

ALEXANDER ROAD HIGH SCHOOL

November 2021

PHYSICAL SCIENCES ASSESSMENT PAPER 2

2 HOURS

JA

GRADE 10

TOTAL = 100

Instructions:

- The question paper consists of 8 questions.
 - Answer all the questions.
 - Answer section A on the answer sheet provided AND section B on folio sheets.
 - 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 formula sheet has been provided on the back of the answer sheet.
 - A periodic table has been provided at the end of the question paper.
-

SECTION A*(answer on the answer sheet)***QUESTION 1:**

Four possible options are provided as answers to the following questions. Each question has only one correct answer. Choose the correct answer and write the letter (A – D) next to the relevant question number (1.1 – 1.7) on the answer sheet.

- 1.1 A mixture is defined as...
- A. the combination of two or more pure substances that are bonded together.
 - B. the combination of two or more pure substances that are not bonded together.
 - C. the combination of two or more pure substances in a fixed ratio.
 - D. any substance that cannot be separated by physical methods.
- 1.2 Which one of the following substances is a pure substance?
- A. O₂
 - B. Air
 - C. Sand
 - D. Sea water

1.3 Which one of the following is correct regarding an atom of magnesium (Mg)?

	Number of Core Electrons	Number of Valence Electrons
A.	24	12
B.	12	2
C.	12	0
D.	10	2

1.4 Which one of the following lists shows elements in the order of increasing atomic radius?

- A. C, N, O, F
- B. O, N, P, Na
- C. Be, Mg, Al, Ga
- D. Xe, Kr, Ar, Ne

1.5 Which one of the following statements is FALSE?

A chemical change is a change in which...

- A. new substances are formed.
- B. energy changes are relatively large.
- C. mass is conserved.
- D. the number of atoms change.

1.6 The chemical formula of iron (III) sulphate is...

- A. FeS
- B. FeSO₄
- C. Fe₂(SO₄)₃
- D. Fe₃(SO₄)₂

1.7 Which one of the following pure substances has the greatest number of particles?

- A. 50 g aluminium foil
- B. 50 g copper wire
- C. 100 g silver coin
- D. 150 g gold ring

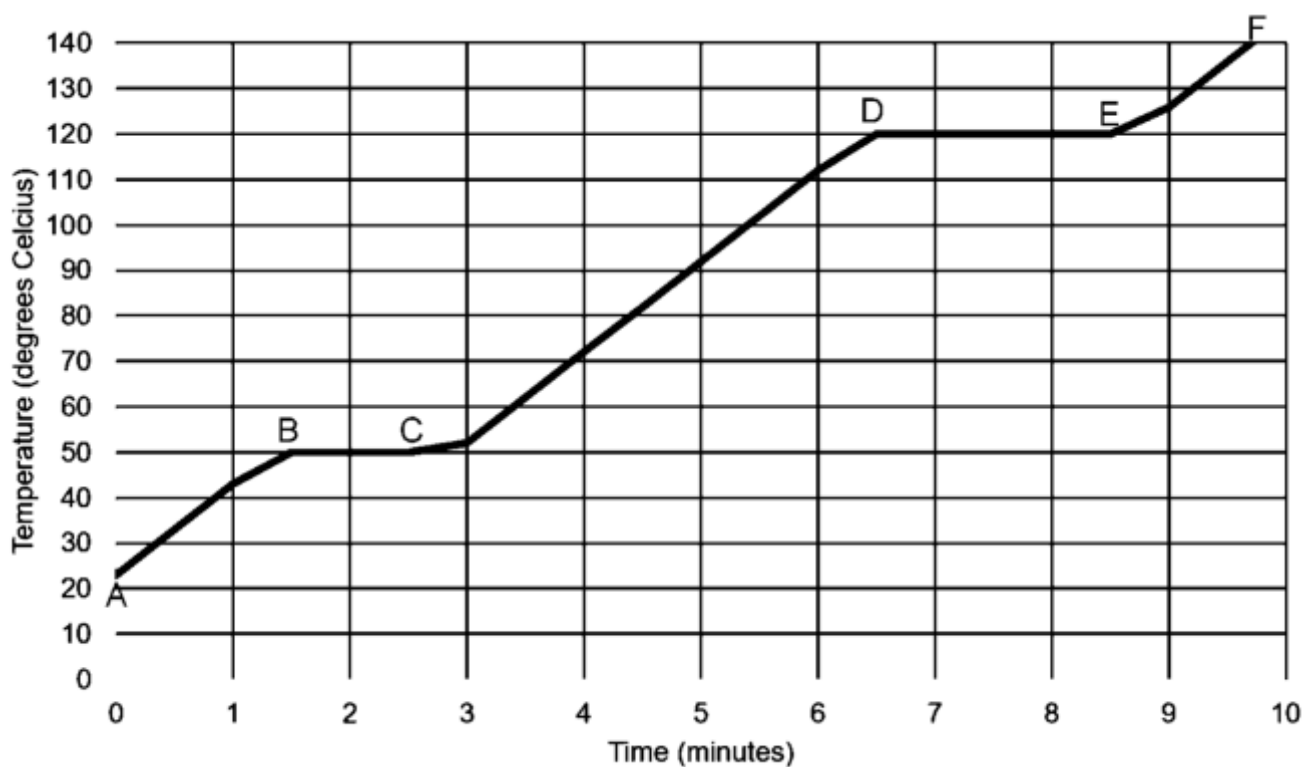
TOTAL SECTION A = [14]

SECTION B

(answer on folio paper)

QUESTION 2:

The heating curve of substance X is given below.



