



**ALEXANDER ROAD HIGH SCHOOL**

JUNE 2017

3 HOUR

**PHYSICAL SCIENCES MID-YEAR EXAMINATION**

CO, KB, MH

TOTAL = 150

**GRADE 10**

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**Instructions**

- The question paper consists of 11 questions. Take note: Section B: Physics, Section C: Chemistry
  - 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 have been included at the end of the question paper, and a periodic table 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 – 1.9) on the answer sheet.

- 1.1 The circuit that flows through parallel resistors and the potential difference in the parallel circuit behaves like this:
- A current and potential difference divide equally
  - B current divides and potential difference remains constant over all parallel resistors
  - C potential difference divides and current remains constant in all parallel resistors
  - D current and potential difference remain constant over all parallel resistors

1.2 The type(s) of reaction that take(s) place in the following reaction is:



- A gas forming only
- B gas forming and redox
- C redox only
- D precipitation and redox

1.3 The correct charges on the METALS in  $\text{CaSO}_4$ ,  $\text{FeCl}_3$  and  $\text{Ag}_2\text{SO}_4$ , respectively are:

- A 1+ , 2+ , 1+
- B 1+ , 3+ , 1+
- C 2+ , 2+ , 2+
- D 2+ , 3+ , 1+

1.4 Which of the following will conduct electricity in its molten form, but not as a solid?

- A graphite
- B copper
- C silicon
- D copper sulphate

1.5 Which of these forms a lattice that is held together by strong electrostatic forces?

- A diamond
- B graphite
- C iron
- D potassium permanganate

1.6 Arrange the following atoms from the biggest to the smallest:

**C; Cl; P; S; O**

- A P; S; Cl; C; O
- B Cl; S; P; O; C
- C C; O; P; S; Cl
- D O; C; Cl; S; P

1.7 The following are examples of vector and scalar quantities. Which ONE of the following is a VECTOR quantity?

- A Charge
- B Acceleration
- C Time
- D Energy

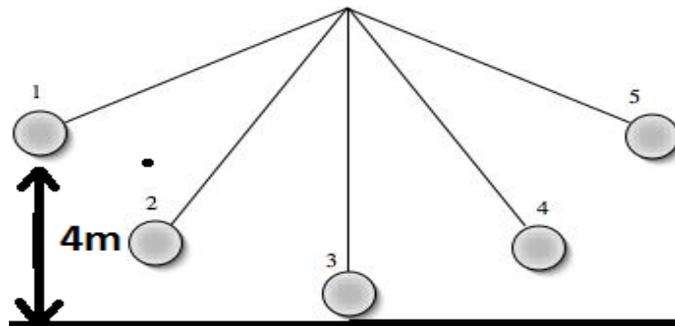
1.8 The wave form is moving from right to left, in the direction of the arrow.



How is the medium moving at the point marked, P?

