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**ZERAKI ACHIEVERS' EXAMINATIONS (2021)**  
**Term 3 - 2021**  
**CHEMISTRY (MARKING SCHEME)**  
**FORM ONE (1)**  
**Time: 2½ Hours**

**Name:** ..... **Adm No:** .....

**School:** ..... **Class:** .....

**Signature:** ..... **Date:** .....

**Instructions to candidate**

- a) Write your name, admission number, and stream in the spaces provided.
- b) Answer **ALL** questions in the spaces provided
- c) All working **MUST** be clearly shown where applicable
- d) KNEC mathematical tables and silent non-programmable electronic calculators may be used
- e) This paper consists of *11 printed pages*
- f) The candidate should check the question paper to ascertain that all the pages are printed as indicated and that no question is missing

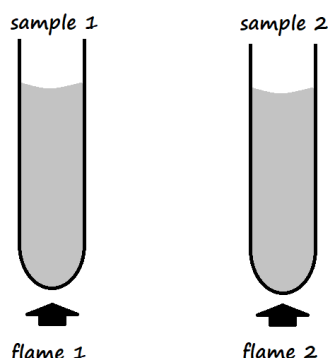
**FOR EXAMINERS' USE ONLY**

| Question | Maximum Score | Candidate's Score |
|----------|---------------|-------------------|
| 1 – 25   | 80            |                   |

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1. Equal volumes of water in two separate boiling tubes were separately heated using two different Bunsen burner flames.

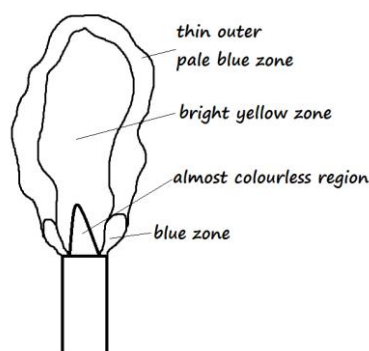


Sample 1 registered a higher temperature than sample 2.

- a) Name and draw flame 2

(2 Marks)

Name *Luminous flame*



- b) State the condition under which flame 1 is produced by a Bunsen burner

(1 Mark)

*It is produced when the air hole is fully open*

2. The table below shows the colours obtained when some indicators were added to various solutions

| Solution           | Phenolphthalein Indicator | Methyl Orange Indicator | Indicator W |
|--------------------|---------------------------|-------------------------|-------------|
| Distilled water    | <i>Colourless</i>         | <i>Orange</i>           | Green       |
| Ammonium hydroxide | Pink                      | <i>Yellow</i>           | Blue        |
| Hydrochloric acid  | <i>Colourless</i>         | Red                     | Red         |
| Sodium hydroxide   | <i>Pink</i>               | <i>Yellow</i>           | Violet      |

- a) Fill in the blank spaces in the table above?

(3 Marks)

- b) State the possible identity of Indicator **W**. (1 Mark)

*Universal indicator*

- c) What is the advantage of using Indicator **W**? (1 Mark)

*It shows the strengths of acids and bases*

3. State the laboratory rules that should be applied to prevent the following accidents:

- a) Mistaking hydrochloric acid to be distilled water (1 Mark)

*Label all chemicals correctly to avoid confusion*

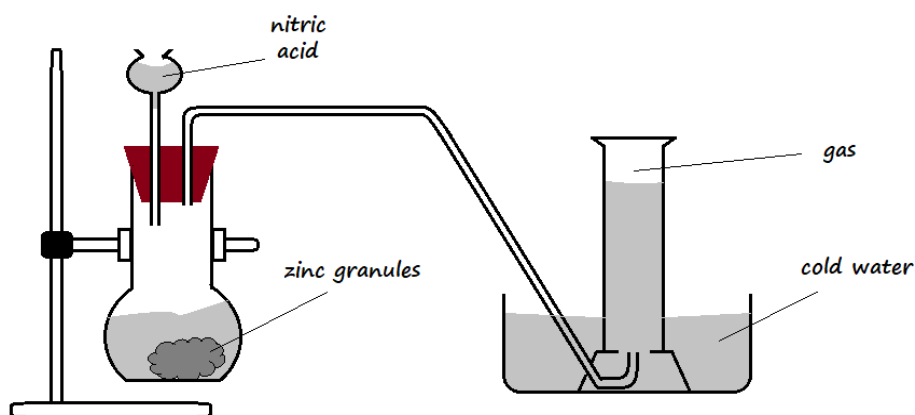
- b) A student got burnt after secretly lighting up a magnesium ribbon (1 Mark)

