LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

GRADE 10

PHYSICAL SCIENCES: PHYSICS (P1)

JUNE 2016

MARKS: 150

DURATION: 2 hours
DATE: 13-06-2016

This question paper consists of 11 pages including the data sheet

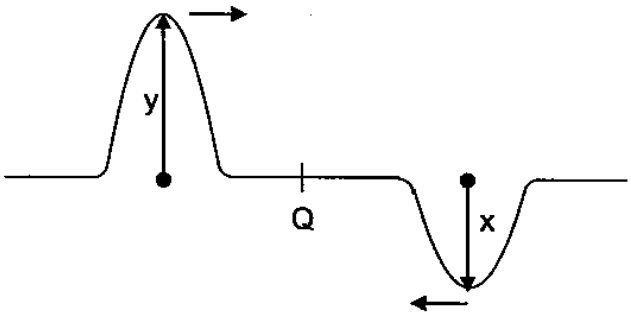
INSTRUCTIONS AND INFORMATION

1. Answer all questions.
2. Non-programmable calculators may be used.
3. Appropriate mathematical instruments may be used.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Be brief whenever motivations, discussions, et cetera, are required
6. You may use the data sheet provided.
7. Show the formulae and substitutions in ALL calculations.
8. Round off your final answer to a minimum of two (2) decimal places, unless otherwise stated.

QUESTION 1: MULTIPLE-CHOICE QUESTIONS

Four options are provided as possible answers to the following questions. Each question has only ONE correct answer. Choose the answer and write only the letter (A – D) next to the question number (1.1 – 1.10) in the ANSWER BOOK.

1.1 Two pulses are travelling towards each other along a string, as shown in the diagram below.



When the centres of the pulses meet at **Q**, the amplitude of the resultant pulse will be …

A. x + y

B. 2(x + y)

C. 2(y - x)

D. y – x

(2)

1.2 Which ONE of the following statements is CORRECT?
All waves …

A. Transmit energy

B. Are transverse

C. Are longitudinal

D. Travel through vacuum

(2)

1.3 A tuning fork is made to vibrate by striking it gently on a rubber stopper. The sound waves produced are …

A. Transverse waves and require a medium for propagation.
B. Transverse waves and require no medium for propagation.
C. Longitudinal waves and require a medium for propagation.
D. Longitudinal waves and require no medium for propagation. (2)

1.4 The amplitude and frequency of a sound wave are both increased. How are the loudness, pitch and speed of this sound wave affected?

	LOUDNESS	**PITCH**	**SPEED**
A.	Decreases	Raised	Decreases
B.	Increases	Raised	Remain the same
C.	Increases	Unchanged	Remain the same
D.	Decreases	Lowered	Decreases

(2)

1.5 Consider the following statements concerning Gamma rays

(i) It has no charge

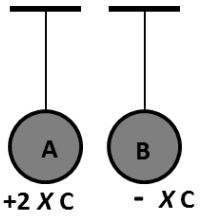
(ii) Has the longest wavelength

(iii) Have the most penetrative ability

Which ONE of the following combinations is CORRECT?

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

1.6 Two insulated, graphite-coated polystyrene spheres, A and B are suspended from threads. The spheres are held a small distance apart. The charges on the sphere A is +2x C and on B is –x C. the spheres are released and they move towards each other



Which ONE of the following is likely to happen?

A. The spheres will move towards each other and cling to one another
B. The spheres will repel each other
C. The spheres will move towards each other, touch each other and become neutral (2)
D. The spheres will swing towards each other, touch each other and move apart

1.7 A glass rod is charged **positively** by rubbing the glass rod with a silk cloth. During this process ...

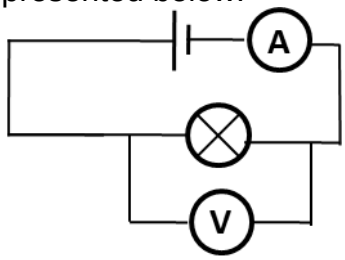
A. Electrons are transferred from the glass rod to the silk cloth.

