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KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 10

PHYSICAL SCIENCES
COMMON TEST
MARCH 2024

SEE ACADEMY

MARKS: 100

DURATION: 2 hours

This question paper consists of 10 pages and a data sheet.

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INSTRUCTIONS AND INFORMATION

1. This question paper consists of SIX questions. Answer ALL the questions in the ANSWER BOOK.
2. Start EACH question on a NEW page in the ANSWER BOOK.
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 SHEET.
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.

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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 (1.1–1.5) in the ANSWER BOOK, for example 1.6 E.

1.1 In which ONE of the following media will sound travel the fastest?

A Air

B Water

C Steel

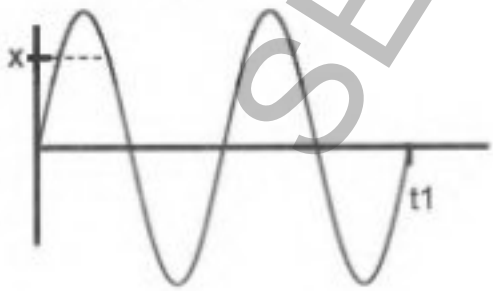
D Vacuum (2)

1.2 A sound produces the wave pattern below.

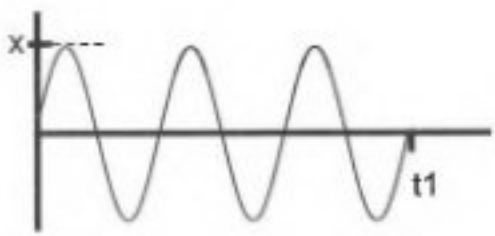


Which diagram represents the sound wave at a higher pitch but same loudness?

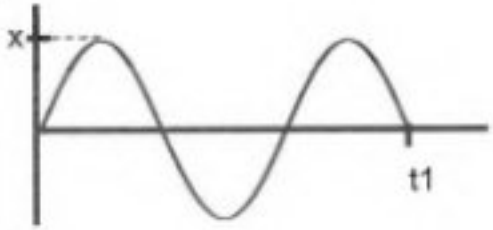
A



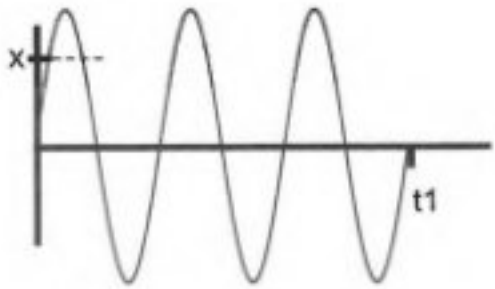
B



C



D



(2)

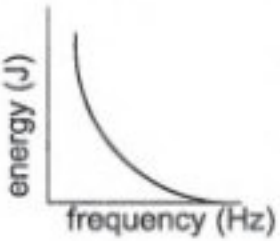
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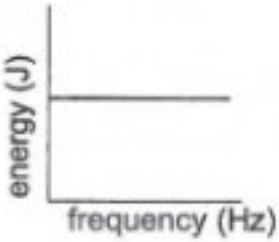
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1.3 Which graph represents the relationship between the frequency and energy of a photon?

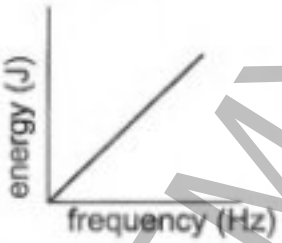
A



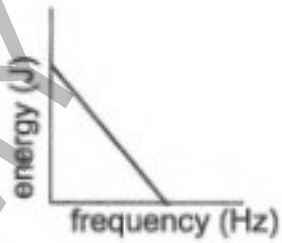
B



C



D



(2)

1.4 Which ONE of the following is equivalent to 1 AMPERE?

A $1\ C \cdot s^{-1}$

B $1\ C \cdot s$

C $1\ J \cdot C$

D $1\ J \cdot C^{-1}$ (2)

1.5 Which ONE of the following CANNOT be the charge of an object?

A $3{,}2 \times 10^{-19}\ C$

B $8{,}0 \times 10^{-19}\ C$

C $6{,}4 \times 10^{-19}\ C$

D $7{,}2 \times 10^{-19}\ C$ (2)

[2 X 5 = 10]

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QUESTION 2 (Start on a new page.)

Two transverse pulses, **A** and **B**, approach a point P in the same medium. Pulse **B** is travelling to the LEFT and has an amplitude three times larger than that of Pulse **A**. Both pulses have a wavelength of 5 cm. The pulses experience DESTRUCTIVE interference at point P where they form a trough with an amplitude of 6 cm.