*Do not carry out any experiment without informing the teacher*

- c) A student got severe stomach upset after eating some bread during a Chemistry laboratory session (1 Mark)

*Avoid tasting or eating anything in the laboratory to prevent poisoning*

4. The setup below was arranged for the collection of **dry** hydrogen gas in the laboratory. Use it to answer the questions that follow.



- a) Identify **two** mistakes in the set-up (2 Marks)

*The stem of the thistle funnel is not dipped into the solution in the flask*

*The gas is collected over water (should be dry)*

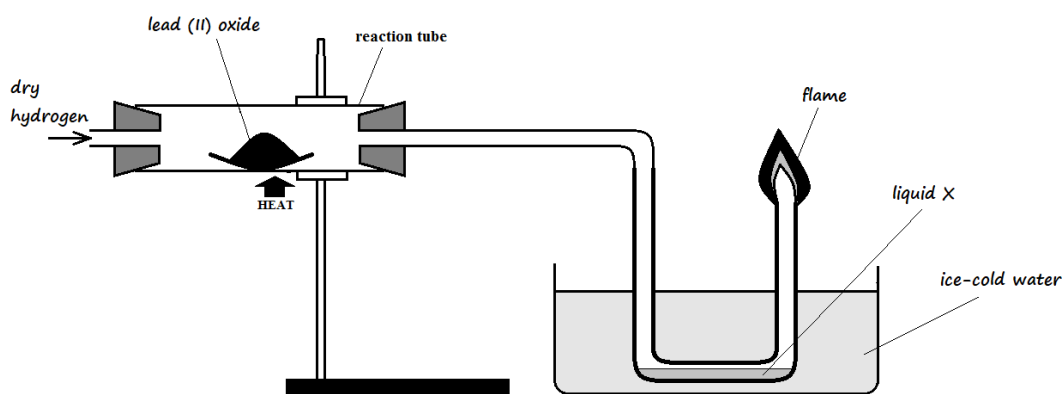
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- b) Suggest remedies for the mistakes identified in **a)** above (2 Marks)

*Extending the stem of the thistle funnel into the solution, or using a dropping funnel*

*Collecting the gas by using downward displacement of air, or using a syringe*

5. Dry hydrogen gas was passed over heated lead (II) oxide in a combustion tube as shown in the diagram below.



- a) State **two** observations that were made in the combustion tube (2 Marks)

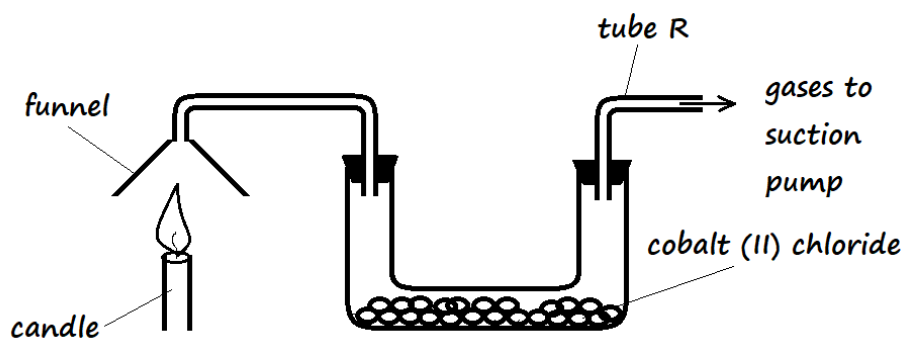
*Orange lead (II) oxide changes to a grey substance*

