


MINISTRY OF GENERAL EDUCATION
Jimel Mission Boarding School
End of Term One Examination
 Grade 12



Science 5124/2
 Paper 2 19th April, 2021
 Addition Materials:
 Soft clean eraser
 Soft pencil (type B or HB is recommended)
Time 2 Hours
 Instructions to candidates
 There are **three** sections in the paper **A, B** and **C**. Answer all questions in section **A** and **B** within the spaces in the paper. Choose **two** questions from Section **C**

ANSWER GRID FOR SECTION A

PUT A (x) ON THE LETTER INDICATING THE CHOICE OF YOUR ANSWER

| | | | | |
|----|---|---|---|---|
| 1. | A | B | C | D |
| 2. | A | B | C | D |
| 3. | A | B | C | D |
| 4. | A | B | C | D |
| 5. | A | B | C | D |
| 6. | A | B | C | D |
| 7. | A | B | C | D |
| 8. | A | B | C | D |
| 9. | A | B | C | D |
| 10 | A | B | C | D |

| | | | | |
|-----|---|---|---|---|
| 11. | A | B | C | D |
| 12. | A | B | C | D |
| 13. | A | B | C | D |
| 14. | A | B | C | D |
| 15. | A | B | C | D |
| 16. | A | B | C | D |
| 17. | A | B | C | D |
| 18. | A | B | C | D |
| 19. | A | B | C | D |
| 20. | A | B | C | D |

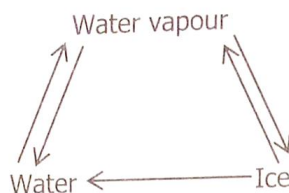
SECTION A

Answer **all** the questions on the answer grid provided.

A1 A learner wanted an apparatus that he could use to accurately measure 10.5cm^3 of dilute hydrochloric acid to prepare a salt of sodium metal by neutralisation. Which one of the following apparatus would you advise him to use?

- A** Beaker
- B** Burette
- C** Pipette
- D** Volumetric flask

A2 In which conversion do water molecules lose energy?



- A** Ice \longrightarrow water
- B** Ice \longrightarrow water vapour
- C** Water vapour \longrightarrow ice
- D** Water \longrightarrow water vapour

A3 Which one of the following best describes metallic bonding? It is a force of attraction between ...

- A** two different types of metals.
- B** protons in the nucleus of a metal and the valence electrons of the metal.
- C** valence electrons and protons in the nucleus of a non-metal.
- D** valence electrons and metal ions.

A4 Lime water is a strong alkali. What would be the net ionic equation for a reaction between lime water and an acid solution of nitric acid?

- A** $\text{H}^+_{(\text{aq})} + \text{OH}^-_{(\text{aq})} \rightarrow \text{H}_2\text{O}_{(\text{l})}$
- B** $\text{H}^+_{(\text{aq})} + \text{NO}_3^-_{(\text{aq})} \rightarrow \text{HNO}_3_{(\text{l})}$
- C** $\text{Ca}^{2+}_{(\text{aq})} + 2\text{NO}_3^-_{(\text{aq})} \rightarrow \text{Ca}(\text{NO}_3)_2_{(\text{aq})}$
- D** $\text{Ca}^{2+}_{(\text{aq})} + 2\text{OH}^-_{(\text{aq})} \rightarrow \text{Ca}(\text{OH})_2_{(\text{aq})}$

A5 A sample of an oxide of manganese is analysed and it is found that 11.0g of manganese combined with 4.8g of oxygen. What is the empirical formula of the oxide?

- A** Mn_2O
- B** Mn_2O_3
- C** MnO
- D** MnO

B1 Study the **figure B1.1** and **B1.1** below and answer the questions that follows

