



Province of the  
**EASTERN CAPE**  
EDUCATION

**JUNE EXAMINATION**

**JUNE 2016**

**GRADE 10**

**PHYSICAL SCIENCES: PHYSICS (P1)**

**MARKS: 100**

**TIME: 2 hours**

**This question paper consists of 11 pages**

## INSTRUCTIONS AND INFORMATION

1. This question paper consists of **EIGHT** questions.
2. Answer **ALL** the questions.
3. Number the answers correctly according to the numbering system used in this question paper.
4. Leave **ONE** line between two sub questions, for example between QUESTION 2.1 and QUESTION 2.2.
5. You may use a non-programmable calculator.
6. You may use appropriate mathematical instruments.
7. You are advised to use the attached DATA SHEETS.
8. Show **ALL** formulae and substitutions in **ALL** calculations.
9. Round off your final numerical answers to a minimum of **TWO** decimal places.
10. Give brief motivations, discussions, et cetera where required.
11. Write neatly and legibly.

**QUESTION 1: MULTIPLE CHOICE QUESTIONS**

Four possible options are provided as answers to the following question, **choose the correct answer and only write the letter next to the question number (1.1 – 1.10.)** on the answer sheet.

- 1.1 If the velocity of a wave remains constant, which one of the following increases when the frequency decreases?
- A. amplitude
  - B. Speed
  - C. wavelength
  - D. Period
- (2)
- 1.2 The region in a longitudinal wave where the particles are closest together is:
- A amplitude
  - B rarefaction
  - C frequency
  - D compression
- (2)
- 1.3 Through which of the following substance does sound travel fastest?
- A vacuum
  - B air
  - C water
  - D steel
- (2)
- 1.4 Consider the following statements concerning magnetic fields:
- (i) the direction of the magnetic field lines is from north to south.
  - (ii) the strength of the magnetic field lines is indicated by the closeness of the field lines.
  - (iii) the magnitude of the magnetic field of a bar magnet is weaker near its poles.
- Which of the following combination is correct?
- A (i) and (ii) only
  - B (i) and (iii) only
  - C (ii) and (iii) only
  - D (i) , (ii) and (iii)
- (2)

- 1.5 Which ONE of the following is the correct arrangement of electromagnetic waves in the order of increasing wavelength.
- A Visible light, radio waves, X rays
  - B Radio waves, visible light, X rays
  - C X rays, visible light, radio waves
  - D Visible light, gamma rays, radio waves (2)
- 1.6 The energy of an electromagnetic wave with wavelength  $\lambda$  is E.
- The energy of an electromagnetic wave with wavelength  $2\lambda$  is equal to...
- A  $\frac{1}{4}E$
  - B  $\frac{1}{2}E$
  - C E
  - D  $2E$  (2)
- 1.7 A glass rod is charged positively by rubbing it with a silk cloth.
- Which one of the following best explains why this happens?
- A electrons are transferred from the rod to the cloth
  - B electrons are transferred from the cloth to the rod
  - C protons are transferred from the rod to the cloth
  - D protons are transferred from the cloth to the rod (2)
- 1.8. One ampere (A) is...
- A one joule per coulomb
  - B one volt per coulomb
  - C one coulomb per second
  - D equal to 1C (2)

1.9 Which ONE of the following is the equivalent of one volt per ampere?

A ohm

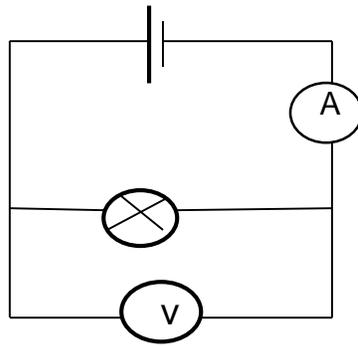
B coulomb

C hertz

D joule

(2)

1.10 Consider the closed circuit represented below.



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

	<b>Voltmeter</b>	<b>Ammeter</b>
A	Decrease	Increase
B	Unchanged	Become zero
C	Become zero	Become zero
D	Unchanged	decrease

[20]

**QUESTION 2**

John and Susan are holding a rope and create pulses that travel from each end.

