GAUTENG DEPARTMENT OF EDUCATION

PROVINCIAL EXAMINATION

JUNE 2017

GRADE 10

PHYSICAL SCIENCES

PAPER 1

TIME: 1½ hours

MARKS: 100

11 pages + 1 data sheet

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INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions in the ANSWER BOOK.

2. This question paper consists of TWO sections:

   SECTION A: 20 MARKS
   SECTION B: 80 MARKS

3. You may use a non-programmable calculator.

4. You may use appropriate mathematical instruments.

5. Number the answers correctly according to the numbering system used in this question paper.

6. Give brief substantiations, discussions, et cetera where required.

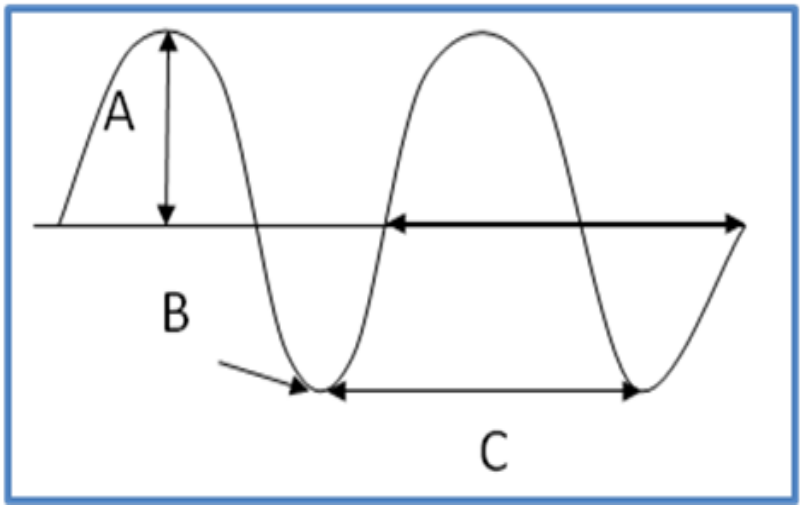
7. Round-off your final numerical answers to a minimum of TWO decimal places.

SECTION A

QUESTION 1: MULTIPLE-CHOICE QUESTIONS

Four options are given as possible answers to the following questions. Choose the correct answer and write the letter (A – D) of your choice next to the question number in the ANSWER BOOK, e.g. 1.11 C.

1.1 Study the accompanying sketch.



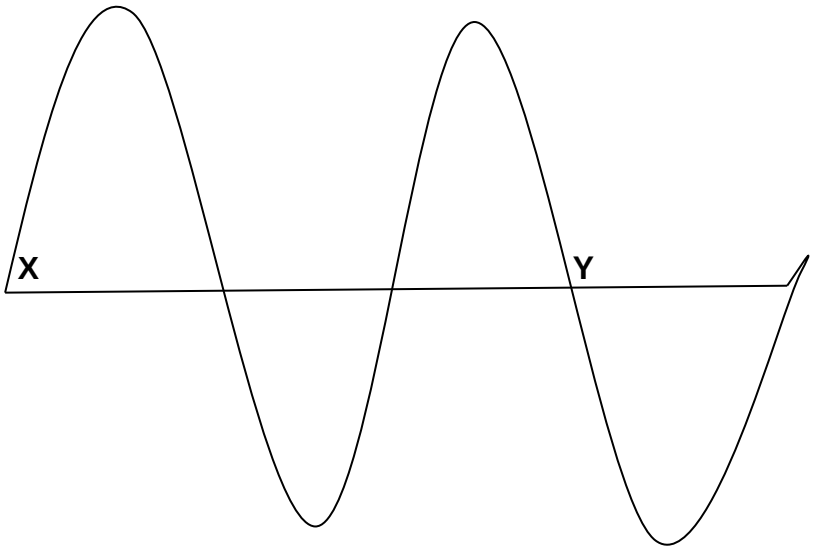
The following are represented by A, B and C:

A Amplitude, trough, wavelength
B Crest, trough, wavelength
C Amplitude, wavelength, pulse length
D Crest, trough, wavelength (2)

1.2 The speed of a pulse depends on the ...

A distance that the pulse moves.
B length of the pulse.
C medium through which the pulse moves.
D amplitude of the pulse. (2)

1.3 The diagram below shows two points X and Y on a wave train.



How many wavelengths separate point X and Y?

