LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

NATIONAL
SENIOR CERTIFICATE

GRADE 10



MARKS: 100

TIME: 2 hours

THIS QUESTION PAPER CONSISTS OF 10 PAGES AND 1 DATA SHEET

INSTRUCTIONS AND INFORMATION

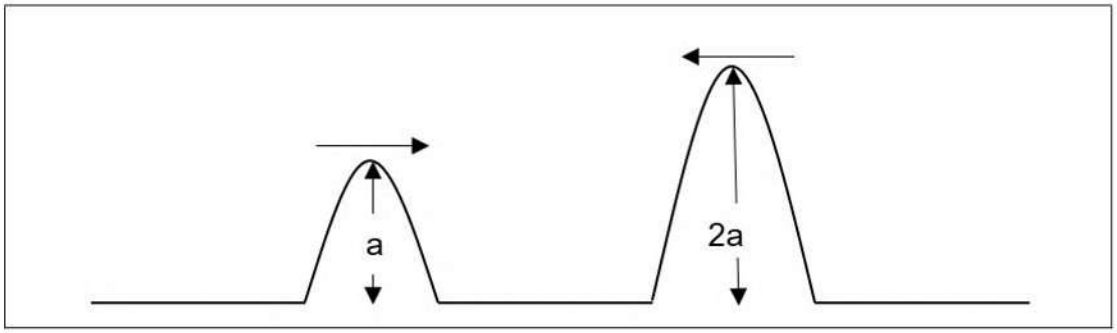
1. Write your name and surname on the ANSWER BOOK.
2. This question paper consists of EIGHT questions.
3. Answer ALL the questions in the ANSWER BOOK.
4. Start EACH question on a NEW page in the ANSWER BOOK.
5. Number the answers correctly according to the numbering system used in this question paper.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

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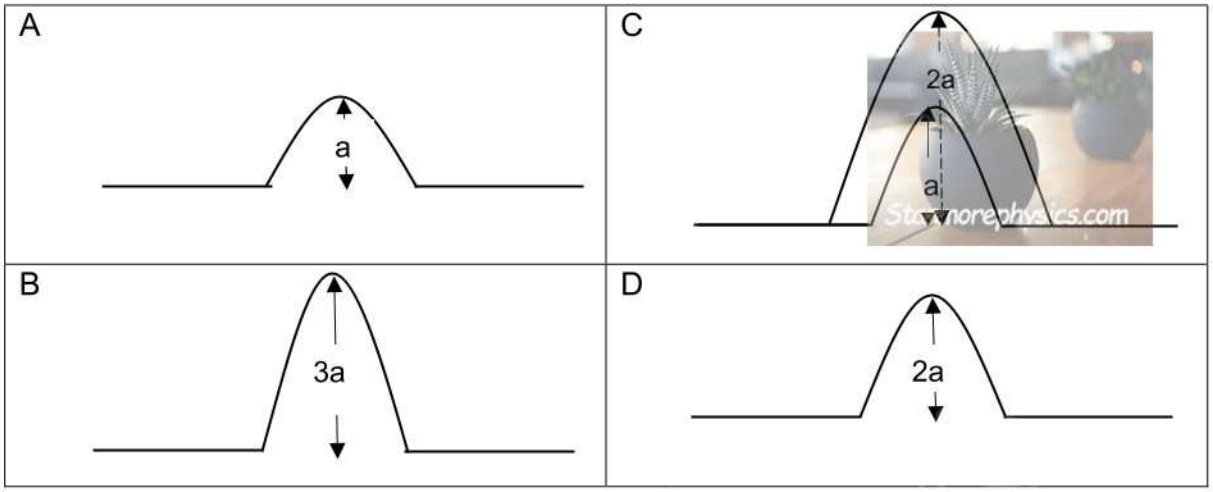
QUESTION 1

Four options are provided as possible answers to the following questions. Each question has only ONE correct answer. Choose the answer and write down only the letter A, B, C or D next to the question number (1.1 – 1.5) in your ANSWER SHEET/BOOK.

