



CENTRAL EAST EDUCATION DIVISION

2023 MALAWI SCHOOL CERTIFICATE OF EDUCATION MOCK EXAMINATION

CHEMISTRY

Tuesday, 28th March

Subject Number: M036/I

Time allowed: 2 hours

8:00 -10:00 a.m.

PAPER I

(100 marks)

PROVISIONAL MARKING KEY

1a. Pure substance is a material that has constant composition and consistent properties throughout the sample. (1 mark)

b. Pure substances are B and D (2)
impure are A, C and K (3)

c. Distance moved by solvent = $\frac{\text{distance moved by substance}}{\text{relative flow value}}$ (1)

$$= \frac{40\text{mm}}{0.85} \quad (1) \\ = 47 \text{ mm} \quad (1)$$

(3 marks)

d. i. Introduce a burning splint at the mouth of a gas jar that contains hydrogen gas. (1) It produces a pop sound. (1)

2a. Oxidation is the loss of electron/ gain of oxygen/ increase of oxidation number/ removal of hydrogen while reduction is the gain of electron/ loss of oxygen/ decrease of oxidation number/ addition of hydrogen(1).



c. Magnesium metal. (1)

d. $2\text{Cr} + (-2) \times 7 = -2$

$$2\text{Cr} + (-14) = -2$$

$$2\text{Cr} = +14 - 2$$

$$2\text{Cr} = +12$$

$$\text{Cr} = +6$$

3a.i. An acid is a proton donor. (1 mark)

ii. HCl/Cl^- (1), H_3O^+/H_2O (1)

b. $CH_3COOH(aq) + H_2O(l) \rightleftharpoons CH_3COO^-(1\text{ mark}) + H_3O^+(aq)(1\text{ mark})$

4a. Rate of reaction is the change of amount of reactants to form products per unit time. (1)

b. correct scale (1), labels (1), any 2 correct points (1), line of fitness (1)

$$c = \frac{Y_2 - Y_1}{X_2 - X_1}$$

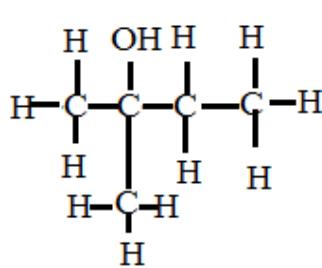
$$= \frac{15 - 0}{5 - 0}$$

$$= \frac{15}{5} \quad (1)$$

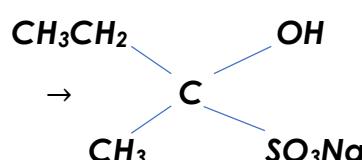
$$= \frac{15}{5}$$

$$= 3 \text{ cm}^3/\text{s} \quad (1)$$

5a



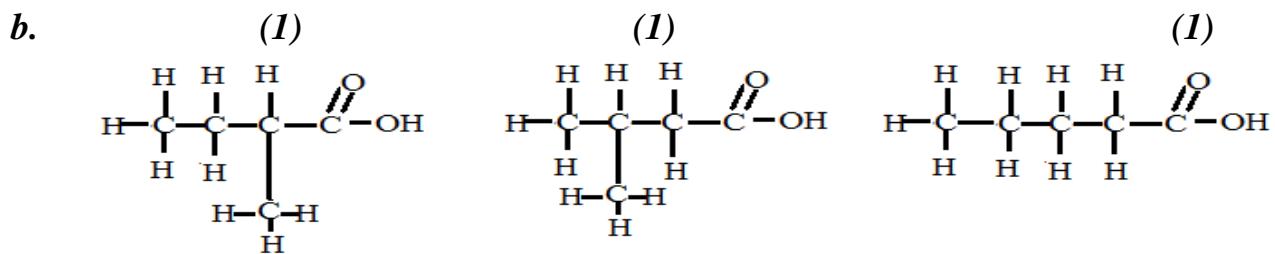
b (i). $CH_3CH_2COCH_3 + NaHSO_3 \rightarrow$



(1 mark)

(ii) addition reaction (1)

6a Isomers are compounds of the same molecular formula but different structural formula(1) whereas conformers are the compounds that differ from each other by the rotation of a single bond in the molecule.(1) (2 marks)



7a. *It does not melt when heated*

It can not be remoulded

It has cross-linked covalent bonds (2)

b. *It has no cross-linked bonds (1) therefore, it needs less energy to break the bond (1).*

8a *Greenhouse gases are air components whose accumulation in the atmosphere which rise in global temperature.*

(1 mark)

b. Examples of greenhouse gases

- *Carbon dioxide*
 - *Sulphur dioxide*
 - *Nitrogen dioxide*
 - *Nitrogen monoxide*
- (any three)*

c. prevents pollution (1)

conserves raw materials(1)

source of employment

any two

d. *hot water removes oxygen(1) thereby causing suffocation of aquatic animals(1)*

9ai. Ionic bond

ii. metal atoms lose their outermost electrons and become positively charged(1) so there is electrostatic force of attraction(1) between the positive metal ions and the free delocalised electrons(1)

iii. are soluble water (1)

have high melting and boiling point (1)

conducts electricity in molten and aqueous state (1)

bi. Is a mixture of metals in order to improve the strength of the metal(1)

ii. does not corrode

it is tough

durable

any two

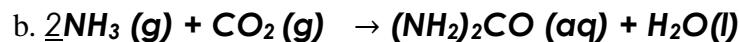
ci. because it exists in different physical forms at the same state of matter (1)

ii.