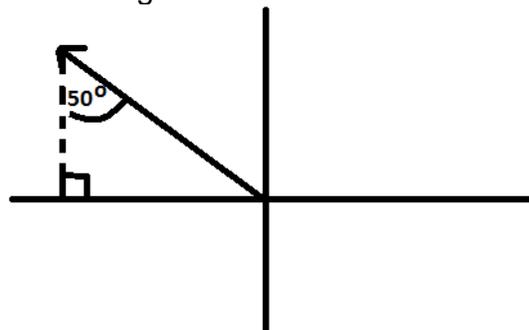
- A ↓
- B ↑
- C ↙
- D →

1.9 A ball of mass 2kg is released from rest at point 1. Calculate the mechanical energy at Point 1.



- A 78,4 N
- B 56,7 N
- C 83,1 N
- D 23 N

1.10 What is the bearing of the following vector?



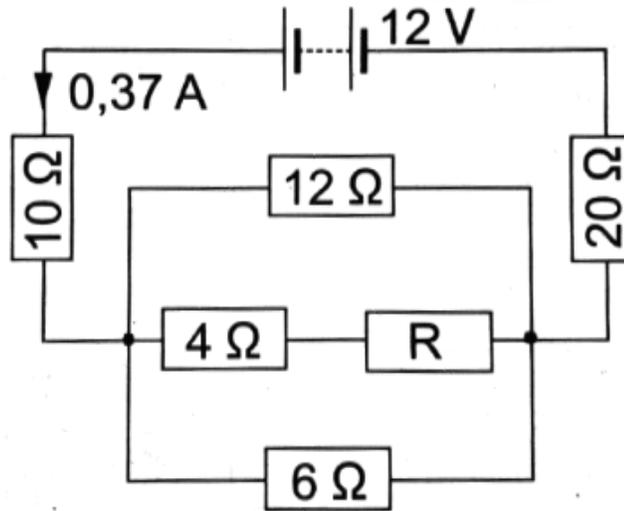
- A 50°
- B 310°
- C 320°
- D 220°

[2 x 10 = 20]

**SECTION B: Physics**

**QUESTION 2**

2.1 The following figure shows six resistors that are connected in a circuit, with a 12V battery.

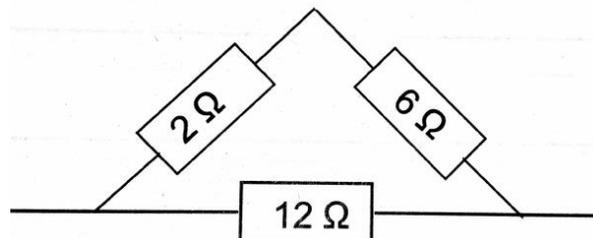


- 2.1 State the definition of potential difference. (2)
- 2.2 Calculate the potential difference across the 10 Ω resistor. (3)
- 2.3 Calculate the potential difference across the 20 Ω resistor. (2)
- 2.4 Calculate the potential difference across the network of parallel resistors. (1)
- 2.5 Calculate the current through resistor R. (5)

- 2.6.1 Name the 4 factors that influences the resistance of a conductor. (2)
- 2.6.2 Select one of the factors and state how it influences the resistance of a conductor.(1)

2.7 Complete the sentence (only write the answers) – choose from the suggested answers:  
A voltmeter has a \_\_\_2.7.1\_\_\_ (low/high) resistance and must always be connected in \_\_\_2.7.2\_\_\_ (series/parallel). An ammeter, however, has a \_\_\_2.7.3\_\_\_ (low/high) resistance and must always be connected in \_\_\_2.7.4\_\_\_ (series/parallel). (4)

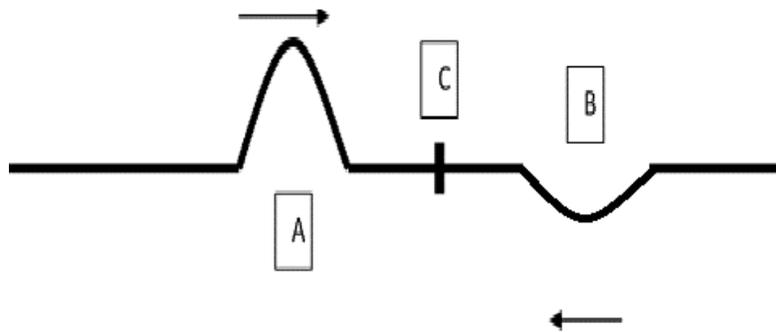
2.8 Calculate the total resistance of the following resistors that are connected in a circuit.



(4)  
**[24]**

### QUESTION 3

- 3.1 Two pulses A and B move towards each other at the same speed. The amplitude of pulse A is **1,5cm** and the amplitude of B is **0,8cm**. The pulses meet each other at point C.