*Droplets of a colourless liquid are observed on the cooler parts of the tube*

- b) Write a word equation for the reaction taking place in the combustion tube (1 Mark)



6. The products of a burning candle were passed through a U-tube containing anhydrous cobalt (II) chloride as shown in the diagram below



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- a) State the observation that was made in the U-tube (1 Mark)

*The blue solid turns pink*

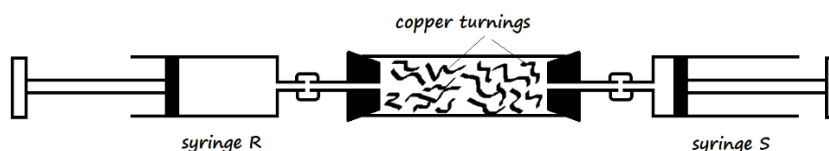
- b) Write a word equation for the reaction taking place in the U-tube (1 Mark)

*Anhydrous cobalt (II) chloride + Water  $\rightarrow$  Hydrated Cobalt (II) chloride*

- c) Name the gas that came out through tube **R** (1 Mark)

*Carbon (IV) oxide*

7. Copper turnings were packed in a combustion tube connected to two syringes as shown in the diagram below. Syringe **R** contained 120cm<sup>3</sup> of air while syringe **S** was empty.



The copper turnings were heated strongly as air was being passed from syringe **R** to syringe **S** slowly and repeatedly, until there was no further change in volume of air in syringe **R**. The final volume of air left was 95.5cm<sup>3</sup>.

- a) Why was air passed over the heated copper turnings slowly and repeatedly? (2 Marks)

*It was passed slowly to give time for the copper turnings to react with oxygen, and passed repeatedly to ensure all oxygen reacts*

- b) State **one** observation made in the combustion tube during the experiment (1 Mark)

*The copper turnings turn from brown to a black substance*

- c) Determine the percentage of oxygen used during the experiment (2 Marks)

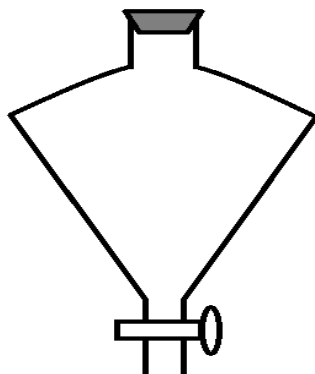
$$\begin{aligned}\text{volume of air used} &= \text{Initial volume} - \text{final volume} \\ &= 120 - 95.5 \\ &= 24.5\text{cm}^3\end{aligned}$$

$$\begin{aligned}\% \text{air used} &= \frac{\text{volume of air used}}{\text{initial volume of air}} \times 100 \\ &= \frac{24.5}{120} \times 100 \\ &= 20.42\%\end{aligned}$$

[Type here]



8. The apparatus below was used to separate a mixture of liquid **A** and **B**



State **two** properties of the liquids that make it possible to separate them using this apparatus  
(2 Marks)