A 0,75
B 1
C 1,5
D 3 (2)

1.4 What would a drummer do to make a drum produce a lower pitch?

A Hit the drum harder.
B Hit the drum less hard.
C Tighten the drum skin.
D Loosen the drum skin. (2)

1.5 The following are arranged in order of increasing wavelength.

A Microwaves, visible light, x-rays
B X-rays, visible light, microwaves
C Microwaves, x-rays, visible light
D Visible light, x-rays, microwaves (2)

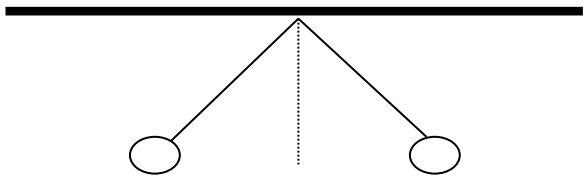
1.6 Consider the following statements regarding magnetic fields.

(i) The direction of magnetic field lines is from north to south.
(ii) The strength of the magnetic field is indicated by the closeness of the field lines.
(iii) The magnetic field of a bar magnet is weaker near its poles.

Which of the above statements are CORRECT?

A (i), (ii) and (iii)
B (i) and (ii)
C (i) and (iii)
D (ii) and (iii) (2)

1.7 Two charged balls are hanging from light inextensible strings. They remain at rest with equal angles to the vertical as shown in the diagram below.



This shows that ...

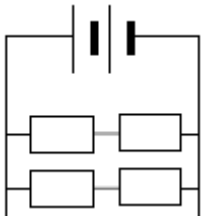
A the balls have equal but opposite charges.
B one is charged and the other is not charged.
C the balls have opposite but not necessarily equal charges.
D the balls have equal charges. (2)

1.8 Which of the following symbols represents the SI-unit of resistance?

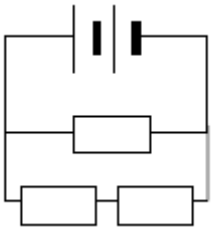
A R
B C
C Ω
D A (2)

1.9 All the resistors in the circuits below are identical. Which ONE of the following circuits has the highest total resistance?

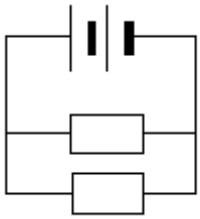
A



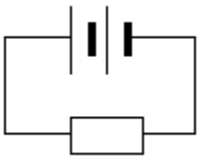
B



C



D



(2)

1.10 The amount of charge that passes through a resistor when a current of 1,2 A flows in 2,5 minutes is ...

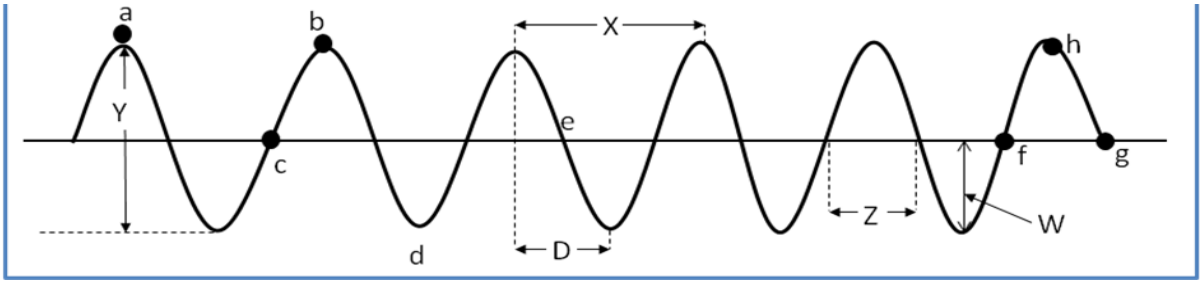
A 18 Ω.
B 180 Ω.
C 3 Ω.
D 0,48 Ω. (2)

