education

Department:
Education
PROVINCE OF KWAZULU-NATAL

NATIONAL SENIOR CERTIFICATE

GRADE 10

PHYSICAL SCIENCES P1

COMMON TEST

MARCH 2019

TIME : 1 Hour

MARKS: 50

This question paper consists of 9 pages and 1 data sheet.

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INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions in the ANSWER BOOK.

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

3. Leave ONE line between two subquestions, for example between QUESTION 2.1 and QUESTION 2.2.

4. You may use a non-programmable calculator.

5. You are advised to use the attached DATA SHEET.

6. Show ALL formulae and substitutions in ALL calculations.

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

8. Give brief motivations, discussions, et cetera where required.

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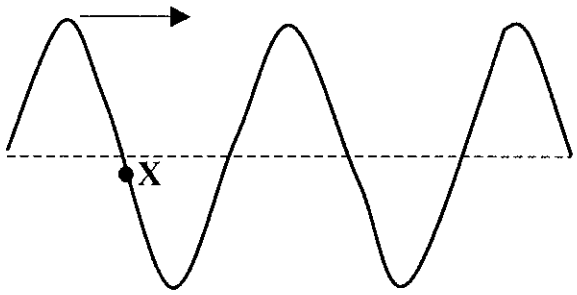
QUESTION 1: MULTIPLE-CHOICE QUESTIONS

Four possible responses are provided as 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 – 1.4) in the ANSWER BOOK , for example 1.5 C.

1.1 The number of wave cycles passing a given point in one second is called the …

A amplitude.
B speed.
C frequency.
D period. (2)

1.2 The diagram shows a wave moving from left to right through water.



A cork X, is at this moment …

A moving upwards.
B moving downwards.
C moving to the left.
D stationary. (2)

1.3 Two waves, A and B, are produced by vibrating sources with the same frequency. Waves A and B have wavelengths of 1m and 3m respectively. If the speed of wave B is v, then the speed of wave A is ...

A $^1/_9v$
B $^1/_3v$
C v
D $3v$ (2)

1.4 Which of the following factor/s DOES NOT influence the energy of a photon of light?

I The amplitude of the light wave.
II The wavelength of the light.
III The frequency of the light.
IV The speed of the light.

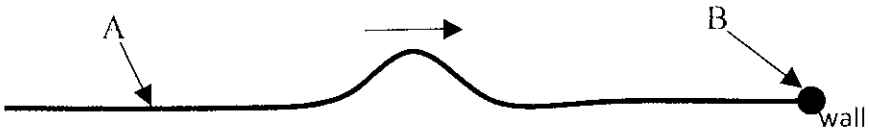
A I only
B III only
C II and III
D I, II and III (2)

2 x 4 [8]

QUESTION 2

2.1 A pulse is sent down along spring as shown in the diagram. Point B is attached to a wall. The particles of the pulse vibrate at right angles to its direction of motion.

It took 0,6 seconds for the pulse to return to point A.

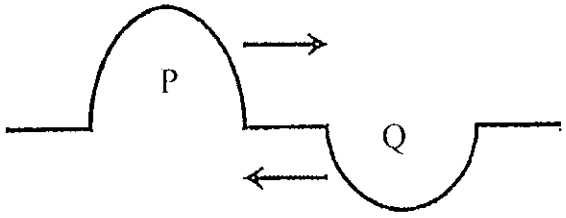


2.1.1 What type of pulse is represented in the diagram? (1)

2.1.2 How many seconds did it take for the pulse to travel from A to B? (1)

2.1.3 Sketch a simple diagram of the reflected pulse after it has bounced off point B. (1)

2.2 The diagram shows two pulses P and Q travelling in opposite directions in a rope. The amplitude of P is 12mm and that of Q is 8mm.

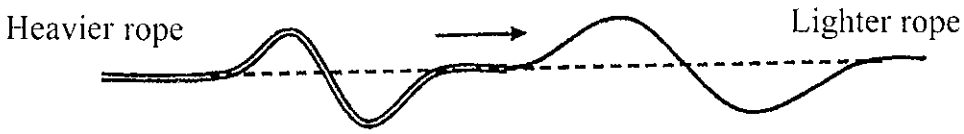


2.2.1 Name the type of interference that takes place when the two pulses meet. (1)

2.2.2 Will a resultant crest or trough be formed when these two pulses meet? (1)

2.2.3 In which direction will pulse Q move immediately AFTER the two pulses meet? (1)
Write either TO THE LEFT or TO THE RIGHT.

