GATUNDU SOUTH JOINT EXAM **Kenya**

Certificate of Secondary Education

CHEMISTRY PAPER 2

(Theory)

JULY/AUGUST 2019

MARKING SCHEME

(a) i) drying agent – Concentrated sulphuric (VI) acid (1mk)
Downward delivery method of gas collection/ upward displacement of air (1mk)
Workability (1mk)

ii) Liquid Y – dil. sulphuric (VI) acid

iii) $Na_2SO_3\,(aq) + H_2SO_4\,(aq) \longrightarrow Na_2SO_4\,(aq) + H_2O\,(l) + SO_2(g)$

Pen 1mk for wrong/missing state symbols

iv) The gas should be prepared in a fume chamber since it is poisonous/ toxic

(b) The piece of Magnesium continues to burn forming a white powder **(½)** and yellow deposits **(½)** at the bottom of the gas jar. Magnesium reacts with Sulphur (IV) oxide gas to form magnesium oxide**(½)** and sulphur**(½)**

(c) (i) Vanadium (V) oxide or Platinum (either)

(ii) Equilibrium shifts to the right/ favours the forward reaction/more $SO_3\,(g)$ is produced

Reason: Increased pressure favours lower volume/ RHS has 2vols or 2moles while LHS has 3vols or 3moles

(iii) When it is dissolved in water, the reaction is highly exothermic which causes the acid to vaporize and this would be dangerous.

2.A) (i) $CH_3CH_3 + \frac{7}{2}O_2 \longrightarrow 2CO_2(g) + 3H_2O\,(l)$

Ignore states symbols

(ii) As an antiseptic/ as a solvent for iodine, perfumes, varnishes/ mixed with petrol to form gasohol (a fuel)/ in alcoholic drinks like beer

(B) a) (i) Carbon (IV) oxide gas

(ii) Hydrogen gas

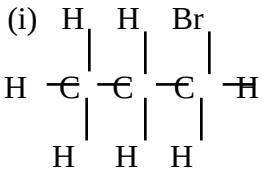
(iii) Propane

(b) (i) Hydrogenation

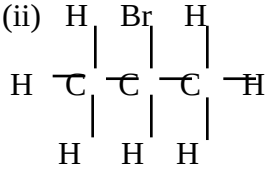
(ii) Neutralization

(iii) Substitution

(c) (i)



(ii)



(d) $2CH_3\ CH_2CH_2OH + 9\ O_2 \longrightarrow 6CO_2\ (g) + 8H_2O\ (l)$

Ignore states symbols

(e) Reagent: Chlorine gas Condition: U.V. light

(f) 21.9 tonnes = 21.9 x 1000 x 1000 = 21,900,000g

RMM of N (CH_3CH_2COOH) = 3(12) + 6(1) + 2(16) = 74

RMM of R ($CH_3\ CH_2COONa$) = 3(12) + 5(1) + 2(16) + 23 = 96

Moles of N ($CH_3\ CH_2COOH$) = 21,900,000 ÷ 74 = 295,945.95moles

Mole ratio CH_3CH_2COOH: CH_3CH_2COONa

1 : 1

Moles of CH_3CH_2COONa = 295,945.95moles

Mass of CH_3CH_2COONa = Moles x RMM

= 295,945.95 x 96

= 28,410,811.2g

= 28.41 tonnes

3. (a) (i) Enthalpy of formation of CO

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

= -110 + - 283
= -393kj/mol

144g graphite = 144 ÷ 12
= 12 moles

1 mole gives -393kj/mol

12 moles = 12 x -393 kj/mol
= - 4,716 kj

(b) This is the enthalpy change when **one mole** of a substance burns in oxygen

(ii) $4 (- 399kjmol^{-1}) + 5 (- 286kjmol^{-1}) = \Delta H_f + - 2877kjmol^{-1}$

$-3026 + 2877 = \Delta H_f$

$\Delta H_f = -149kj/mol$

(c) (i) the heat change when an acid is neutralized by a base to produce **one mole of water**

(ii) $H^+ (aq) + OH^- (aq) \longrightarrow H_2O (l)$

(iii) I. $\Delta H = MC\Delta T$

Mass of the mixture = 50 x 1 = 50g

Initial Temp = (25+ 26) ÷ 2 = 25.5°C

$\Delta T = 38.5 - 25.5 = 13^oC = 13K$

$\Delta H = 50 \times 13 \times 4.2 = 2730$ J or 2.73kJ

II. Moles of NaOH = $\frac{25 \ x \ 2}{1000}$

= 0.05moles

0.05 moles produces 2.73 kJ

1 mole produces $\frac{1 \ x \ 2.73}{0.05} = 54.6$

ΔH= 54.6 kJ/mol

4. a) (i) E

(ii) emf = $E_D - E_B$

= 0.34 - - 2.28

= + 2.62 V

(iii) B (s) / B^{2+} (aq) // D^{2+} (aq) / D (s) ; E^{θ} = + 2.62V

(iv) No. E^{2+} (aq) will be reduced to E (s) because A (s) is a stronger reducing agent than E (s)

(b) Q = It
= 1.34 x 150 x 60
=12060 cuolombs
2F= 2 X 96500
= 193000 C
14.125g produce 12060 C
? Produce 193000C
= 193000 X 14.125 ÷ 12060
= 226.04

c) Workable electrolysis setup (1mk)

Anode – Impure copper (1mk)

Cathode – Thin sheet of pure copper (1mk)

5. a) Sulphur (IV) oxide / Copper (I) sulphide, Cu_2S/ Iron (II) Oxide FeO (any two)

b) (i) Sulphur (IV) oxide (ii) CuO

c) Cu_2S (s) + 2 Cu_2O (s) $\longrightarrow$ 6 Cu (s) + SO_2 (g)

d) To remove Iron (II) oxide impurities in form of slag

SiO_2(s) + FeO (s) $\longrightarrow$ $FeSiO_{3\,(g)}$ (slag)

e) Electrolysis

f) i) Copper metal exhibit **metallic bonding**. In the metallic bond we have **delocalized/ free and mobile electrons which move** when a potential difference is applied.

ii) copper and tin

g) Nitrogen (II) oxide (NO)

h) Making pipes/ making electrical cables/ making alloys e.g. bronze/ making jewelleries and statues/ making coins

i) Cuprite, Malachite, Copper glance (Chacocite)

6. a) I (i) A loses electron/ energy level

(ii) G gains electrons/ incoming electron experiences repulsion/ nuclear attraction becomes weaker

II. Increases due to increasing strength of the metallic bonds from A to C

III. Increases from A to F due to increasing nuclear attraction as the atomic size decreases

IV. D has a giant atomic structure with strong covalent bonds

b) (i) decreases from N to P due to increase in the number of energy levels

(ii) LP_2

(iii) The solution of the oxide of Y turns red litmus paper blue while the solution of the oxide of S turns blue litmus paper to red. Y oxide is alkaline while s oxide is acidic

(iv) 2.8

7. a) The spontaneous disintegration of unstable nuclei to give radiations and nuclear energy

b) (i) A – Beta (β) particles B – gamma(γ) rays C – alpha (α) particles

(ii) Beta particles are deflected more than alpha particles because the beta particles are fast moving and lighter while alpha particles are heavier and slower.

iii) Gamma rays because they are the lightest and they lack charge

c) To study the rate of absorption of fertilizers/ Gamma rays used to kill bacteria in tinned food/ used to measure the thickness of paper in paper manufacture