- *are poor conductors of electricity*
- *have strong covalent bonds*
- *are insoluble in water*
- *high relatively high melting point and boiling points*

(Any two, 2 marks)

10a. Limiting reagent is the reactant that is completely used up in a reaction while the other one is still available whereas excess reagent



34g of NH₃ reacts with 44g of CO₂ (1)

637.2 g of NH₃ reacts with more

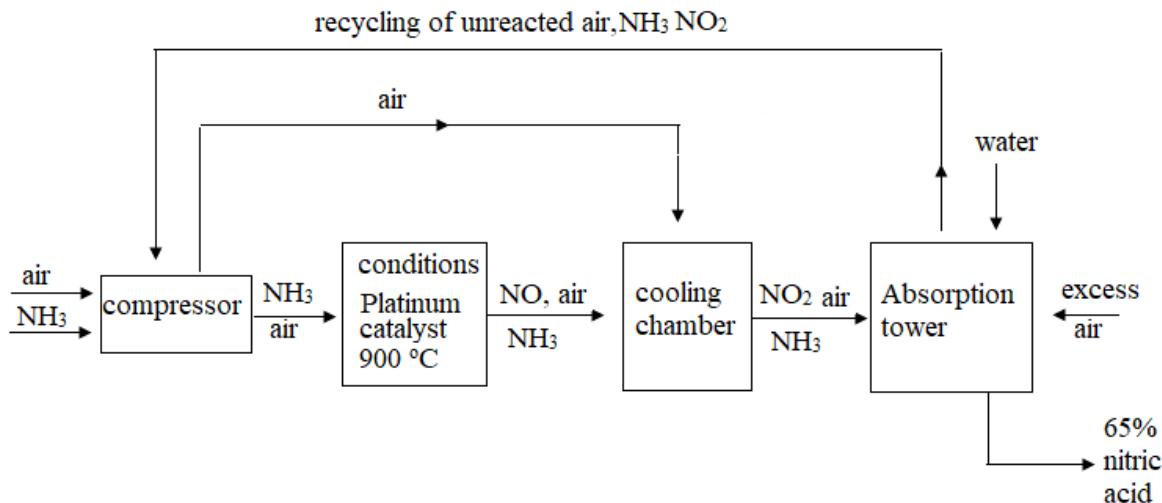
$$\frac{637.2 \text{ g of NH}_3 \times 44 \text{ g of CO}_2}{34 \text{ g of NH}_3}$$

824.61g CO₂ (1)

But the available CO₂ is 1142g; therefore NH₃ is a limiting reagent.(1)

4 marks 1 mark for each step

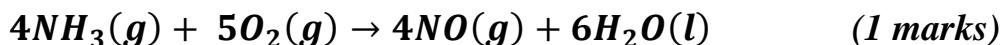
11.



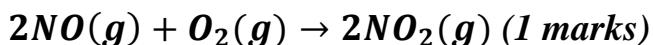
6 marks for a flow diagram

Ostward process is the industrial production of nitric acid. The process has the stages below

- a. *Production of nitrogen monoxide by reacting ammonia and oxygen gas in air 1*



- b. *Production of nitrogen dioxide by reacting nitrogen monoxide gas with oxygen from air 1*



- c. *Production of nitric acid by reacting nitrogen dioxide with oxygen and water*



12. a. a solution whose concentration is known (1)

b. calculate the mass of NaCl to be measured on the beam balance

$$m = \text{No of moles} \times \text{RFM}$$

$$\text{No of moles} = M \times V$$

$$= 0.1M \times 500/1000 \text{ dm}^3 \quad (1)$$

$$= 0.1 \text{ moles} \quad (1)$$

$$m = 0.1 \text{ moles} \times (23+35.5) \quad (1)$$

= 5.85g (1) 4 marks for calculations

Measure 5. 85g of NaCl crystals on triple balance and put in a beaker (1)

Add distilled water and stir to dissolve(1)

Transfer the contents into a 500 cm³ volumetric flask (1)

Wash the beaker and transfer the contents into the flask(1)

Add water to the volumetric flask up to the mark (1)

Store the prepared solution in the reagent bottle and label it 0.1M NaCl (1)

13

- *Pour about 4 cm³of oil or 40g of animal fat into 100 cm³ (1)*
- *Add 15 cm3 of sodium hydroxide solution (1)*
- *Boil the mixture for about 10 – 15 minutes while stirring (1)*
- *Add small amount of distilled water (1)*
- *Add 4 spatula of sodium sodium chloride(1)and stir well to improve precipitation (1)*
- *Allow the mixture to cool (1)*
- *Filter off the solid (1)*
- *Wash the solid residue with distilled water (1)*
- *The residue is soap and it is dried (1)*