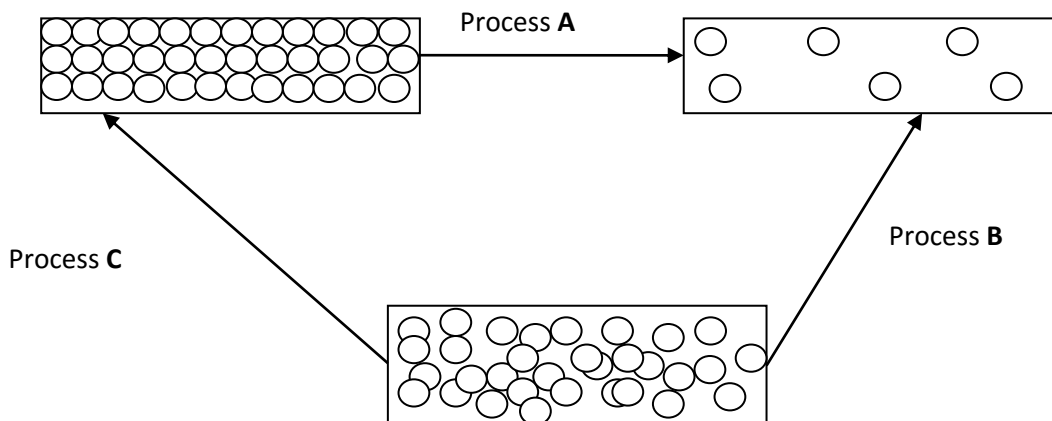


Figure B1.1 changes of state

Table B1.1 common substances

| | | | |
|------------------|----------------------|-------------------|-------------------|
| Substance | Aluminium oxide | Ammonium chloride | Calcium hydroxide |
| Substance | Copper (II) sulphate | Iodine crystals | Water |

a) (i) Identify process **A** in **Figure B1.1**

Sublimation.....[1]

(ii). From the table **b1.1**, identify **two** substances that can undergo process **A**

Iodine crystals, Ammonium chloride.....[2]

b) State whether process **B** and **C** are endothermic or exothermic. Explain your answer.

B-Endothermic reaction because heat energy is absorbed to breaks the bonds

C- Exothermic because heat energy is released when building the bonds......[2]

[Total: 5 marks]

B2 In an experiment to prepare a salt, a learner reacted 3.0g of magnesium oxide with 40.0cm³ of dilute nitric acid of concentration 2.0mol/dm³

a) Write a balanced chemical equation for the reaction

Magnesium + Nitric acid.....Magnesium chloride + Water

MgO_(s) + 2HNO_{3(aq)}.....Mg (HNO₃)_{2(aq)}.....+ H₂O_(l)[2]

b) Calculate number of moles of

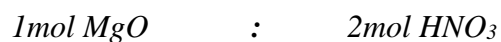
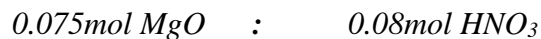
i) Magnesium oxide

| | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><i>Relative Molecular Mass</i></p> <p><i>MgO</i></p> <p><i>Mg: (1x24= 24g/mol)</i></p> <p><i>O: (1x16=16g/mol)</i></p> <p><i>RAM = 40 +16 = 40g/mol</i></p> | <p><i>Data</i></p> <p><i>m= 3.0g; Mr= 40g/mol</i></p> <p><i>n = m/Mr</i></p> <p><i>=3.0g/40g/mol</i></p> <p><i>= 0.075mol</i></p> | <p>Note: when solving this kind of problem in mole concept always write the collect molecular formula and determine the relative atomic mass.</p> <p style="text-align: right;">[1]</p> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

ii) Dilute nitric acid

| | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Data</p> <p><i>C= 2.0mol/dm³</i></p> <p><i>V= 40.0cm³ = (40/1000cm³)</i></p> <p><i>= 0.04dm³</i></p> <p><i>Always convert the volume in cm³ to dm³ by dividing with 1000</i></p> | <p><i>Concentration= number of moles/volume</i></p> <p><i>C = n/V</i></p> <p><i>2.0mol/dm³ = n/ 0.04dm³ (Multiply)</i></p> <p><i>n = 2.0mol/dm³ x 0.04dm³ (cancel out the volume)</i></p> <p><i>n= 0.08mol</i></p> <p style="text-align: right;">[1]</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

iii) Determine the limiting reactant

According to mole ratio from the balanced chemical equation*According to mole ratio based on calculations*

We can conclude that Magnesium oxide was a limiting reactant in such a way, it finished first when there was still 1mol of HNO₃.

[2]

[Total: 6 marks]

B3 Table B3.1 below shows the elements in a Period on the Periodic Table

Table B3.1: Elements in a Period

| | | | | | | | |
|-----------|-----------|----------|----------|----------|----------|----------|-----------|
| Li | Be | B | C | N | O | F | Ne |
|-----------|-----------|----------|----------|----------|----------|----------|-----------|

- a) To which period of the Periodic Table do these elements belong?
2 (two) [1]
- b) What happens to the number of shells across the Period shown above?
The number of shells is neither increasing nor decreasing because the elements are in the same period. [1]
- c) Answer the following question using only the elements in the **table B3.1**
 Each element can be used once, more than once or not at all
- i) Which **two** elements would form an ionic compound?
Li and O, Li and F, Be and F, Be and O [1]
- ii) Which element has a valency of three
B (Boron) [1]
- iii) Which element has allotropes?
C (Carbon) [1]

[Total: 5 marks]