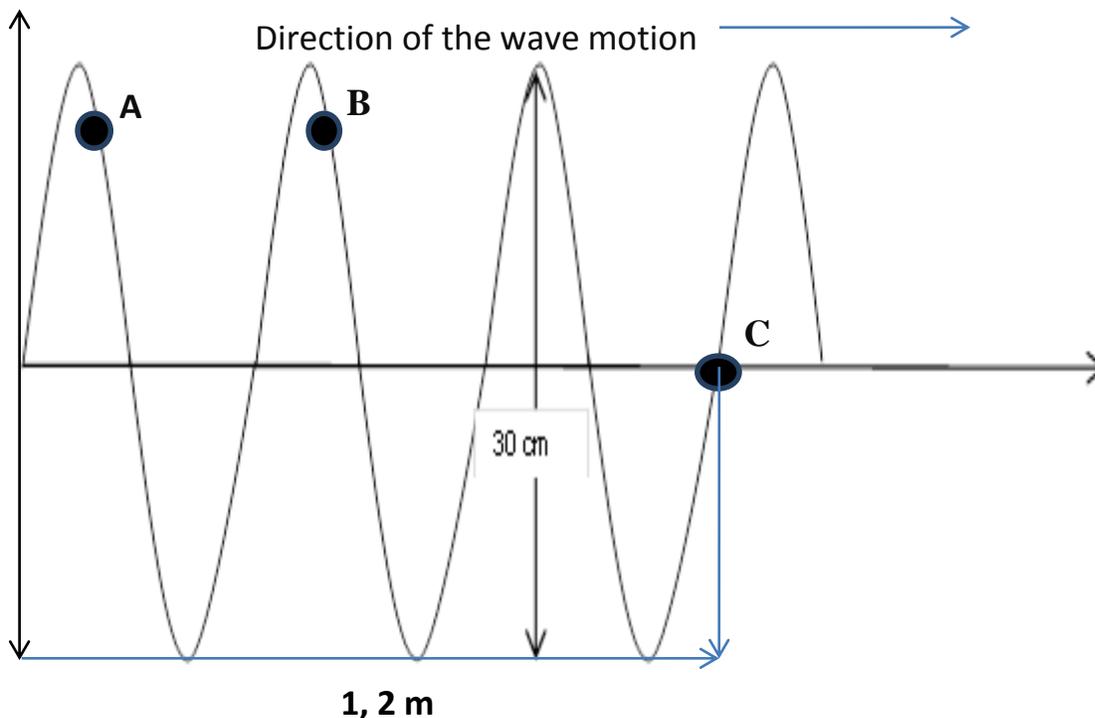
In the rope, a pulse of amplitude +15 mm is travelling to the right and a pulse of amplitude -10 mm is travelling to the left

- 2.1 Define the term transverse pulse (2)
- 2.2 Make a labelled sketch to represent these two pulses. (4)
- 2.3 What type of interference will take place when these two pulses meet? (1)
- 2.4 Write down the name of the phenomenon that occurs when the two pulses meet. (1)
- 2.5 Draw a diagram to show the **resulting pulse** when they cross (reach the same point). Label the diagram to indicate the following: **amplitude;**  
**size of amplitude** (2)  
**[10]**

**QUESTION 3**

The diagram represents a wave moving from left to right.

The time between two consecutive **troughs** is 0,2 s. Points A, B and C are shown on the graph.