B. Electrons are transferred from the silk cloth to the glass rod.

C. Protons are transferred from the glass rod to the silk cloth.

D. Protons are transferred from the silk cloth to the glass rod. (2)

1.8 Consider the closed circuit represented below.



How will the ammeter and voltmeter readings change, if the bulb burns out?

	Ammeter reading …	**Voltmeter reading …**
A	Becomes zero	Does not change
B	Becomes zero	Increases
C	Does not change	Does not change
D	Increases	Becomes zero

(2)

1.9 When a potential difference V is applied across a resistor for a time Δt ,current I flows through a resistor for time Δt**.** The charge Q flowing through the resistor will be …

A. $V\Delta t$

B. $\frac{I}{\Delta t}$

C. $I\Delta t$

D. $\frac{V}{W}$

1.10 The direction of the magnetic field lines of a magnet is towards its …

A. South Pole
B. Positive Pole
C. North Pole
D. Negative Pole

(2)

[20]

QUESTION 2

Two pulses, A and B, are moving along a light string. Pulse A is moving to the right with an amplitude of +7 cm, while pulse B is moving to the left with amplitude of +3 cm. Pulses A and B meet at position C. Assume that all energy is conserved.

2.1 How does the speed of pulse A compare with that of pulse B? (2)

2.2 Make a labelled sketch to represent these two pulses before they meet at C. Include the amplitudes and direction of motion. (4)

2.3 What type of interference will take place when these two pulses meet? (2)

2.4 Write down the value, in metres, of the amplitude of the pulse as they meet at point C? (2)

2.5 How will the amplitude of pulse B change after the interference at point C? Write only INCREASE/DECREASE/STAY THE SAME. (2)

2.6 Make a labelled sketch to represent the resulting pulse(s) after they have crossed each other. (2)

[14]

QUESTION 3

3.1 Learners are observing waves moving in a ripple tank, they observe that 3 wave crests are passing through a length of 120 mm after every 10 seconds.

3.1.1 Define the term, **wavelength** of a wave in words (2)

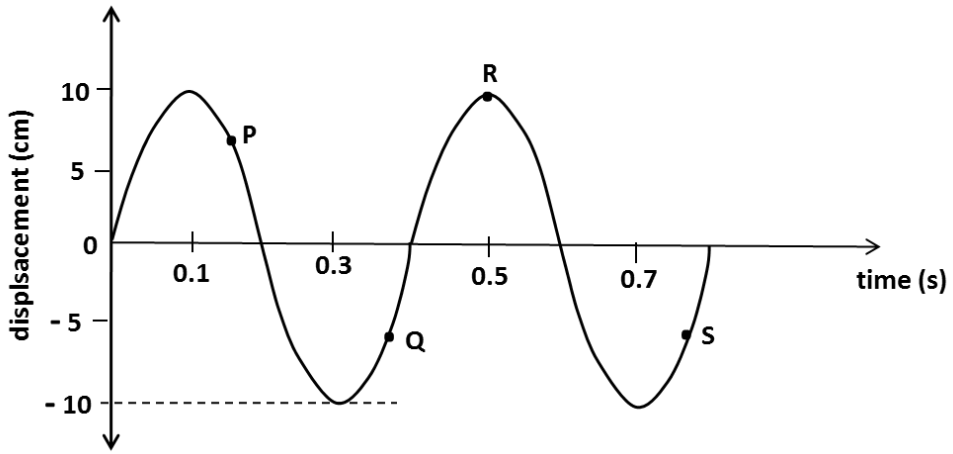
Calculate the:

3.1.2. wavelength of the wave, in metres (3)

3.1.3. the speed of this wave (4)