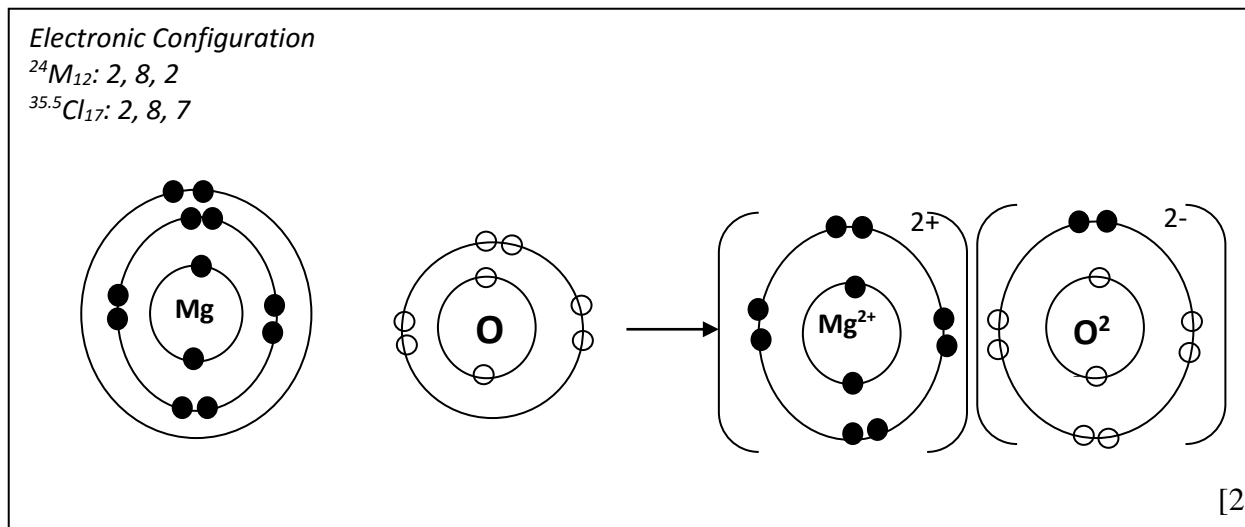
B4. Atoms **A**, **B** and **C** have 8, 17 and 20 electrons respectively.

- a) Using the letters, construct a chemical formula of a compound formed between atoms of elements **A** and **C**.
 A^2 \times C^2 AC *or* CA .
Both element A and C their valence number is 2, so they should be canceled. Always the metal should be in front, hence, Element C is a Metal (calcium) while Element A is a Non-metal (Oxygen) so the formula is MgO. [1]
- b) Elements **B** and **C** can react to form a compound.
- i) Name the type of bond formed in the compound
Ionic or electrovalent bond
This type of bond occurs between metals and non-metals and involves loss and gain of electron (metals lose electron while non-metal gain electron) [1]

ii) State **one** Physical property of this compound

- they exist as solid at room temperature and pressure
- they conduct electricity in molten state
- they have high density

c) Draw the electronic structure of the product formed when atoms of element A combine with element C



d) Give **one** industrial use of element B

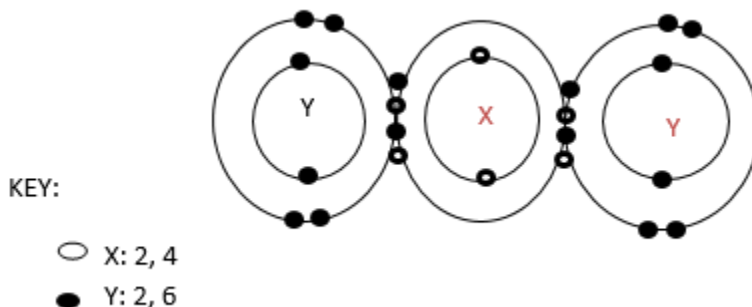
- It used in treatment of water
- Sterilization of clinical instrument
- Used in cleaning industries.....[1]

[Total: 6 marks]

Section C

Answer two questions from this section. Write your answer in the separate answer booklet provided.

C1 Study the figure below showing a compound.



a. Name the compound shown below.

Carbon dioxide [1]

b. Write down the chemical formula of a compound

CO₂ [1]

c. What type of bonding is present in this compound

Covalent bonding [1]

d. Suggest **two** compounds which have the type of bonding mentioned in in (c)above

Water, methane (alkane and alkene groups members), ammonia [2]

e. Explain the difference between covalent and ionic bond

Covalent bonding is the type of bonding that occurs among non-metals (involves sharing of electron to attain the octet ground state) while ionic bonding is the type of bonding that occurs between metals and non-metals (transfer and gain of electron to attain the ground octet state). [2]

f. State any **three** properties you would expect the compound to have

- It exist a gas at room temperature and pressure
- it does not conduct electricity in any state
- its less dense than air
- It has a low density, colourless and odourless [3]

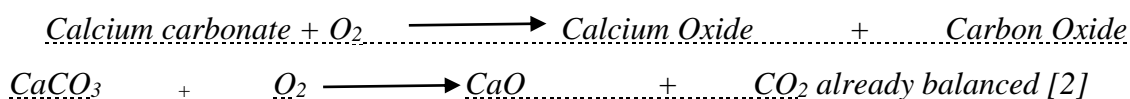
Total: 10marks

C2 Calcium oxide is an important compound that is manufactured from limestone

(a) (i) State the method by which calcium oxide is made from limestone

Decomposition [1]

(ii). Write a balanced chemical equation for the formation of calcium oxide from limestone, include state symbols.