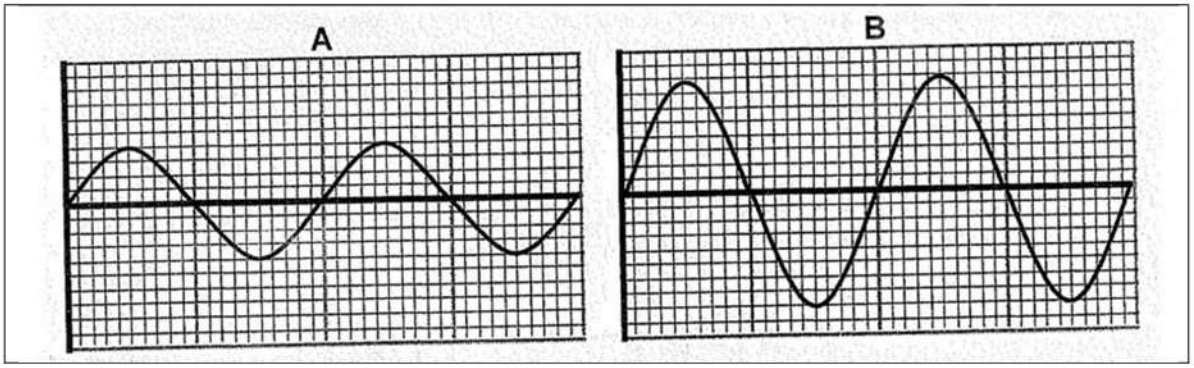
1.1. The diagram below represents two pulses, with amplitudes **a** and **2a**, travelling in opposite directions.



Which one of the following represents the resultant amplitude at the instant that these two pulses meet? (2)



1.2. The diagram below represents two sound waves.



Which ONE of the following combinations, comparing the frequency and loudness of A with that of B, are correct?

	Frequency of A	**Loudness of A**
A	Greater than B	Less than B
B	Less than B	Greater than B
C	The same as B	Greater than B
D	The same as B	Less than B

(2)

1.3. An object is neutrally charged if it has equal number of…

A. electrons, neutrons and protons.

B. electrons and neutrons.

C. electrons and protons.

D. neutrons and protons. (2)

1.4. Two insulated, graphite-coated polystyrene spheres are suspended from threads. The spheres are held a small distance apart. The charges on the spheres are -2×10^{-6} C and $+ 2 \times 10^{-6}$ C.
Which of the following is likely to happen?

A. The spheres move towards each other and cling to one another.

B. The spheres will repel each other.

C. The spheres will swing towards each other and almost touch each other.

D. The spheres will move towards each other, touch each other, become neutral and move apart. (2)

1.5. Which ONE of the following is the function of gamma rays?

A. used to image bone structures.

B. radio, television broadcasts.

C. sterilise medical equipment.

D. laser metal cutting. (2)

[10]

Question 2

Transverse waves, with a wavelength of 0,45 m, travel along a string at 0,25 $m \cdot s^{-1}$. The amplitude of the waves is 0,20 m.

2.1. Define a transverse wave. (2)

2.2. Draw a labelled diagram showing two wavelengths of the wave to illustrate your answer. Label the directions of disturbance and propagation, the amplitude and the wavelength. (4)

2.3. Calculate the frequency of the waves. (4)

2.4. Calculate the period of the waves. (3)

2.5. When the frequency of the waves is doubled, how are the following quantities affected? Write only DECREASES, NO CHANGE or INCREASES.