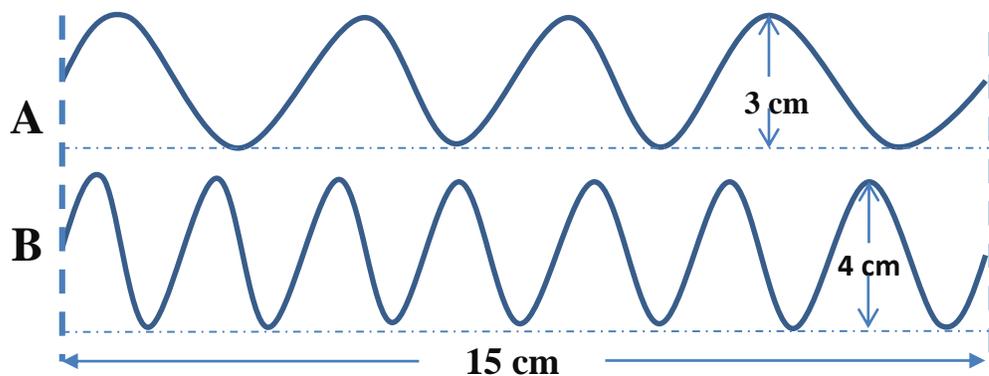
- 3.1 Define the term trough (2)
- 3.2 Write down the LETTERS that represent the points that are in phase (1)
- 3.3 Calculate
- 3.3.1 the wave length of the wave (2)
- 3.3.2 the amplitude of the wave (1)
- 3.3.3 the frequency of the wave (2)
- 3.3.4 the speed of the wave (3)
- 3.3.5 the time taken for FIVE troughs to move past a certain point in the path of the wave. (3)

[14]

#### QUESTION 4

The size and shape of musical instruments influence the sounds that they are able to produce.

- 4.1 The two graphs below represent sound waves produced by a musical instrument.



- 4.1.1 Which graph A or B represents the louder sound? Give reason for your answer. (2)
- 4.1.2 Which graph A or B represents the higher pitch? Give reason for your answer. (2)

4.2 Bats have very poor eye sight and make use of echolocation to find their way.

Echolocation is an example of sonar that makes use of ultrasound.

4.2.1 What type of wave is a sound wave? (1)

4.2.2 A bat that hangs from the roof of a cave makes peeping sounds and the echo from an object in the cave reaches the bat after 0,08 s. The speed of sound in the cave is  $345 \text{ m}\cdot\text{s}^{-1}$ . How far is the object away from the bat? (4)

4.2.3. State the property of sound wave on which echolocation is based. (1)

**[10]**

### QUESTION 5

5.1 Define a photon (2)

5.2 The number of cell phone users has increased tremendously. Research reports that cell phone radiation affects living cells.

5.2.1 Name the kind of radiation on which cell phones operate? (1)

5.2.2 Name one negative effect of the over usage of cell phones (1)

5.3 A photon associated with a certain electromagnetic radiation has  $4,7 \times 10^{-25} \text{ J}$  energy. Calculate the wavelength of this wave (5)

**[9]**

### QUESTION 6

6.1 What are 'ferromagnetic' materials? (2)

The following magnets are given to you in these positions



6.2 Redraw the sketch of the magnets in your ANSWER BOOK and draw the Magnetic field pattern around these magnets (3)

6.3 A small piece of magnetic material is placed at X in the middle of the

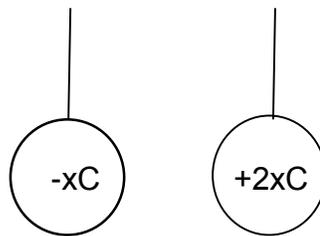
arrangement. Will the material move? Give reason for the answer. (3)

6.4 Give an example of a phenomenon that is affected by earth's magnetic field. (1)

**[9]**

### QUESTION 7

Two insulated, graphite-coated polystyrene spheres are suspended from threads. The spheres are held a small distance apart. The charges on the spheres are  $-x\text{ C}$  and  $+2x\text{ C}$ . When the spheres are released they move towards each other.



