



SEPTEMBER 2019

**ALEXANDER ROAD HIGH SCHOOL**

60 MIN

JA, MH

**PHYSICAL SCIENCE CONTROL TEST**

TOTAL = 60

**GRADE 10**

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**Instructions**

- The question paper consists of 6 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 at the end of the question paper.
- A periodic table has been provided on the back of the answer sheet.

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**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.

**Chemistry:**

- 1.1 One mole is defined as...
- A Avogadro's number.
  - B the amount of substance having the same number of particles as there are atoms in 1 g of carbon-12.
  - C the amount of substance having the same number of particles as there are atoms in 12 g of carbon-12.
  - D the volume of a gas at standard temperature and pressure.

- 1.2 A hydrocarbon is a compound made up of hydrogen and carbon ONLY. A certain hydrocarbon is 85,7% carbon by mass. The empirical formula of the compound is...
- A CH<sub>2</sub>
  - B C<sub>2</sub>H<sub>4</sub>
  - C C<sub>2</sub>H
  - D CH<sub>4</sub>
- 1.3 In the compound H<sub>2</sub>S, the ratio of the mass of hydrogen to sulphur is always...
- A 2:1
  - B 1:2
  - C 1:8
  - D 1:16
- 1.4 The correct name for FeCl<sub>3</sub> is...
- A Iron chloride
  - B Iron (II) chloride
  - C Iron (III) chloride
  - D Iron chlorate

**Physics:**

- 1.5 Which one of the following pairs of quantities are both vector quantities?
- A Force and direction
  - B Displacement and distance
  - C Acceleration and distance
  - D Acceleration and displacement
- 1.6 Which of the following CANNOT be the resultant of two vectors with magnitude 16 N and 25 N?
- A 9 N
  - B 42 N
  - C 18 N
  - D 21 N

**TOTAL SECTION A [12]**

## SECTION B

-Answer on folio paper-

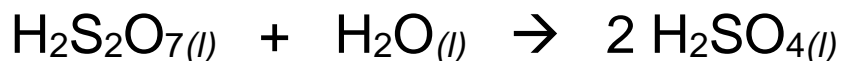
### Chemistry:

#### QUESTION 2:

Ammonia (NH<sub>3</sub>) is a substance used to make fertilizers such as ammonium sulphate. Ammonia is produced by reacting hydrogen and nitrogen.

- 2.1 Write a BALANCED chemical equation showing the formation of ammonia (3) from nitrogen and hydrogen.
- 2.2 Write the chemical formula for ammonium sulphate. (2)

Besides ammonia, sulphuric acid (H<sub>2</sub>SO<sub>4</sub>) is also needed to make ammonium sulphate. Sulphuric acid is produced by diluting a substance known as oleum (H<sub>2</sub>S<sub>2</sub>O<sub>7</sub>). The BALANCED equation for the reaction is

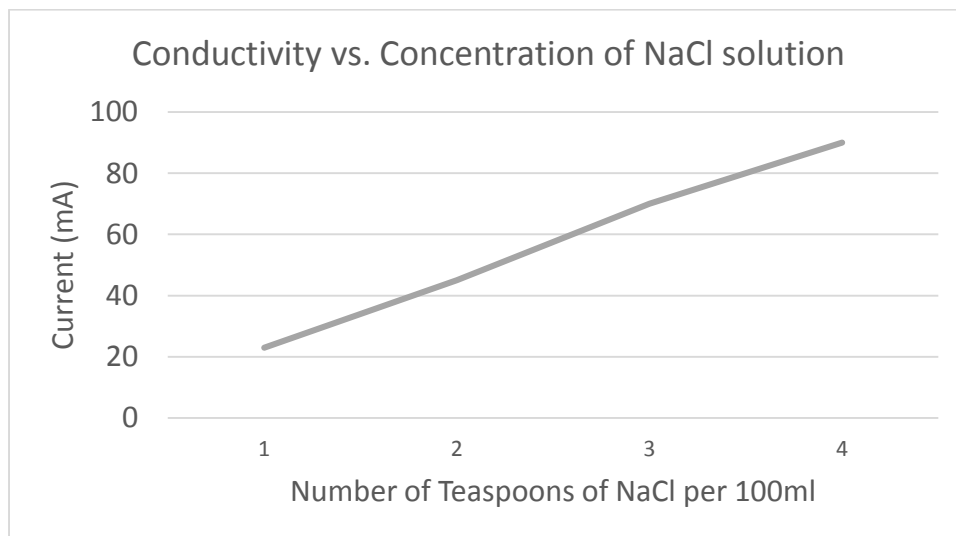


- 2.3 State the law of conservation of mass. (1)
- 2.4 Is mass conserved in the reaction above? Support your answer with the appropriate calculation(s). (3)
- 2.5 What does the (l) in the chemical equation indicate? (1)

[10]

#### QUESTION 3:

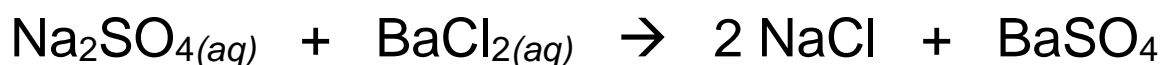
Phila investigated how the conductivity of a sodium chloride (NaCl) solution changes as the concentration of the solution is changed.