2.5.1. The speed of the waves. (1)

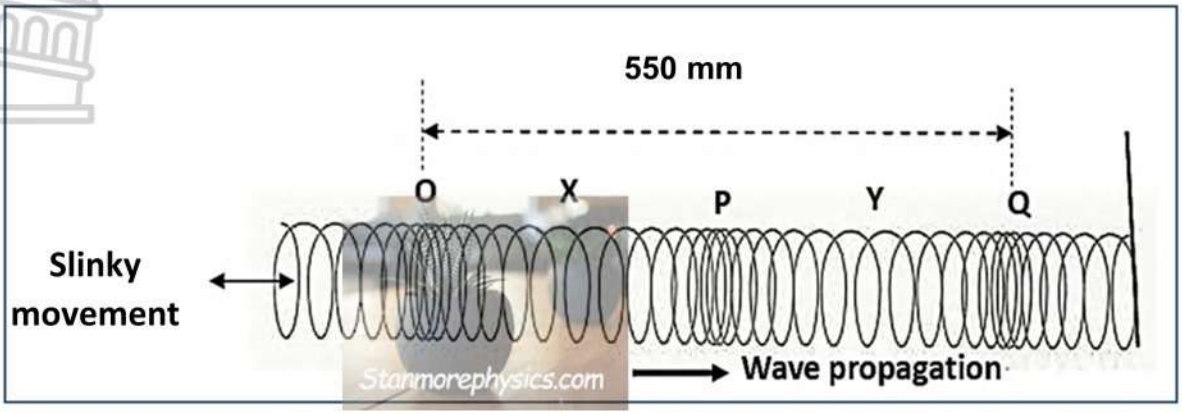
2.5.2. The amplitude of the wave. (1)

[15]

Question 3

3.1. Define the term longitudinal wave. (2)

3.2. Two learners used a slinky spring and produced a wave pattern as shown in the sketch.



3.2.1. Points **X** and **Y** represent regions where the coils are spread apart, thus maximizing the distance between coils.
What is the NAME given to such points? (1)

3.2.2. Points **O**, **P** and **Q** represent regions where the coils are pressed together in a small amount of space. What is the name given to such points? (1)

3.2.3. Determine the wavelength of the wave, in meters, by making use of the sketch. (2)

3.2.4. Calculate the period of this wave if the velocity is 9,0 $m \cdot s^{-1}$. (5)

[11]

Question 4

4.1. When plucked, a guitar string emits a sound with a frequency of 256 Hz. The wavelength of the sound is 1,33 m. When the tension of the string is tightened, the guitar string vibrates with a frequency of 300 Hz.

4.1.1. Calculate the speed of sound in air. (3)

4.1.2. When the tension of the string is tightened, how are the following properties of the sound wave affected?
Only write INCREASE, DECREASE or REMAIN THE SAME.

4.1.2.1. The pitch of the sound. (1)

4.1.2.2. The speed of the sound. (1)

4.1.2.3. The wavelength of the sound. (1)

4.2. Distinguish between a pure note and a noise. (2)

4.3. An earthquake produces waves of frequency 23 100 Hz. Most often, fewer animals die during an earthquake than people.

4.3.1. What name is given to sounds of frequencies in this range? (1)

4.3.2. Explain why fewer animals usually die during an earthquake than people. (2)

4.3.3. Explain how human beings can avoid dying in large numbers. (2)

[13]

Question 5

Different types of electromagnetic radiation have different frequencies. This can influence their properties and what each could be used for in our daily lives.

5.1. Describe the source of electromagnetic waves. (2)

5.2. Mention two models by which electromagnetic radiation may be explained. (2)

5.3. Study the diagram below which shows the change in frequency of part of the electromagnetic spectrum.

Frequency decreases ←

Infrared waves	**Visible light**	**Microwaves**	**Gamma rays**

5.3.1 Which one of the waves listed has the highest penetrating ability? Give a reason why this wave has the highest penetrating ability. (3)

5.4. Write down ONE use of each of the following types of radiation:

5.4.1. Visible light (1)

5.4.2. Microwaves (1)

5.5. When doctors need to establish the seriousness of a fracture, a picture is taken of the broken bone. The picture below shows a fracture.



[Source: learning radiography.com]

Write down the following:

5.5.1. Name of the type of radiation used for this procedure. (1)

5.5.2. Property of this type of radiation used for this procedure. (1)

5.5.3. Danger of overexposure to this type of radiation. (1)

5.6. A radio programme is transmitted in the FM band on a wavelength of 3 m. Calculate the frequency of the wave. (4)

[16]