- 2.1 Define the term *boiling point*. (2)
- 2.2 Write down the boiling point of substance X. (1)
- 2.3 Give the phase(s) of substance X...
- 2.3.1 from A to B. (1)
- 2.3.2 from D to E. (1)
- 2.4 Give the name of the phase change that occurs between B and C. (1)

2.5 Substance X – like all substances – is made up of tiny, microscopic particles. Use the kinetic molecular theory (KMT) to explain what is happening to substance X AND therefore what is happening with the particles of substance X from...

2.5.1 C to D. (2)

2.5.2 D to E. (3)

[11]

QUESTION 3:

Consider the following atoms/ions:

carbon-12

S^{2-}

${}_{47}^{112}X$

${}_{5}^{10}B$

${}_{5}^yB$

${}_{29}^{65}Cu^+$

3.1 Draw the Aufbau diagram for carbon-12. (3)

3.2 Give the full sp -notation for S^{2-} . (3)

3.3.1 Define the term *isotopes*. (2)

3.3.2 Using the periodic table, write down the NAME or SYMBOL of the element to which the isotope ${}_{47}^{112}X$ belongs. (1)

3.3.3 20% of a sample of boron is ${}_{5}^{10}B$. The only two isotopes present in the sample are ${}_{5}^{10}B$ and ${}_{5}^yB$ and boron's average atomic mass is 10,8. Calculate y . (4)

3.4.1 Define the term *ion*. (2)

3.4.2 How many protons, neutrons and electrons are there in ${}_{29}^{65}Cu^+$? (3)

[18]

QUESTION 4:

The first ionisation energies for the alkali metals (group 1) are given in the table below.

Alkali Metal	First Ionisation Energy (kJ.mol ⁻¹)
Lithium (Li)	526
Sodium (Na)	504
Potassium (K)	425
Rubidium (Rb)	410
Caesium (Cs)	380

- 4.1 Define the term *first ionisation energy*. (2)
- 4.2 Explain why the first ionisation energy decreases moving down the group. (2)
- 4.3 Would the first ionisation energy of chlorine be GREATER THAN, LESS THAN or EQUAL TO the first ionisation energy of sodium?
Give a (single sentence) reason for your answer. (2)
- 4.4 The second ionisation energy of lithium is 7 296 kJ.mol⁻¹. Why is the second ionisation energy of lithium significantly greater than its first ionisation energy? (2)

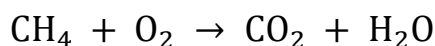
[8]

QUESTION 5:

Methane (CH₄) is a covalently-bonded compound found in natural gas.

- 5.1 Define the term *covalent bond*. (2)
- 5.2 Draw the Lewis diagram of methane (CH₄). (2)
- 5.3 Is the C – H bond in methane POLAR or NON-POLAR?
Support your answer with an appropriate calculation. (2)

In colder parts of the world (such as Europe), natural gas is used as a source of energy for central heating in homes. The methane in the natural gas burns in oxygen according to the following chemical equation:



- 5.4 Give the Couper notation of CO_2 . (2)
- 5.5 Balance the chemical equation. (2)
- 5.6 Is this reaction EXOTHERMIC or ENDOTHERMIC? **Briefly explain.** (2)

[12]

QUESTION 6:

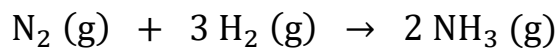
Mixing a clear solution of potassium iodide with a clear solution of lead (II) nitrate results in the formation of a yellow solid and a clear solution containing only potassium nitrate.

- 6.1 Is this an example of a PHYSICAL or CHEMICAL change? (1)
- 6.2 Write down the formula of...
- 6.2.1 Potassium iodide. (2)
- 6.2.2 Lead (II) nitrate. (2)
- 6.3 What type of bonding exists in potassium iodide? (1)
- 6.4 Predict the NAME or FORMULA of the yellow solid which formed. (2)

[8]

QUESTION 7:

Ammonia (NH₃) is an important molecule used to make fertilizers. In a factory, nitrogen and hydrogen gas are reacted to produce ammonia according to the following balanced chemical equation:

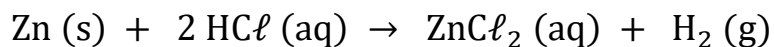


- 7.1 Define the term *one mole*. (2)
- 7.2 If 35 g of N₂ reacts, calculate:
- 7.2.1 The number of moles of N₂ which react. (3)
- 7.2.2 The number of molecules of H₂ which react. (4)
- 7.2.3 The mass of NH₃ produced. (4)
- 7.3 One of the fertilizers made from ammonia is (NH₄)₂HPO₄ (diammonium phosphate). Calculate:
- 7.3.1 The molar mass of (NH₄)₂HPO₄. (2)
- 7.3.2 The concentration of 10 g of (NH₄)₂HPO₄ dissolved in 500 cm³ of water. (4)

[19]

QUESTION 8:

Hydrogen gas is produced by reacting zinc metal with hydrochloric acid according to the following balanced chemical equation:



- 8.1 Write down the phase of ZnCl_2 . (1)
- 8.2 Use the metallic bonding model to explain why Zn (s) is a moderately good conductor of electricity. (2)
- 8.3 If 800 cm^3 of $0,25 \text{ mol.dm}^{-3} \text{ HCl}$ solution reacts completely with excess zinc, calculate the volume of H_2 produced at standard temperature and pressure. (5)
- 8.4 The reaction in question 8.3 is repeated with the temperature at 100°C .
- 8.4.1 How would the volume of H_2 calculated in question 8.3 change?
Write only INCREASES, DECREASES or REMAINS THE SAME. (1)
- 8.4.2 Briefly explain your answer to question 8.4.1. (1)

[10]

TOTAL SECTION B = [86]