*The liquids have different densities*

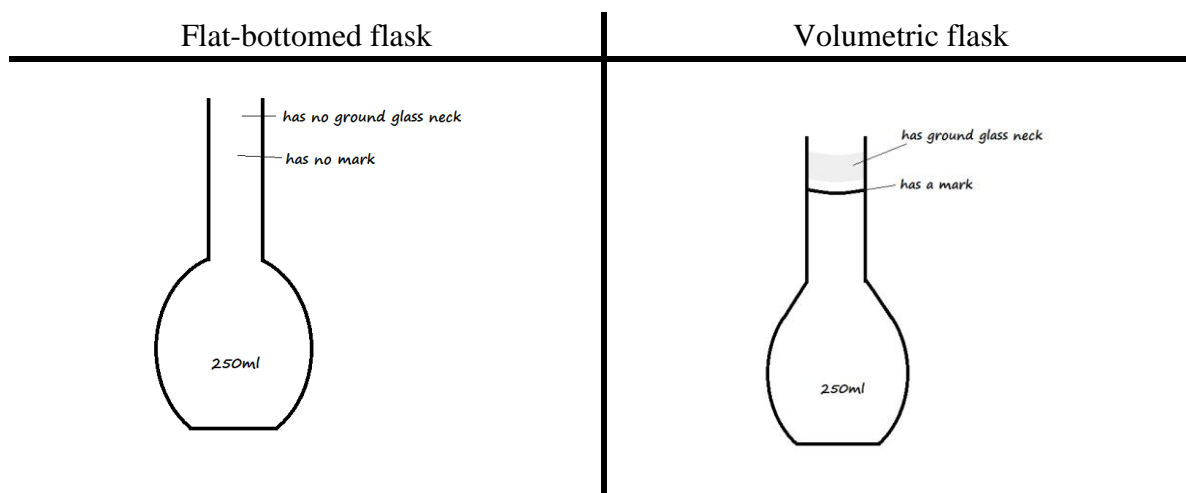
*The liquids are immiscible*

9. A mixture contains iron filings, sulphur, and table salt. Describe a procedure that a student can use to separate the mixture and recover all the components of the mixture. (3 Marks)

*Use a magnet to remove the iron filings from the mixture. Add water to the remaining mixture and stir to dissolve the table salt. Filter the mixture to obtain sodium chloride solution as a filtrate, and sulphur as a residue. Heat the filtrate to saturation and allow to cool to obtain crystals of sodium chloride.*

10.

- a) Draw **two** separate diagrams to differentiate a flat-bottomed flask of 250ml and a volumetric flask of 250ml (2 Marks)



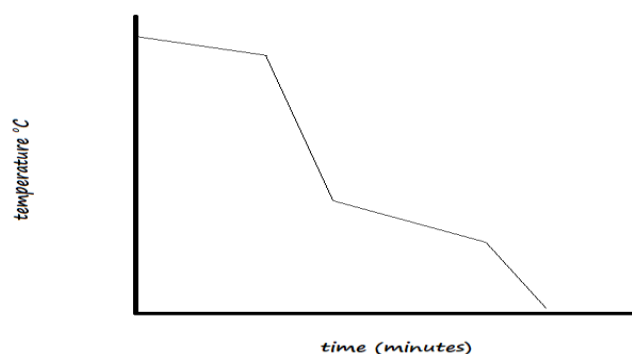
- b) State the main use of a volumetric flask (1 Mark)

*To prepare solutions of specific concentration*

- c) Flat bottomed flasks and volumetric flasks are made of glass. Explain (1 Mark)

*Glass is transparent and makes reactions in the vessels easily visible*

11. The diagram below shows the cooling curve of a certain substance



- Is this substance pure or impure? Explain (2 Marks)

*Impure. It melts and boils over a range of temperatures//It does not have a sharp melting point and boiling point.*

12. Write word equations for the following reactions: (3 Marks)

- a) Sodium and water

*Sodium + Water  $\rightarrow$  Sodium hydroxide + Hydrogen gas*

- b) Calcium oxide and nitric acid

*Calcium oxide + Nitric acid  $\rightarrow$  Calcium nitrate + Water*

- c) Magnesium carbonate and hydrochloric acid

*Magnesium carbonate + Hydrochloric acid  $\rightarrow$  Magnesium chloride +  
Carbon (IV) oxide + Water*

13. Salt is normally sprinkled on roads during winter in temperate countries.

- a) State and explain why salt is normally sprinkled on roads (2 Marks)

*The salt makes the ice on the road to melt away. Salt acts as an impurity and lowers the freezing point of water.*

- b) Why is this practice of great concern to motorists (1 Marks)

*Salt increases the rate at which motor vehicle body parts rust.*

14. Explain how each of the following components is removed from a sample of air, before the fractional distillation of liquefied air:

- a) Carbon (IV) oxide (1 Mark)

*By bubbling the sample of air through concentrated sodium hydroxide solution or concentrated potassium hydroxide solution*

- b) Water vapour (1 Mark)

*By cooling the air sample to temperatures below  $-25^{\circ}\text{C}$*

- c) Solid impurities (1 Mark)