Question 6

6.1. Define a photon. (2)

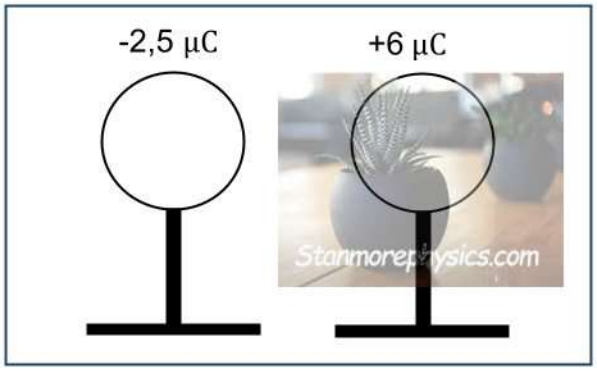
6.2. The wavelength of microwaves produced by a microwave oven machine is 0,015 nm. A bowl of soup is placed inside the microwave oven. Calculate the energy of these microwave photons. (1 nm = 10^{-9} m). (5)

6.3. The bowl of soup is now placed in a microwave oven of shorter wavelengths. How will the energy gained by the soup compare with the energy in 6.2? Write only DECREASES, REMAINS THE SAME, or INCREASES. (2)

[9]

Question 7

7.1. Two metal spheres on insulated stand carry charges of -2,5 μC and +6 μC. ($1\ \mu C = 1 \times 10^{-6} C$)



They are allowed to touch each other.

7.1.1. State the principle of conservation of charge. (2)

7.1.2. Calculate the new charge on in each sphere in coulombs. (4)

7.2. Toshi rubs a plastic ball over his head which causes the ball to acquire a charge of $-5 \times 10^{-9}\ C$.



7.2.1. Write down the concept which describe how charges is gained by contact or rubbing. (1)

7.2.2. Does the ball have a DEFICIENCY or EXCESS of electrons after contact with Toshi's hair? (1)

7.2.3. State the *principle of charge quantization*. (2)

7.2.4. Determine the number of electrons that are in excess or deficient on the ball. (4)

7.2.5. Thabo then opens a tap so that a thin stream of water runs from it. The ball is brought close to the water without touching it. The water bends towards the ball.

Explain why the water bends towards the ball. (2)

A plastic ruler is allowed to touch the ball. The ball is returned to the stream of water and nothing happens.

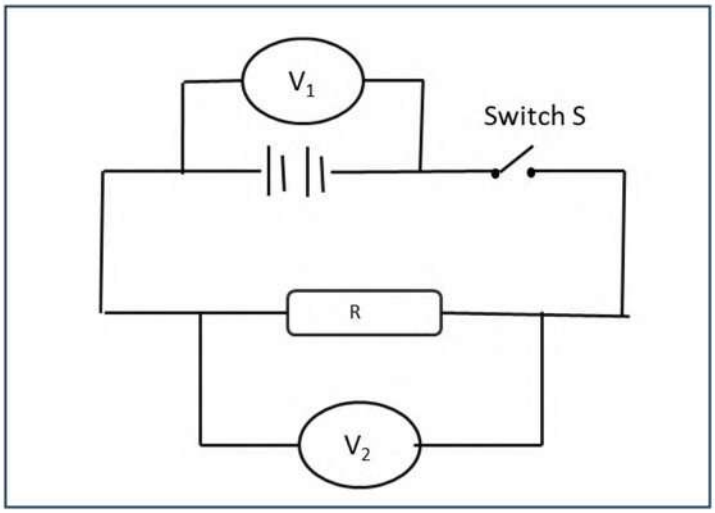
7.2.6. What is the charge on the ball after touching the ruler? (1)

[17]

QUESTION 8

8.1. Define current strength. (2)

8.2.



Study the diagram above and identify a voltmeter that measures:

8.2.1. Potential difference across the ends of a conductor. (1)

8.2.2. Emf. (1)

8.2.3. Terminal potential difference. Give a condition for the voltmeter to measure the terminal potential difference, with reference to the switch (S). (2)

8.3 Calculate the amount of charge that passes through a point in a circuit when a current of 1,5 A flows for 2,5 minutes. (4)

[10]

TOTAL:100

Information sheets – 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	$3,0 \times 10^{8}$ $m \cdot s^{-1}$
Planck's constant *Planck se konstante*	h	$6,63 \times 10^{-34}$ $J \cdot s$
Charge on electron *Lading op elektron*	e	$-1,6 \times 10^{-19}$ C
Electron mass *Elektronmassa*	m_e	$9,11 \times 10^{-31}$ 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*

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

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