3.1.4. Write down the value for the period of this wave (1)

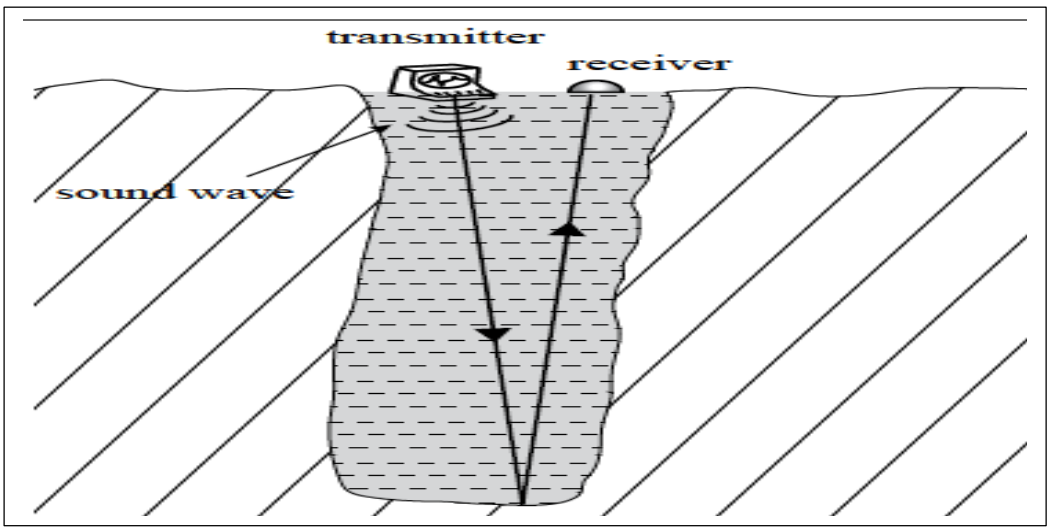
3.2 The graph below shows the displacement of particles in the water. The speed of the wave produced is 12 $m.s^{-1}$.



3.2.1	Define a transverse wave	(2)
3.2.2	Identify TWO points in the graph at which the particles would be moving in the same direction	(2)
3.2.3	Which point has the maximum displacement?	(1)
	Calculate :	
3.2.4.	The frequency of the wave produced	(3)
3.2.5.	The wavelength of the wave produced	(4)
.	*A change that makes the amplitude of the wave to be doubled is affected*	
3.2.6	How would this change affect the speed of the wave? Write down only **Increase**, **Decrease** or **No Change**	(2)
3.2.7	What is the value, in metres, of the new amplitude of the wave?	(2)
		[26]

QUESTION 4

A geologist is surveying a remote valley. He finds a deep mineshaft filled with water. He places an echo-sounding device on the water surface to find the depth of the shaft. Sound waves are sent downwards from the transmitter, reflected off the bottom of the shaft, and picked up by the receiver placed next to the transmitter.
The transmitter sends a sound wave and the receiver picks up the reflected wave 0.018 s later. The speed of the sound waves in water is 1500 m· s^{-1}.



4.1	What type of a wave is a sound wave?	(1)
4.2	Define the term ***echo***	(1)
4.3	Calculate the depth of the mineshaft.	(5)

The frequency of the sound waves is 22 kHz and their speed in water is 1500 m s^{-1}.

4.4 Calculate the **wavelength** of the sound waves in water. (4)

4.5 A sound wave with a lower frequency is used instead;
How will this change in frequency affect the following? (Write down only INCREASES, DECREASES or REMAINS THE SAME.)

4.5.1 The time taken for the reflected wave to reach the receiver from the bottom of the shaft (2)

4.5.2 The wavelength of the wave (2)

4.6 Give one word for sound waves with frequencies 20 kHz and above (1)

4.7 Explain why doctors prefer to use the type of waves in 4.6 as scans when examining the foetus during pregnancy (2)

[18]

QUESTION 5

5.1. Electromagnetic wave can be used to transmit signals such as those for mobile phone calls, Cooking and satellite transmission

5.1.1. Identify the electromagnetic radiation described above. (1)

5.1.2. How does the wavelength of this radiation compare to those of gamma rays? (2)

5.2. A satellite transmission transmit **photons** with a wavelength of $2 \times 10^{-2}\, m$

5.2.1. Define a **photon** (2)

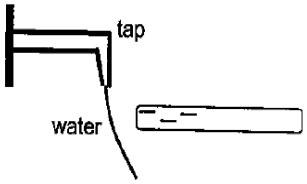
5.2.2. Calculate the frequency of this photon (4)

