



**ALEXANDER ROAD HIGH SCHOOL**

JUNE 2019

2 HOURS

**PHYSICAL SCIENCE JUNE EXAM PAPER 2**

JA

TOTAL = 100

**GRADE 10**

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Instructions

- The question paper consists of 7 questions.
  - Answer all the questions.
  - Answer Section A on the answer sheet provided.
  - Answer Section B on the folio paper provided.
  - Rule off after each question in Section B.
  - A non-programmable calculator may be used.
  - Number the answers correctly according to the numbering system.
  - Round off to two (2) decimal places where necessary.
  - A periodic table has been included on the back of the answer sheet.
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**SECTION A**

**QUESTION 1: Multiple choice (answer on the answer sheet)**

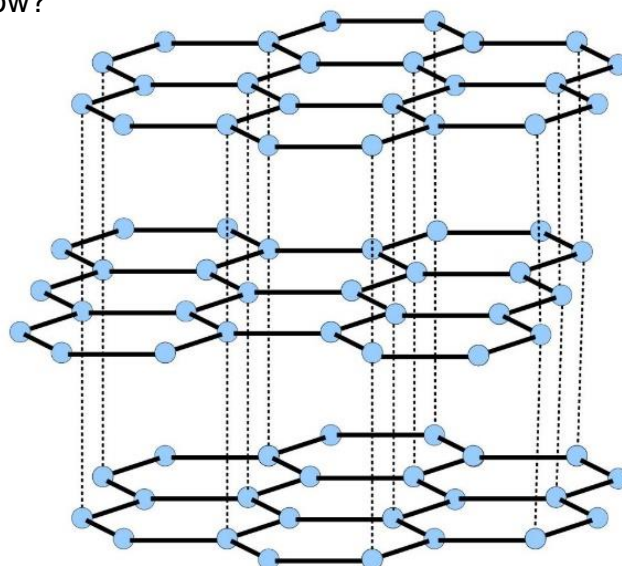
Four possible options are provided as answers to the following questions. Each question has only 1 correct answer. Choose the correct answer and write the letter (A – D) next to the relevant question number (1.1 –1.10) on the answer sheet.

- 1.1 Which ONE of the following substances is non-magnetic?
- A. Iron nail
  - B. Steel pot
  - C. Copper wire
  - D. Chromium-nickel alloy

- 1.2 Which ONE of the following substances can be classified as a heterogeneous mixture?
- A. Mud
  - B. Brass
  - C. Tea
  - D. Air
- 1.3 The process in which a solid becomes a gas without passing through the intermediate liquid phase is called...
- A. deposition
  - B. boiling
  - C. evaporation
  - D. sublimation
- 1.4 In Bohr's atomic model, the maximum number of electrons which can be accommodated in the second energy level is...
- A. 2
  - B. 6
  - C. 8
  - D. 18
- 1.5 Consider C, N, P and Na. The atomic size in ASCENDING (i.e. increasing) order is...
- A. C, N, P, Na
  - B. Na, C, N, P
  - C. N, C, P, Na
  - D. N, C, Na, P

1.6 Which allotrope of carbon does the image below show?

- A. Diamond
- B. Graphite
- C. Buckminsterfullerene
- D. Carbon nanotube



1.7 Water molecules separate when water evaporates to form water vapour. Which ONE of the following explanations best describes this process?

- A. This is an example of a physical change.
- B. This is an example of a chemical change.
- C. A new chemical substance is being formed.
- D. Energy is being released into the atmosphere.

1.8 Hydrogen peroxide ( $\text{H}_2\text{O}_2$ ) decomposes in the presence of  $\text{MnO}_2$  to form water and oxygen gas. The reaction vessel gets warmer. Which ONE of the following combinations is correct?

<b>A</b>	Decomposition reaction	Exothermic reaction	$\text{MnO}_2$ acts as a catalyst
<b>B</b>	Decomposition reaction	Endothermic reaction	$\text{MnO}_2$ acts as a catalyst
<b>C</b>	Synthesis reaction	Exothermic reaction	$\text{MnO}_2$ acts as a catalyst
<b>D</b>	Synthesis reaction	Endothermic reaction	$\text{MnO}_2$ is a reactant

1.9 In which ONE of the following compounds do BOTH ions have the same electron configuration as argon?

- A. Beryllium chloride
- B. Sodium chloride
- C. Potassium chloride
- D. Potassium bromide