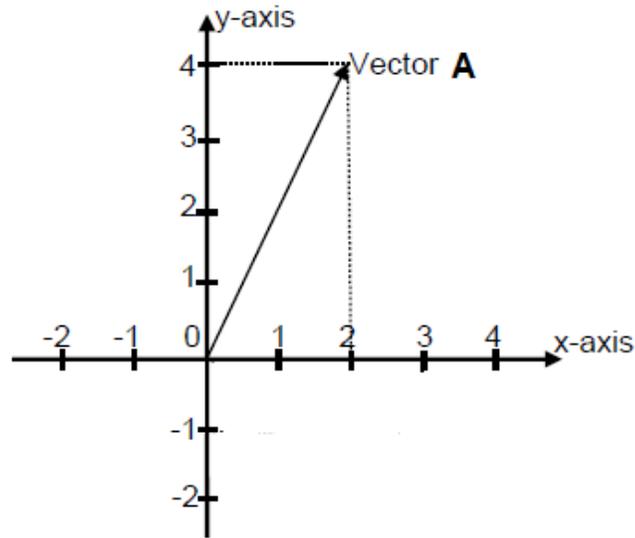
- 3.1.1 What is the name given to the type of interference that occurs at point C? (1)
- 3.1.2 What is the height of the resultant pulse? (1)
- 3.2 The distance between 6 consecutive crests is 600mm. If the wave is travelling at  $7\text{m}\cdot\text{s}^{-1}$  then calculate:
- 3.2.1 The wavelength (2)
- 3.2.2 The frequency (3)
- 3.2.3 The period (2)
- 3.3 A submarine emits a sound in order to determine the distance of objects under the ocean. The submarine emits a sound and receives it back after 0,5s. If the speed of sound in water is  $1220\text{m}\cdot\text{s}^{-1}$ , determine the distance of the object. (3)

**[12]**

### QUESTION 4

- 4.1 Define the following:
- 4.1.1 Scalar (2)
- 4.1.2 Vector (2)

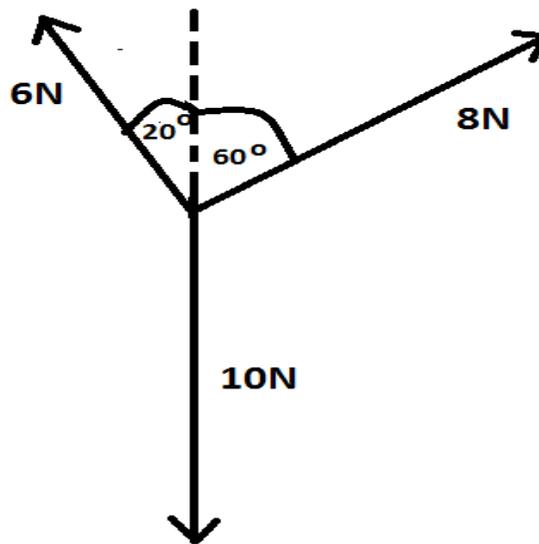
4.2 Vectors A is drawn to scale on the Cartesian plane below



4.2.1 Calculate the magnitude of Vector A. (3)

4.2.2 Calculate the bearing of vector A (measured clockwise from the positive y-axis). (3)

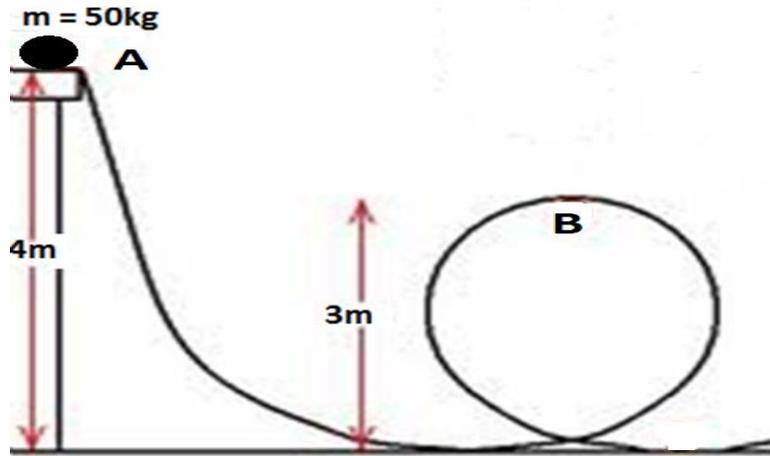
4.3 Determine the resultant vector and bearing of the following vectors by using a scale drawing. Use the scale 1cm = 1N.