5.2.3. Calculate the energy of this photon (3)

[12]

QUESTION 6

A Learner in Physical Sciences class rubs his hair with a plastic rod. The rod becomes negatively charged. The learner now opens a tap so that thin stream water runs from it. When the rod is brought close to the water without touching it, it is observed that the water bends towards the rod as shown in the diagram below

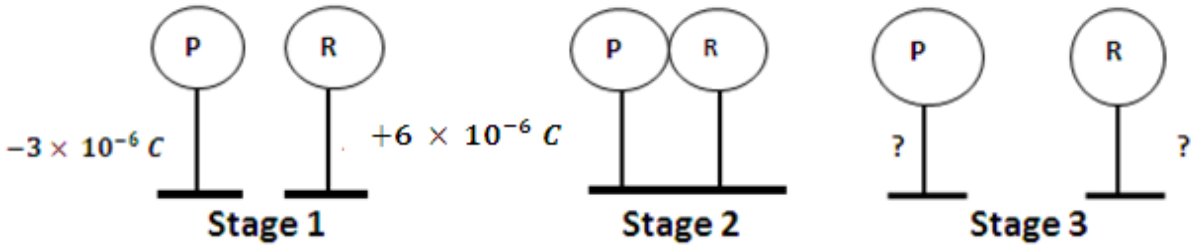


6.1 Give a reason why the steam of water bends towards the rod (3)

During rubbing process 10^{14} electrons are transferred to the rod

6.3 Calculate the net charge carried by the rod after rubbing (3)

Two small metal spheres, on insulated stands, carry charges of $-3 \times 10^{-6}\ C$ and $+6 \times 10^{-6}\ C$ respectively. The spheres were moved to touch one another, got separated and then returned to their original positions



6.3.1 Which ONE of the two spheres, **P** or **R**, at Stage 1, has electron deficiency? (1)

6.3.2 Will the spheres at Stage 3 **Attract** or **Repel**? (1)

6.3.2 Write down the reason for your answer in 6.3.2 above (2)

6.3.4 State the principle of Conservation of Charge (2)

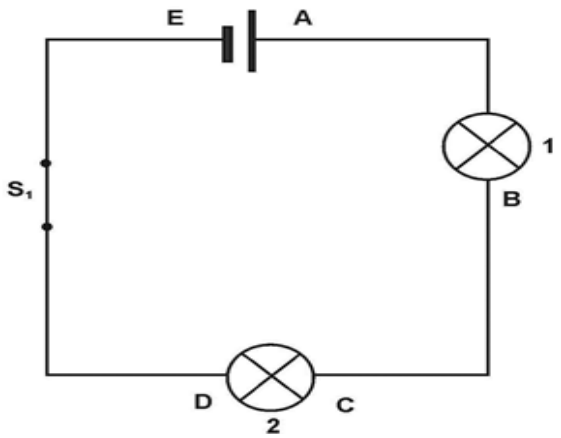
6.3.5 Calculate the charge on **Sphere P** at **Stage 3** (3)

6.3.6 Comparing stage 1 and stage 3, determine the number of electrons transferred. (3)

[18]

QUESTION 7

Consider the diagram of a circuit containing one cell connected to 2 identical light bulbs in series with a switch that is closed.