2.1 NAME and STATE the principle used to determine the resultant amplitude of the pulse formed at point P. (3)

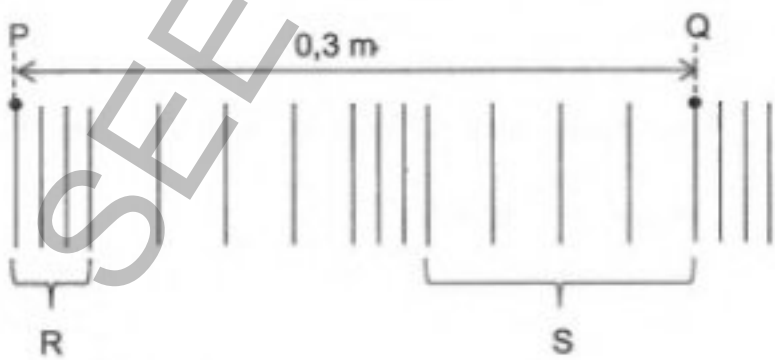
2.2 Determine the amplitude of Pulse **B** before it reaches point P. (3)

2.3 Write down the wavelength of the pulse at point P. (1)

2.4 Draw the pulses after they pass point P. Label each pulse clearly. (3)
[10]

QUESTION 3 (Start on a new page.)

3.1 The distance between points P and Q is 0,3 m on the wave pattern shown below.



The speed of the wave is 1,5 $m \cdot s^{-1}$

3.1.1 Is the above wave TRANSVERSE or LONGITUDINAL? (1)

3.1.2 Write down the names of the sections of the wave labelled R and S. Provide the letter and next to it the correct name. (2)

3.1.3 Calculate the wavelength of the wave. (2)

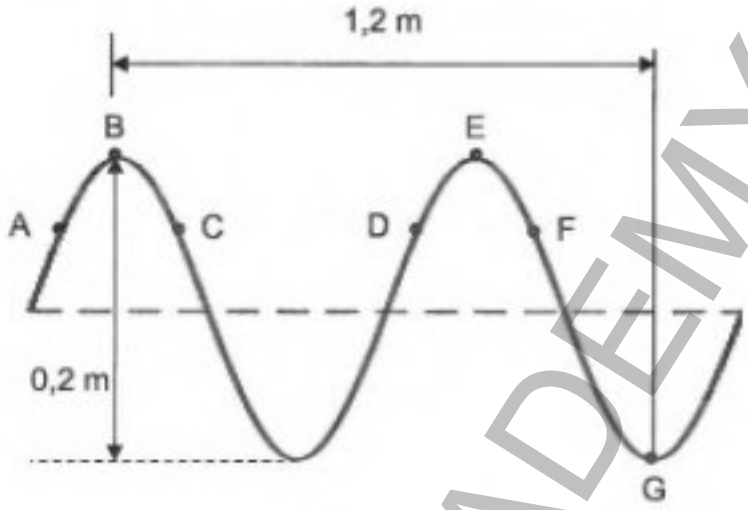
3.1.4 Determine the period of the wave. (4)

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3.2 The diagram below represents a wave moving from left to right. The distance between points B and G is 1,2 m.



TWO complete wave cycles pass point B every second.

3.2.1 Write down the amplitude of the wave. (1)

3.2.2 Identify a point that is in phase with point C. (1)

3.2.3 Define the term *frequency* in words. (2)

Calculate:

3.2.4 The time taken for the wave to move from point B to point G. (4)

3.2.5 The speed of the wave. (3)

[20]

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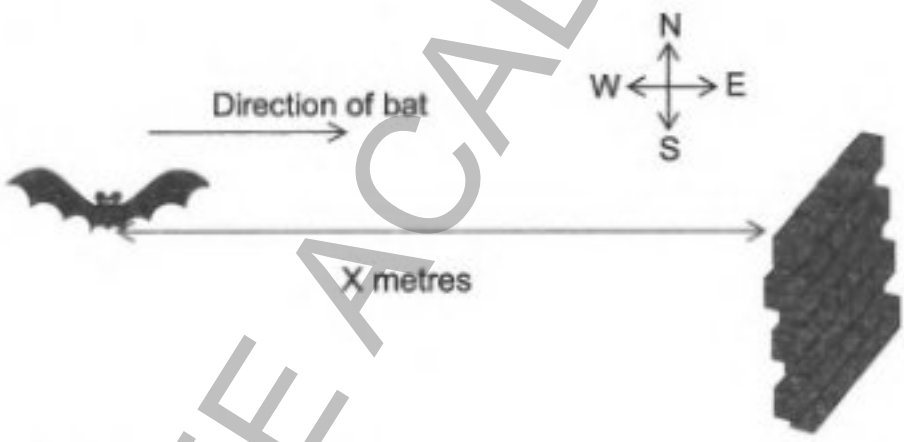
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QUESTION 4 (Start on a new page.)

4.1 The average human ear can hear sounds up to a frequency of 20 kHz. Bats can detect frequencies of up to 200 kHz, using this adaption to navigate. They emit high frequency sound waves and detect the echo.

A bat flying at a constant velocity of 3 $m \cdot s^{-1}$ due east emits a sound wave when it is X metres away from a wall. The sound bounces off the wall and the bat detects the echo 2 seconds later.
During this 2 second interval the bat continued flying due east covering a distance of 6 metres.

Take the speed of sound in air as 340 $m \cdot s^{-1}$.



4.1.1 Define the term *echo* in words. (2)

4.1.2 Determine the initial distance X between the bat and the wall. (4)

The wavelength of the sound wave emitted by the bat is 7,56 x 10^{-3} m.

4.1.3 Use suitable calculations to determine whether a human ear will be able to hear the sound. (4)

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