1.10 The relative molecular mass of  $(\text{NH}_4)_3\text{PO}_4$  is...

- A. 113
- B. 141
- C. 144
- D. 149

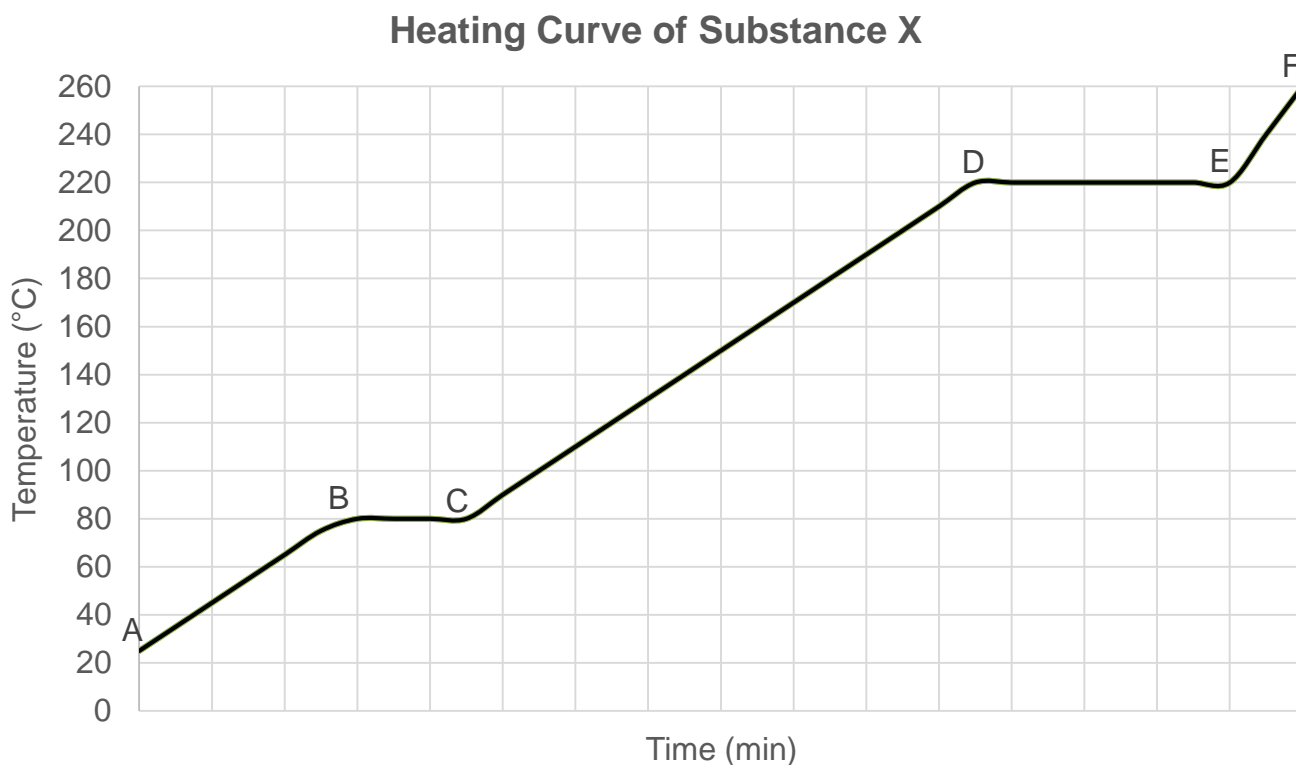
[2 x 10 = 20]

## SECTION B

Answer on folio sheets –

### QUESTION 2:

A group of scientists take a pure, unknown substance X and heat it using a Bunsen burner. The scientists record the temperature of substance X every 30 seconds. Using their data, they plot the following graph.



- 2.1 What is a *pure substance*? (2)
- 2.2 Give one term for the process taking place between:
- 2.2.1 BC (1)
- 2.2.2 DE (1)
- 2.3 Explain the difference between *temperature* and *heat*. (2)
- 2.4 Use the kinetic molecular theory (KMT) to explain why the temperature of substance X remains the same from D to E despite the scientists heating the substance with a Bunsen burner. (1)
- 2.5 Define the term *boiling point*. (2)
- 2.6 What is the boiling point of substance X? (1)

- 2.7 A group of experimenters from the South African Bureau of Standards (SABS) determine the boiling points of a number of different substances under a standard set of conditions. The results are shown in the table below.