*Through filtration of the air sample//Through electrostatic precipitation of the air sample*

- d) Why is it important to remove carbon (IV) oxide from the air sample? (1 Mark)

*Carbon (IV) oxide solidifies at extremely low temperatures and may block the thin pipes in the fractional distillation process system.*

15. Name the constituent element in each of the following compounds:

- a) Copper (II) sulphate (1½ Marks)

*Copper, Sulphur, and Oxygen*

- b) Sodium nitrate (1½ Mark)

*Sodium, Nitrogen, and Oxygen*

- c) Potassium iodide (1 Mark)

*Potassium and iodine*



16.

a) Complete the table below

(3 Marks)

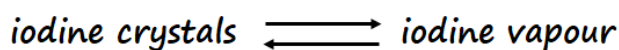
| English Name | Symbol |
|--------------|--------|
| Sodium       | Na     |
| Phosphorous  | P      |
| Lead         | Pb     |
| Potassium    | K      |
| Gold         | Au     |
| Mercury      | Hg     |

b) State the difference between a compound and a mixture

(2 Marks)

*A compound is a substance in which the elements are chemically combined and have a new property, while a mixture is composed of various elements or substances that are not chemically combined and each component retains its physical and chemical properties.*

17. The diagram below represents a change



a) What type of change is represented above?

(1 Mark)

*Temporary physical change*

b) Give **four** characteristics of the change

(2 Marks)

*No new substances are formed*

*The change is reversible*

*There is no net heat change*

*There is no change in mass*

[Type here]



18. Give any **three** apparatus that are used to measure accurate volumes of liquids and solutions in the laboratory (3 Marks)

*Pipette*

*Burette*

*Syringe*

*Volumetric flask*

19. Define the following:

a) Boiling point

(1 Mark)

*This is the constant temperature at which a liquid is converted to gas when heated.*

b) Matter

(1 Mark)

*Matter is anything that has mass and occupies space*

c) Indicator

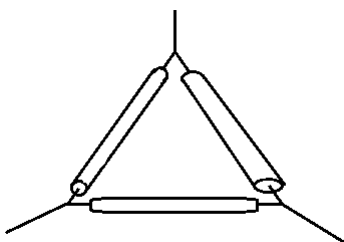
*This is a chemical substance that shows a specific colour when added to acid, and a different specific colour when added to a base.*

20. Substance **W** is highly soluble in propanone, while substance **M** has low solubility in propanone. Which of the two substances will travel the shortest distance on an adsorbent material during paper chromatography? Explain (3 Marks)

*Substance M. Its inability to dissolve makes it stick more to the adsorbent material.*

21. Name the following apparatus and state its use in the laboratory

(2 Marks)



*Pipe-clay triangle. For holding crucibles during heating.*

22. When separating solid copper (II) sulphate from a copper (II) sulphate solution, the solution was first heated then transferred to a water bath. Why was it important to heat the solution over a water bath? (2 Marks)

*To prevent spitting of the copper (II) sulphate crystals, and to prevent loss of the water of crystallization.*

23. State **two** major differences between the properties of solids and those for gases (2 Marks)

*The forces of attraction between solid particles are strong while those in gases are weak*

*Solids have a definite shape and volume while gases have a definite volume but no definite shape*

*Solid particles vibrate within fixed positions while liquid particles can change positions.*

24. After carrying out the process of distillation, describe how one can confirm that the distillate contains no dissolved solute (2 Marks)

*Put a sample of the distillate on a clean watch glass and heat gently to evaporation. If the watch glass remains clean, it indicates that the distillate no longer contains dissolved solute.*

25. Which method of separation can be used to obtain the following:

- a) Petrol from crude oil (1 Mark)

*Fractional distillation*

- b) Oil from sunflower seeds (1 Mark)

*Solvent extraction*

- c) Distinguish between a homogenous mixture and heterogenous mixture (2 Marks)

*A homogenous mixture is one in which the components cannot be distinguished, while a heterogenous mixture is one in which the components can be clearly distinguished.*