(6)  
[16]

### QUESTION 5

- 5.1 State the law of conservation of mechanical energy. (2)
- 5.2 A round metal ball, with a mass of 50kg, starts from rest at a height of 4m and moves down an incline, accelerating as it does so. At ground level the track forms a vertical circle and the ball passes through the circle and continues out the other side. The vertical circle reaches a height of 3m above the ground.



- 5.2.1 Calculate the mechanical energy at A. (3)
- 5.2.2 Calculate the potential energy at point B (3)
- 5.2.3 Calculate the kinetic energy at point B (3)
- 5.2.4 Calculate the speed of the ball at point B (3)

*The mass of the ball is **now increased to 60kg**. How will this affect the:*

- 5.2.5 Mechanical energy at A? Simply state INCREASE, DECREASE or STAYS THE SAME (1)
- 5.2.6 Kinetic energy at B? Simply state INCREASE, DECREASE or STAYS THE SAME (1)
- [16]**

## SECTION C: Chemistry

### QUESTION 6

- 6.1 State the solubility rule for the hydroxides. (2)
- 6.2 As a laboratory assistant you are asked to find out which salts are present in 2 bottles from the chemical store room, that lost their labels. Your boss tells you that these two bottles contain white salts and they are definitely a bromide and a sulphate. Describe the steps that you will follow to determine the contents of these bottles. Describe the whole process that you will follow as well as the tests for BOTH salts and also say what the determining factor is that distinguishes the salts from each other. (6)
- 6.3 Name the type of reactions in each of the following equations:
- 6.3.1  $\text{CuSO}_4 + \text{Mg} \longrightarrow \text{MgSO}_4 + \text{Cu}$
- 6.3.2  $\text{HNO}_3 + \text{NaHCO}_3 \longrightarrow \text{NaNO}_3 + \text{water} + \text{carbon dioxide}$  (2)
- 6.4 Write the balanced equations for the following reactions. Show all the phases of reactants and product.
- 6.4.1 silver nitrate with potassium iodide (3)
- 6.4.2 ammonia with hydrochloric acid (2)
- 6.5 What type of reaction took place in 6.4.2? (1)
- 6.6.1 NAME one gas that is responsible for acid rain. (1)
- 6.6.2 Give a balanced chemical equation for the reaction of this gas with water. (2)

**[19]**

### QUESTION 7

7.1 Choose an item from COLUMN B that best matches a description/item in COLUMN A. Each item in COLUMN B may be used only ONCE. Write only the letter next to the question number (e.g. **6.1.6 A** ).

COLUMN A	COLUMN B
7.1.1 A good conductor of electricity	A Si
7.1.2 Sugar dissolved in water	B Homogeneous mixture
7.1.3 Blood	C Cu
7.1.4 Increased conductivity with increase in temperature	D Heterogeneous mixture
7.1.5 Non-metal element	E S