- 3.1 Give one control variable for this reaction. (1)
- 3.2 Give the mathematical name for the relationship between the conductivity and the concentration. (1)
- 3.3 Explain why the conductivity of the solution increases with concentration. (2)
- 3.4 Will the conductivity of a copper hydroxide ( $\text{Cu}(\text{OH})_2$ ) solution be MORE THAN, LESS THAN or EQUAL TO the conductivity of an equivalent amount of sodium chloride solution? Give a reason for your answer. (2)
- [6]**

**QUESTION 4:**

A sodium sulphate ( $\text{Na}_2\text{SO}_4$ ) solution is prepared by dissolving 28,4 g of sodium sulphate powder in  $250 \text{ cm}^3$  water. The sodium sulphate solution is reacted with a solution of barium chloride ( $\text{BaCl}_2$ ), according to the following balanced chemical equation:



- 4.1 Use the solubility rules to determine the phase (solid or aqueous) of the following compounds. Only state the phase.
- 4.1.1 NaCl (1)
- 4.1.2  $\text{BaSO}_4$  (1)
- 4.2 Define:
- 4.2.1 Molar mass. (1)
- 4.2.2 Concentration. (1)
- 4.3 Calculate:
- 4.3.1 The molar mass of sodium sulphate. (2)
- 4.3.2 The concentration of the sodium sulphate solution BEFORE it was reacted with the barium chloride solution. (5)
- 4.3.3 The mass of barium sulphate which should be produced in this reaction given that 0,2 mol of sodium sulphate react. (3)
- 4.3.4 Percentage yield if only 40 g of barium sulphate form. (2)

**[16]**

**Physics:**

**QUESTION 5:**

A group of hikers are hiking the Bobbejaanskop trail. They follow the following route during their hike:

- 5 km in a northerly direction.
- 8 km at a bearing of  $100^\circ$ .

- 5.1 Define *displacement*. (2)
- 5.2 Use a scale of 1 cm = 1 km and draw an accurate vector diagram of the hikers' route. (2)
- 5.3 Indicate the resultant displacement of the hikers on your vector diagram in question 5.2 and use the vector diagram to determine the magnitude of the displacement of the hikers. (2)
- 5.4 In which direction must the hikers walk to get back to their starting point? (1)

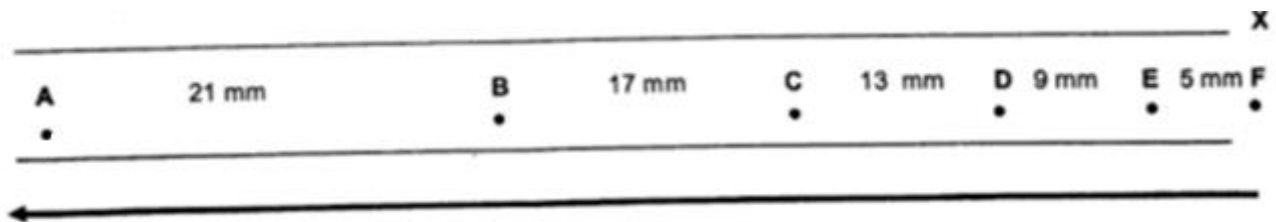
[7]

**QUESTION 6:**

A piece of tickertape is attached to a trolley and is pulled through a ticker-timer which strikes the tape with a frequency of 40 Hz.

X marks the position of the ticker-timer and the arrow indicates the direction in which the tape was pulled.

The distances indicated are marked between individual dots.



- 6.1 Calculate the magnitude of the average velocity with which the trolley moves between A and C. (5)
- 6.2 If the instantaneous velocity at point E is  $0,28 \text{ m}\cdot\text{s}^{-1}$ , calculate the acceleration of the trolley. (4)

[9]

**TOTAL SECTION B [48]**

# FORMULA SHEET

## Chemistry:

FORMULAE	
$n = \frac{m}{M}$	$n = \frac{N}{N_A}$
$c = \frac{n}{V}$ or $c = \frac{m}{MV}$	$n = \frac{V}{V_m}$
CONSTANTS	
Name	Symbol & Value
Standard pressure	$p^0 = 1,013 \times 10^5 Pa$
Molar gas volume at STP	$V_m = 22,4 dm^3 \cdot mol^{-1}$
Standard temperature	$T^0 = 273 K$
Avogadro's constant	$N_A = 6,02 \times 10^{23} mol^{-1}$

## Physics:

FORMULA
$T = \frac{1}{f}$