7.1 Copy the diagram onto your answer sheet and draw in an ammeter that measures the current through the wire at point A and a voltmeter measuring the potential difference between points C and D. (4)

7.2 The current at A was found to be 0,6 A. What is the current at point C? (1)

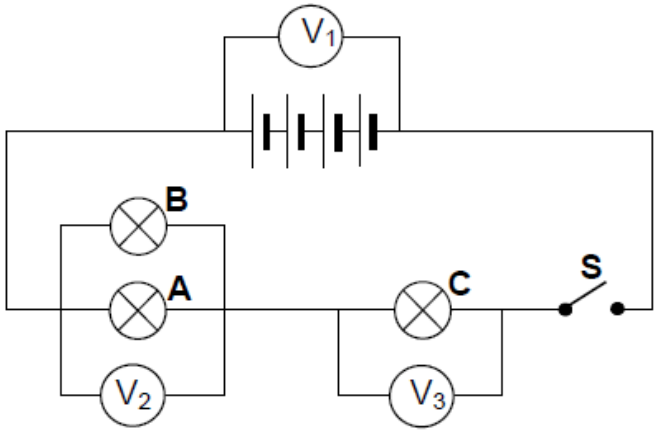
7.3 A conductor that resists the flow of electrical current is called a 'resistor'. (3)
Name three factors which influences the resistance of a conductor

7.4 How will the brightness of bulb 1 compare to bulb 2? Explain why this is observed. (3)

[11]

QUESTION 8

Learners set up a circuit as shown in the diagram below. The emf of **each** cell is 1**,**5 V. Each of bulbs **A** and **B** has a resistance of 2 Ω and bulb **C** has a resistance of 3 Ω.



8.1 Write down the difference between emf and terminal voltage (4)
*Switch **S** is now closed*

8.2 Calculate the effective resistance of bulbs **A** and **B** (3)

8.3 Calculate the total resistance of the circuit (3)

8.4 Determine the reading on:

8.4.1 Voltmeter V_1 (2)

8.4.2 Voltmeter V_3 (2)

8.5 The current passing through bulb C is 1**.**5 A,
Calculate:

8.5.1 The amount of a charge that pass through bulb C in 2 minutes (3)

8.5.2 The amount of energy transferred to bulb C in 2 minutes (3)

8.6 Bulb A burns out; How will the following be affected?
Write down only INCREASES, DECREASES or REMAINS THE SAME.

8.6.1 Current flowing in the circuit (1)

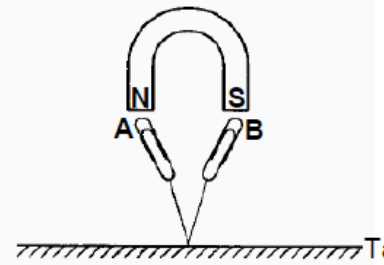
8.6.2 Total Resistance of the circuit (1)

8.6.3 Potential difference across bulb C (1)

[23]

QUESTION 9

In the diagram shown below steel paper clips **A** and **B** are attached to a string which is attached to a table. The paper clips remain suspended beneath a magnet.

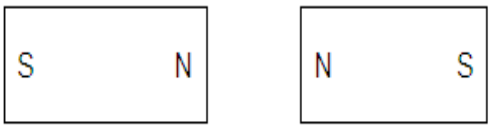


9.1 Define the term *magnetic field*. (2)

9.2 Will the top end of paper clip A be a N pole or a S pole? (1)

9.3 What is the general term given to materials that get attracted to magnets? (1)

9.4 Two bar magnets are placed close to one another as shown in the diagram below.



9.4.1 Draw the magnetic field pattern between the two magnets. (3)

9.4.2 The magnets are now moved further apart. What effect will this change have on the magnetic field pattern drawn in QUESTION 9.4.1? Write down, Move Closer, Move Further Apart, Remain the Same (1)

[8]

TOTAL = 150

DATA FOR PHYSICAL SCIENCES GRADE 10
PAPER 1 (PHYSICS)

TABLE 1: PHYSICAL CONSTANTS

NAME	SYMBOL	VALUE
Speed of light in a vacuum	c	$3,0 \times 10^{8}$ m·s^{-1}
Planck's constant	h	$6,63 \times 10^{-34}$ J·s
Charge on electron	e	$-1,6 \times 10^{-19}$ C
Electron mass	m_e	$9,11 \times 10^{-31}$ kg

TABLE 2: FORMULAE

WAVES, SOUND AND LIGHT

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

ELECTRIC CIRCUITS

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