7.1 Explain why the spheres move towards each other when they are released. (2)

***The two spheres now touch each other.***

7.2 Calculate the charge on each sphere. (3)

7.3 Will the force now be one of attraction or repulsion? Give a reason for your answer. (3)

7.4 Will two charged spheres that touch ALWAYS move away from each other? Explain your answer. (3)

**[11]**

### QUESTION 8

8.1. When lightning flashes, negative charges from the bottom of a cloud leap down through the air to the ground.

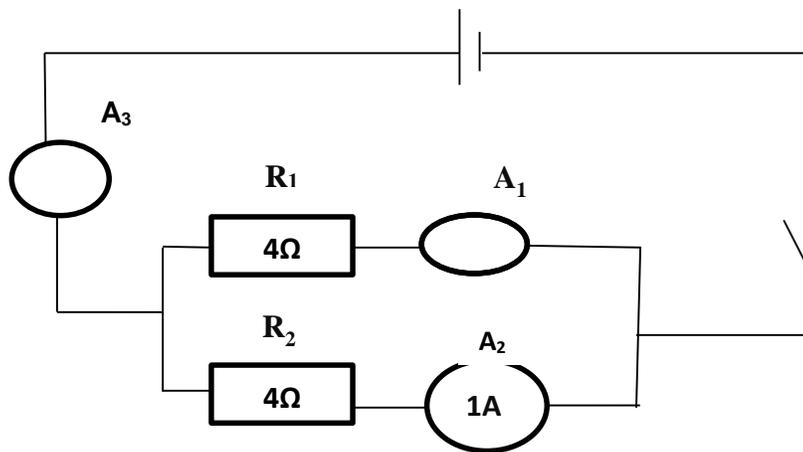
*In one of the lightning flashes, 75 A of electric current passes from the bottom of the cloud to the ground in 1,5 s.*

8.1.1 Define the term electric current (2)

- 8.1.2 Calculate the amount of charge that passes from the cloud to the ground in the lightning flash (4)
- 8.1.3 The potential difference between the bottom of the cloud and the ground is 2 000 000 V. Use your answer from QUESTION 8.1.2 to calculate the amount of heat energy produced during the lightning flash. (3)
- 8.2 Learners in Grade 10 are performing an experiment to show that resistors connected in parallel in a circuit are current dividers while potential difference remains constant. They set up the circuit as follows in the diagram.

Ignore the internal resistance of the circuit.

Resistances  $R_1$  and  $R_2$  are  $4\ \Omega$  each. When the switch is closed the reading on  $A_2$  is 1 A.



- 8.2.1 Write down a possible aim of the experiment (2)
- 8.2.2 Calculate the effective resistance of  $R_1$  and  $R_2$  (3)
- 8.2.3 Determine the reading on  $A_1$  (1)
- 8.2.4 Determine the reading on  $A_3$  (1)
- 8.2.5  $R_1$  and  $R_2$  are now connected in series. How will the total current in the circuit be affected? Write down only INCREASES, DECREASES or REMAINS THE SAME. (1)

[17]

**TOTAL: 100**

**DATA FOR PHYSICAL SCIENCES GRADE 10  
PAPER 1 (PHYSICS)**

**TABLE 1: PHYSICAL CONSTANTS**

NAME	SYMBOL	VALUE
Acceleration due to gravity	$g$	$9,8 \text{ m}\cdot\text{s}^{-2}$
Speed of light in a vacuum	$c$	$3,0\times 10^8 \text{ m}\cdot\text{s}^{-1}$
Planck's constant	$h$	$6,63\times 10^{-34} \text{ J}\cdot\text{s}$
Charge on an electron	$e$	$-1,6\times 10^{-19} \text{ C}$
Electron mass	$m_e$	$9,11\times 10^{-31} \text{ kg}$

**TABLE 2: FORMULAE  
WAVES, SOUND AND LIGHT**

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

**ELECTRIC CIRCUITS**

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