(b) What is the common name for calcium oxide?

Lime [1]

(c) During production of calcium oxide from limestone, a gas is evolved as a by-product

(i) Describe the chemical test for the gas

It turns lime water milky when passed through lime water (calcium hydroxide) [2]

(ii) By what method is the gas collected when prepared in the laboratory? Give a reason for your answer.

It's collected using beehive trough, because it's less dense than air [2]

(iii) State **two** uses of the gas

- it's used in making carbonated drinks

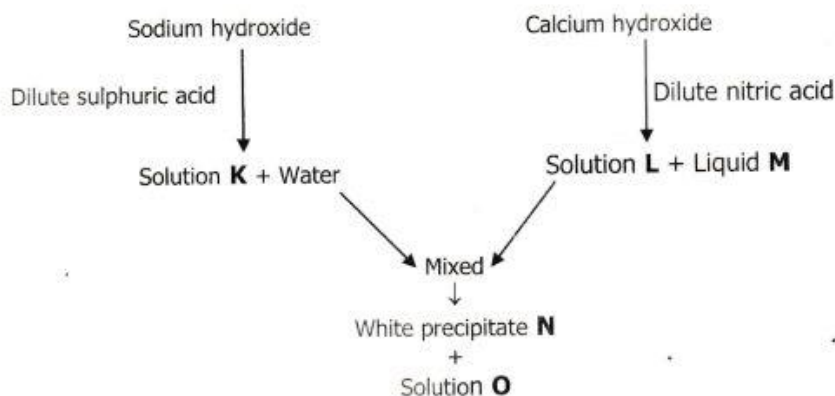
- it's used in fire extinguisher

- it's used as coolant in refrigerators and cold rooms [2]

[Total: 10 marks]

C3

- (a) Define an acid. [1]
 (b) Study the following reaction scheme.



- (i) Give the names and formula of substances **K** to **O**. [5]
 (ii) Write the balanced chemical equation for the formation of solution **L** and liquid **M**. [2]
 (iii) Write an ionic equation for the formation of the white precipitate **N**. [2]
 Include state symbols.

[Total: 10 marks]

Answers to Question C3 above

(a) An acid is the substance which when dissolved in water produces hydrogen ions as the only positively charged particles.

An acid is also defined as a proton donor [1]

(b) *Sodium hydroxide + dilute sulphuric acid* → **Solution K** + water

Sodium hydroxide + dilute sulphuric acid → **Sodium sulphate** + water

$NaOH_{(aq)} + H_2SO_{4(aq)} \longrightarrow Na_2SO_{2(aq)} + H_2O_{(l)}$

Calcium hydroxide + dilute nitric acid → **Solution L** + **Solution M**

Calcium hydroxide + dilute nitric acid → **Calcium nitrate** + **Water**

$Ca(OH)_{2(l)} + HNO_{3(aq)} \longrightarrow Ca(NO_3)_{2(aq)} + H_2O_{(aq)}$

Solution L + Solution L → **White precipitate N** + **Solution O**

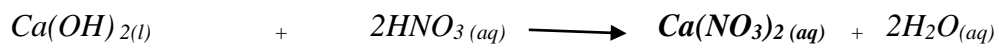
Calcium nitrate + Sodium sulphate → **Calcium sulphate** + **Sodium nitrate**

$Ca(NO_3)_{2(aq)} + Na_2SO_{2(aq)} \longrightarrow CaSO_{4(aq)} + NaNO_{3(aq)}$

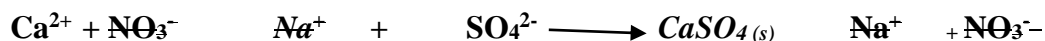
Candidate Name: **MARKING SCHEME**

(i) *Solution K = Sodium sulphate (Na_2SO_4); Solution L = Calcium nitrate ($\text{Ca}(\text{NO}_3)_2$,
Solution M = Water (H_2O); White precipitate N = Calcium sulphate (CaSO_4 (aq))
and Solution O = Sodium nitrate (NaNO_3 (aq))*

(ii) *Calcium hydroxide + dilute nitric acid \longrightarrow Calcium nitrate + Water*



(iii) *$\text{Ca}(\text{NO}_3)_2$ (aq) + Na_2SO_4 (aq) \longrightarrow CaSO_4 (s) + NaNO_3 (aq)*



The End

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