TOTAL SECTION A: [20]

SECTION B

QUESTION 2

Water waves crash against a seawall around the harbour. Six waves hit the seawall in 4 s. The distance between successive troughs is 10 m. The height of the waveform trough to crest is 2.5 m.



2.1 Identify the **type of wave** shown above. (1)

2.2 Explain how the wave, mentioned as answer to Question 2.1, is propagated. (2)

2.3 How many completed waves are indicated in the sketch? (1)

2.4 Write down the letters which indicate any TWO points that ...

2.4.1 are in phase. (2)

2.4.2 are out of phase. (2)

2.4.3 represent one wavelength. (1)

2.5 Calculate the amplitude of the wave. (2)

2.6 Show that the period of the wave is 0.67 s. (2)

2.7 Calculate the frequency of the waves. (2)

2.8 Calculate the speed of the waves. (3)

[18]

QUESTION 3

Electromagnetic radiation refers to waves of a dual nature, which are known as the wave nature and the particle nature. Particles are referred to as photons.

Electromagnetic radiation may include the following:

x-rays, visible light, infrared, gamma rays, ultraviolet light, radio waves

3.1 Define the term *photon*. (2)

3.2 Explain how electromagnetic radiation is propagated. (3)

3.3 From the list above, state which of the following forms of radiation ...

3.3.1 is used in hospitals to sterilize medical instruments. (1)

3.3.2 is used in a television remote control. (1)

3.3.3 has a high penetrating ability. (1)

3.3.4 has the longest wavelength. (1)

3.4 Ultrasound allows gynaecologists to examine babies in their mothers' wombs to ensure that problems are detected early.

3.4.1 Briefly explain why gynaecologists examine babies in their mothers' womb using ultrasound, not x-rays. (2)

3.4.2 An X-ray photon incident on a body has a wavelength of $3{,}1 \times 10^{-9}$ m. Calculate how much energy the photon imparts to the body. (3)

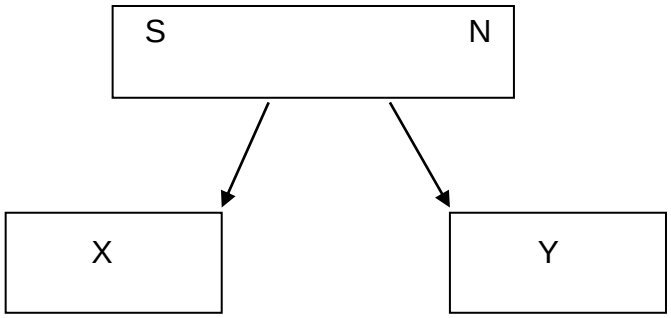
[14]

QUESTION 4

4.1 Write down the definition of a *magnetic field.* (2)

4.2 Name TWO ferromagnetic substances. (2)

4.3 A bar magnet as shown below is broken in half, resulting in two magnets X and Y. Redraw X and Y, clearly indicating poles on X and Y and the resultant magnetic field pattern.



(4)

4.4 What will be the influence (INCREASES, DECREASES or REMAINS THE SAME) on the magnetic field exerted between X and Y if ...

4.4.1 the poles of X and Y are reversed and X and Y are placed at the same distance apart? (2)

4.4.2 X and Y are moved further apart? (2)

[12]

QUESTION 5

Two insulated X and Y graphite-coated polystyrene spheres are kept stationary on an insulated surface a small distance apart. The charges on the spheres are – 5 nC and + 2 nC; respectively. When the spheres are released they move towards each other.