7.2 Iodine crystals sublime when they are heated. (5)

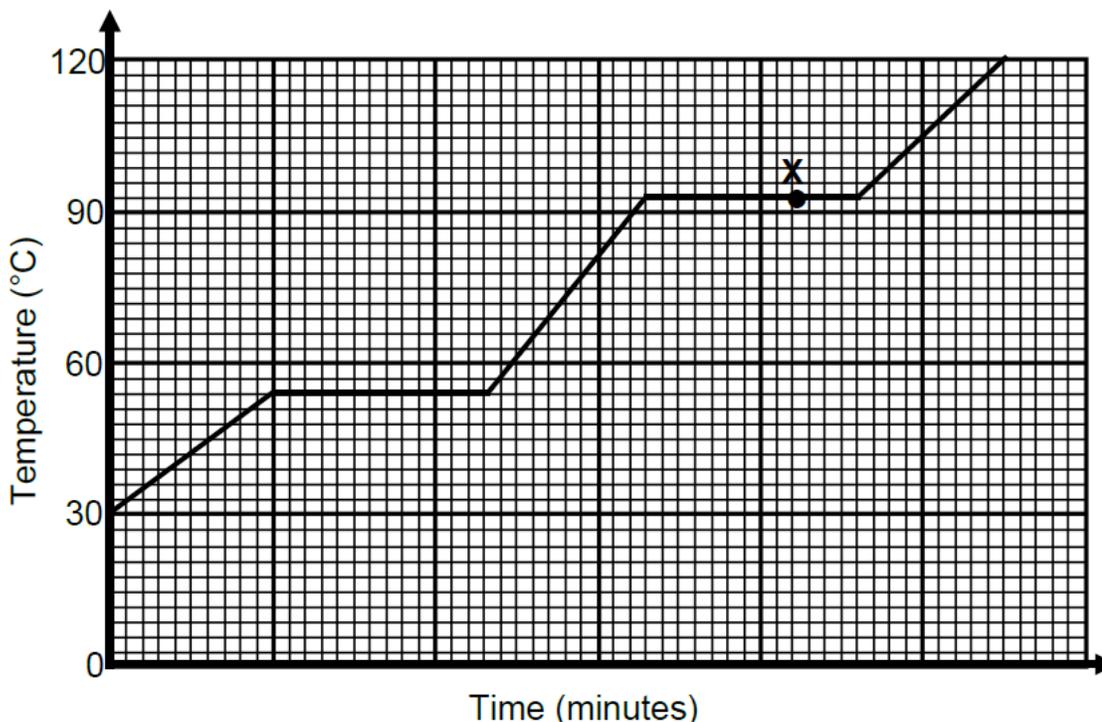
Define the term *sublimation*. (2)

7.3 When ice cream comes out of the freezer it is hard, but when it is left at room temperature for a while, it becomes soft enough to make milkshakes. (3)  
Use the kinetic molecular theory to explain the observation. (3)

[10]

### QUESTION 8

The heating curve of a pure substance at 1 atmosphere pressure is shown in the graph below.



8.1 Is this substance water? Give a reason for your answer. (2)

8.2 Does this substance undergo sublimation? Give a reason for your answer. (2)

8.3.1 What is the process at X called? (1)

8.3.2 Give the definition of the process at X. (3)

**[8]**

### **QUESTION 9**

9.1 Magnesium oxide forms through the combustion of magnesium and is partially soluble in water.

9.1.1 Draw the Aufbau diagram for the magnesium ion. (3)

9.1.2 Write the sp-notation for the oxide ion. (2)

9.1.3 Represent the formation of magnesium oxide from magnesium and oxygen with the aid of Lewis diagrams. (3)

9.1.4 Name the structure (lattice) of solid magnesium oxide. (1)

9.2 An oxygen atom can also bond with another oxygen atom to form oxygen gas.

9.2.1 Name the bond that forms between two oxygen atoms. (1)

9.2.2 Represent the bond between two oxygen atoms with a Lewis diagram. (2)

9.2.3 What type of forces will hold oxygen molecules together? (1)

**[13]**

### **QUESTION 10**

The law of constant proportion states that, in any particular chemical compound, all samples of the compound will be made up of the same elements in the same proportion or ratio.

10.1 Give the chemical formula for iron(III)sulfate. (1)

10.2 Give the ratio in which the elements appear in iron(III) sulfate. (2)

**[3]**

### **QUESTION 11**

11.1 Write a **balanced** chemical equation for the following reaction. Indicate the **phases** of the reactant and products.

Ammonium chloride decomposes to ammonia gas and hydrogen chloride gas. (4)

11.2 Using the law of conservation of mass, prove that mass was conserved during the reaction in 11.1. (5)

**[9]**

**TOTAL 150 MARKS**