I . T has stronger nuclear charge than R or T has more protons than

 R √

 (iv) The solution of the oxide of Q is basin alkaline √ ½ while that of the oxide of V is acidic √ ½ . Q is a metal while V is a non- metal √ ½

(b)(i) C√1

(ii) D√1

(iii) B√1

(c) MgCl2 has strong ionic √ ½ bonds with giant ionic structure √ ½ while SiCl2 has covalent √ ½ bonds with simple molecular structure √ ½

1. (a) (i) Copper (II) oxide √ 1 or CuO(S)

 (ii) Sodium hydroxide √1 NaOH(aq)

(b) (i) Manganese (IV) oxide √1 *rej symbols*

 (ii) Sulphur √1

 (iii) Oxygen in excess √1

 (c) Heat√1

MnO2

 (d) (i) 2H2O2(I) 2 H2 O(I) + O2(g) √1

 (ii) S(S) + O2(g) SO2(g)  √1

 (iii) 2Na(s) + O2(g) Na2O2(s) √1

1. (a) P – Sulphur (IV) oxide ✓ ½ mk Reject SO2

Q – Sulphuric (IV) acid ✓ ½ mk reject H2SO3

R – Sulphur (VI) oxide ✓ ½ mk reject SO3

S – oleum ✓ ½ mk reject H2S2O7

T – Ammonium sulphate ✓ ½ mk reject (NH4)2SO4

V – Carbon ✓ ½ mk reject C

(b) (i) Increased pressure increases the yield due to increased collisions of molecules ✓ ½ mk

(ii) Removal of inpurities such as dust ✓ ½ mk and water ✓ ½ mk

(c) Temperature 4500C

Pressure 2 – 3 atm ½ mk each max 1mk

V2O5 catalyst

(ii)

✓1mk

Penalize ½ mk if no state symbols are indicated

Penalize ½ mk for unbalanced equation

(d) Mix a sample of P with acidified or MnO2- ✓ ½ mk dicolourisation of MnO2- or turning of green of dichromate ion ✓ ½ mk

(e) To prevent “sucking back” ✓ ½ mk this may be caused due to high solubility of SO2in water✓½mk

(h) SO2 emitted in the process is neutralized by Ca(OH)2 in chimneys. This process is called scrubbing✓1mk

SO2 + Ca(OH)2(aq)  CaSO3(aq) + H2O(l) ✓1mk

1. (a) Test the acidity using a litmus pager. There will be no change on litmus when

dipped into a solution of sodium sulphate (1). The litmus paper turns to red when

dipped into a solution of sodium hydrogen sulphate (I).

OR

Add a solid carbonate to each solution. No effervescence observed when the

carbonate is added to a solution of sodium sulphate. Effervescence is observed

when the carbonate is added to a solution of sodium hydrogen sulphate.

(b) Add dilute nitric acid to leadoxide to form a soluble salt, Pb(NO3)2, ✓ ½ mk add a

soluble salt eg sodium sulphate✓ ½ mk to form insoluble PbSO4 and soluble Na2SO4

separate by filtrating ✓ ½ mk Wash the PbSO4 with distilled water to remove traces✓ ½ mk

of soluble salt, Na2SO4. ✓ ½ mk Then dry the salt between filter papers ✓ ½ mk

(c) (i) I *NH*4*NO*3 *s N*2*O g +* 2*H*2*O g*✓1mk

II *2Fe(OH)3(S) Fe2O3(s) + 3H2O(l)*  ✓1mk

(ii) The colour changes from pale green to brown ✓1mk . The iron (II) is oxidised

to iron (III) chloride by hydrogen peroxide (1)

(iii) Carbon(ii) oxide ✓1mk

(d) (a) N2 (g) + O2(g) → 2NO(g) : ✓1mk

(b) Because nitrogen is inert. :✓1mk

(c) Nitrogen (II) oxide is oxidised to Nitrogen (IV) oxide which is a pollutant. ✓1mk