Substance	Boiling Point (°C)
Bromine	59
Water	100
Mercury	184
Ethylene glycol	198
Naphthalene	218
Sodium	883

- Which of the substances from the table above is most likely substance X? (1)
- 2.8 How does the altitude at which the scientists performed their experiment for substance X compare to the altitude at which the SABS experimenters performed their experiment? Write down HIGHER THAN, LOWER THAN or EQUAL TO and then **explain** your answer. (4)

[15]

### QUESTION 3:

- 3.1 Complete the table below. Write only the answer next to the question number (3.1.1-3.1.6) on your answer sheet. (6)

Element / Ion	Atomic Number	Mass Number	Number of Protons	Number of Neutrons	Number of Electrons
(3.1.1)	19	39	19	(3.1.2)	19
(3.1.3)	30	(3.1.4)	30	35	30
Sulphide	16	32	(3.1.5)	16	(3.1.6)

- 3.1 Consider a magnesium atom.
- 3.2.1 Draw the Aufbau diagram for magnesium. (2)
- 3.2.2 How many valence electrons does magnesium have? (1)
- 3.2.3 Magnesium is found in group II on the periodic table. What is the name of this group? (1)
- 3.3 Consider a fluorine atom.
- 3.3.1 Give the full *sp*-notation for fluorine. (2)
- 3.3.2 Which element has the same electron configuration as the fluoride ion? (1)
- 3.3.3 Fluorine is found in group VII on the periodic table. What is the name of this group? (1)

- 3.4 Magnesium and fluorine react to form magnesium fluoride. (2)
- 3.4.1 Give the chemical formula of magnesium fluoride. (2)
- 3.4.2 What type of bonding exists in the magnesium fluoride? (1)
- 3.4.3 Use Lewis diagrams to show the formation of the magnesium fluoride molecule. (3)
- [20]**

#### **QUESTION 4:**

Copper (*Cu*) has two stable isotopes:  ${}^{63}_{29}\text{Cu}$  and  ${}^{65}_{29}\text{Cu}$ . The average atomic mass of copper, as recorded on the periodic table, is 63,5.

- 4.1 Define the term *isotope*. (2)
- 4.2 Give the number of protons and neutrons for **each** isotope. (2)
- 4.3 Calculate the percentage of each isotope. (4)
- [8]**

#### **QUESTION 5:**

- 5.1 Define the term *first ionisation energy*. (1)
- 5.2 How does the first ionisation energy of sodium (*Na*) compare to the first ionisation energy of sulphur (*S*)? Write down GREATER THAN, LESS THAN or EQUAL TO and then **explain** your answer. In your explanation you must refer to atomic size. (3)
- [4]**

#### **QUESTION 6:**

- 6.1 Define the term *chemical bond*. (2)
- 6.2 Which type of bonding exists in each of the following compounds? (3 x 1 = 3)
- 6.2.1 Mg(s)
- 6.2.2 NH<sub>3</sub>
- 6.2.3 ZnCl<sub>2</sub>
- 6.3 Consider the following two covalently-bonded compounds N<sub>2</sub> and H<sub>2</sub>O.
- 6.3.1 Define the term *covalent bond*. (2)
- 6.3.2 Classify the type of covalent bonding in each of the compounds. (2)
- 6.3.3 Draw the Lewis diagram for N<sub>2</sub>. (2)
- 6.3.4 How many bonds exist between the nitrogen atoms in N<sub>2</sub>? (1)
- 6.3.5 Represent H<sub>2</sub>O using Couper notation. (2)

- 6.4 Consider Cu(s) and KCl(s). Use the relevant bonding models to explain why:
- 6.4.1 Cu(s) is a good conductor of electricity but KCl(s) is an electrical insulator. (3)
- 6.4.2 Cu(s) is malleable but KCl(s) is not. Your answer should include an explanation of the term "malleable". (3)
- [20]**

**QUESTION 7:**

- 7.1 Write the chemical formulae for:
- 7.1.1 Iron (II) oxide.
- 7.2.2 Magnesium hydroxide.
- 7.2.3 Potassium sulphate.
- 7.2.4 Silver sulphite.
- 7.2.5 Ammonium nitrate. (5 x 2 = 10)
- 7.2 Consider the molecule  $AlN_3$ .
- 7.2.1 What is the chemical name of  $AlN_3$ ? (1)
- 7.2.2 Calculate the relative formula mass of  $AlN_3$ . (2)
- [13]**

**Total: [100]**