Insulated surface

5.1 State the Law of Conservation of Charge. (2)

5.2 Give a reason why the spheres move towards each other when they are released. (2)

The two spheres are released and then allowed to touch.

5.3 Calculate the charge on each sphere after they touch. (3)

5.4 Were electrons transferred FROM X to Y or FROM Y to X? Give a reason for your answer. (3)

5.5 State what effect of each of the following changes will have of the magnitude of the electrostatic force. Write down only INCREASE, DECREASE or REMAIN THE SAME.

5.5.1 Increase the magnitude of the charges. (2)

5.5.2 Bring the charges closer to each other. (2)
[14]

QUESTION 6

Learners conduct an experiment to determine that if the effective resistance is greater when resistors are connected as potential dividers than when they are connected in parallel.

They are provided with two resistors, an ammeter, 3 cells with emf of 1,5 V each, a voltmeter connected across the battery and both resistors and conductors. (Ignore the internal resistance of the battery.)

6.1 Write down a suitable aim for this experiment. (2)

6.2 Draw the circuit diagram for the experiment using the given apparatus. (5)

6.3 The results of the experiment are tabulated below.

	Ammeter readings (A)	Resistance of Resistor R_1 (Ω)	Resistance of Resistor R_2 (Ω)	Total Resistance of the circuit	Potential difference across R_1 V_1 (V)	Potential difference across R_2 V_2 (V)	Total Potential Difference V_T(V)
Experiment 1	0,75	3	3	A	2,25	C	4,5
Experiment 2	0,96	3	1,7	B	D	1,63	4,5

6.3.1 Calculate the total resistance A and B. (4)

6.3.2 Calculate the potential difference values for C and D. (3)

6.3.3 Determine if resistors in series are potential dividers. (5)

6.4 If the resistors mentioned in the table are connected in parallel how would this affect the total current in the circuit? Justify your answer. (3)

[22]

TOTAL SECTION B: 80

TOTAL: 100

END

DATA FOR PHYSICAL SCIENCES GRADE 10 PAPER 1 (PHYSICS)

TABLE 1: PHYSICAL CONSTANTS/*TABEL 1: FISIESE KONSTANTES*

NAME / *NAAM*	SYMBOL / *SIMBOOL*	VALUE / *WAARDE*
Acceleration due to gravity *Swaartekragversnelling*	g	9,8 $m \cdot s^{-2}$
Speed of light in a vacuum *Spoed van lig in 'n vakuum*	c	3,0 x 10^{8} $m \cdot s^{-1}$
Planck's constant *Planck se konstante*	h	6,63 x 10^{-34} J·s
Charge on electron *Lading op elektron*	e	-1,6 x 10^{-19} C
Electron mass *Elektronmassa*	m_e	9,11 x 10^{-31} kg

TABLE 2: FORMULAE / *TABEL 2: FORMULES*

MOTION / *BEWEGING*

$v_f = v_i + a\Delta t$	$\Delta x = v_i \Delta t + \frac{1}{2} a \Delta t^2$
$v_f^{\ 2} = v_i^{\ 2} + 2a\Delta x$	$\Delta x = \left(\frac{v_f + v_i}{2} \right) \Delta t$

WORK, ENERGY AND POWER / *ARBEID, ENERGIE EN DRYWING*

$U = mgh$ or/*of* $E_P = mgh$	$K = \frac{1}{2} mv^2$ or/*of* $E_k = \frac{1}{2} mv^2$

WAVES, SOUND AND LIGHT / *GOLWE, KLANK EN LIG*

$v = f\lambda$	$T = \frac{1}{f}$
$E = hf$ or/of $E = h\frac{c}{\lambda}$	

ELECTRIC CIRCUITS / *ELEKTRIESE STROOMBANE*

$Q = I\Delta t$	$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \ldots$
$R_s = R_1 + R_2 + \ldots$	$V = \frac{W}{q}$