



SEPTEMBER 2017

ALEXANDER ROAD HIGH SCHOOL

1 HOUR

CO, KB, MH

PHYSICAL SCIENCE CONTROL TEST

TOTAL = 60

GRADE 11

Instructions

- The question paper consists of 4 questions.
- Answer all the questions.
- Answer section A on the answer sheet provided AND section B on folio sheets.
- 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.
- Formulas and a periodic table have been included at the end of the question paper

SECTION A

- Answer on the answer sheet -

QUESTION 1: Multiple choice

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 – 1.6) on the answer sheet.

1.1 Which of the following pairs of substances has ion-dipole forces?

- | | | | |
|---|---------------------------|---|-------------------------|
| A | HCl and NO | B | KCl and BF ₃ |
| C | NaCl and H ₂ O | D | NO and BF ₃ |

1.2 Which one of the following statements best describes the reason why mercury has a convex meniscus?

- A Forces of adhesion are equal to the forces of cohesion.
- B Forces of cohesion are stronger than the forces of adhesion
- C Forces of adhesion are stronger than the forces of cohesion
- D Forces of adhesion and the forces of cohesion play no role in the shape of the meniscus

1.3 The gas with the largest volume at STP is

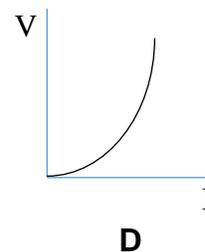
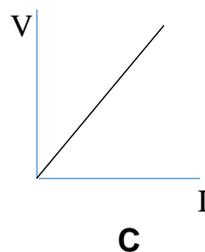
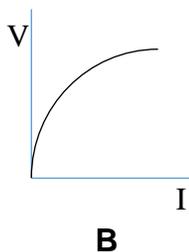
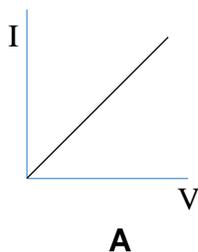
- A 32g of oxygen
- B 5g of hydrogen
- C 6g of helium
- D 142g of chlorine

1.4 Which ONE of the following statements about chemical reactions is CORRECT?

The actual yield of a chemical reaction is usually ...

- A greater than the percentage yield.
- B equal to the percentage yield.
- C greater than the theoretical yield.
- D less than the theoretical yield.

1.5 Which graph shows that a light bulb and a rheostat were used investigating Ohm's law:



1.6 An equivalent unit for Watt will be...

- A** $V \cdot A^{-1}$
- B** $V \cdot A$
- C** $A^2 \cdot \Omega^{-1}$
- D** $V \cdot \Omega$

[2 x 6 = 12]

SECTION B

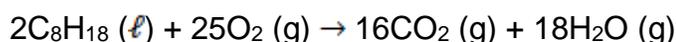
QUESTION 2

2.1 Define the term *molar mass* of a substance. (1)

2.2 Calculate the molar mass of sodium carbonate. (3)

2.3 The combustion engine in motor vehicles uses the volumetric expansion during the combustion of octane (petrol) to function. When the octane ignites because of a spark from the sparkplugs, it produces a large volume of gas, forcing the piston to move in the cylinder.

The balanced reaction for the combustion of octane is as follows:



It was found that this reaction is not 100% effective and that only an 85% yield can be expected from this reaction.

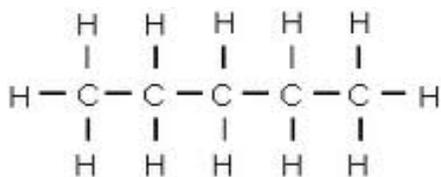
2.3.1 If 6g of octane is injected into the cylinder, what volume of gas can be expected to be produced by this reaction at STP? (10)

2.3.2 Give two environmental concerns that arise from motor vehicles with combustion engines. (2)

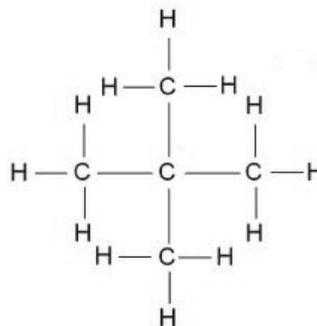
[16]

QUESTION 3

3.1 Pentane (a) and 2,2-dimethylpropane (b) both have the formulae C_5H_{12} and have the same mass. However the intermolecular forces in pentane are stronger. Explain this.



(a)



(b)

(3)

3.2 Explain, in terms of intermolecular forces, why iodine (I_2) dissolves easily in carbon tetrachloride (CCl_4), but not easily in water. (5)

3.3 You are given CCl_4 and HCl ; which one will have the higher boiling point? Explain your answer by referring to intermolecular forces. (5)

3.4 As substances cool down they lose heat and this causes them to change phase; from gas, to liquid, to solid. As this happens, the density of the substance increases. Water, however, does not follow this trend.

Explain, in terms of **intermolecular forces and molecular shapes**, why water is less dense in its solid state compared to its liquid state. (3)

[16]

QUESTION 4

4.1 Define **current strength**. (2)

4.2 The following circuit is given. Ignore the resistance of the battery, the wires and the ammeter:

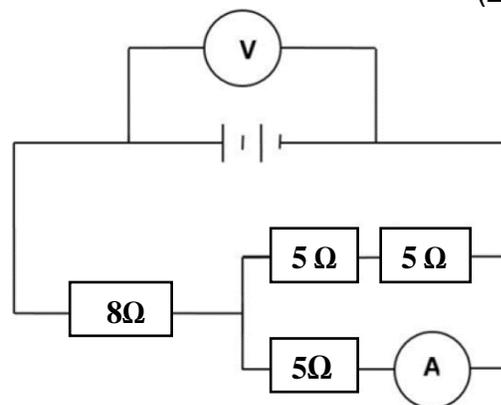
The power of the $8\ \Omega$ resistor is $2\ \text{W}$.

4.2.1 Define Power in an electric circuit. (2)

4.2.2 Calculate the current strength in the main circuit. (3)

4.2.3 Calculate the reading on the ammeter in the parallel branch. (2)

4.2.4 Calculate the reading on the voltmeter. (3)



4.3.1 Calculate the cost of electricity in rands (R), for a $1600\ \text{W}$ heater that is used for 4,5 hours every day during 3 winter months (assume 31 day months). The cost per unit of electricity is R1,90. (3)

4.3.2 Suggest an environmentally friendly change that a household can make, in terms of their electricity usage, to reduce carbon emissions. (1)

[16]

TOTAL 60 MARKS