2.3 A pulse is transmitted from a heavier rope into a lighter rope causing the speed of the pulse to increase.

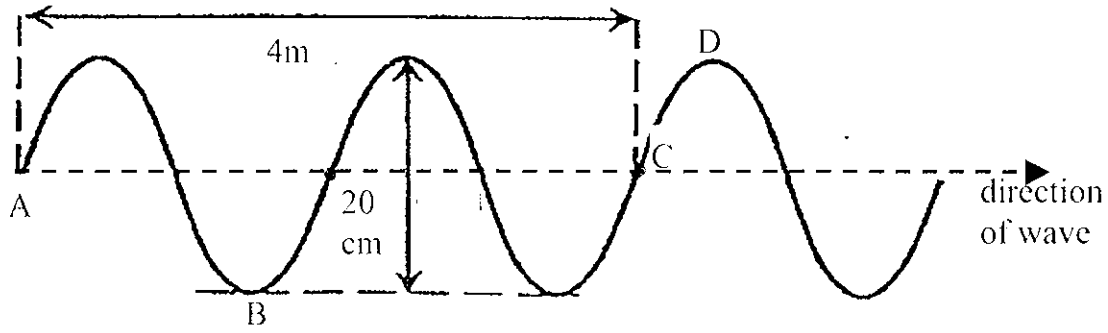


What feature in the diagram above gives an indication that the speed in the lighter rope has increased?

(2)
[8]

QUESTION 3

The transverse wave below has a frequency of 1,50 Hz.



3.1 Define the term wavelength. (2)

3.2 Use the diagram to determine the value of the:

3.2.1 Wavelength. (1)

3.2.2 Amplitude. (1)

3.3 State ONE similarity between a particle at point B and a particle at point D. (1)

3.4 If point A is taken as the starting point of the wave then:

3.4.1 How long will a particle take to move from point A to point D? (3)

3.4.2 Calculate the speed of the wave. (3)

[11]

QUESTION 4

4.1 Two learners decide to make a homemade "telephone" by attaching a thin copper wire which is 10 m long to the bottom of two paper cups. When the wire is stretched one of the learners speaks into one of the paper cups. The resulting sounds are then heard at the other cup. The speed of sound in the wire is 4 600 $m \cdot s^{-1}$.

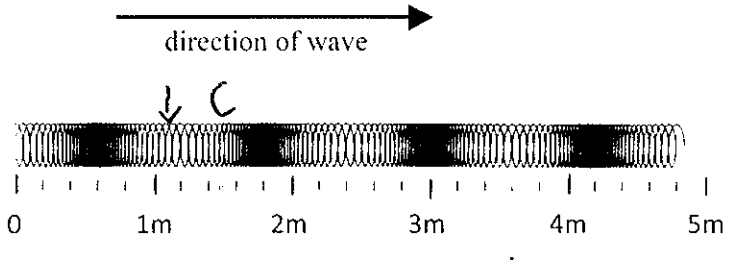
4.1.1 What type of wave is a sound wave? (1)

4.1.2 Explain how the sound is able to travel from the one cup to the other. (2)

4.1.3 Determine the time taken for the sound to travel from one cup to the other. (3)

4.1.4 Will the time taken for the sound to travel through air be GREATER THAN, LESS THAN or EQUAL TO the time taken to travel through the copper wire? (1)

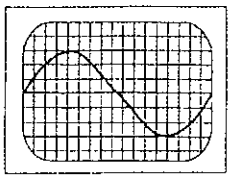
4.2 Study the diagram below and answer the questions that follow.



4.2.1 Give the name for the part of the wave that is labelled C. (1)

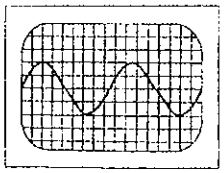
4.2.2 Calculate the frequency of the wave if its speed is 4,80 $m \cdot s^{-1}$. (3)

4.3 The following sound wave, produced by a tuning fork is observed on an oscilloscope.

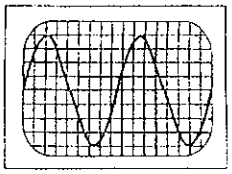


A few more notes are played on different tuning forks and the patterns below are observed.

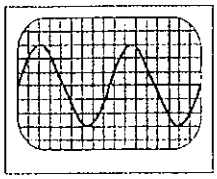
A



B



C



Which ONE of these patterns (A, B or C) represents a LOUDER as well as a HIGHER PITCHED note than the original note?
Explain your answer.

(3)
[14]

QUESTION 5

Over 100 years ago scientists thought that there must be an invisible substance in space that enables light to travel from the sun to the earth. It has now been established that sunlight reaches the earth in the form of electromagnetic waves.

Below is a table of different radiations of the electromagnetic spectrum.

Type of Radiation	Wavelength (m)
Radio waves	6×10^{2}
Infrared	4×10^{-5}
Visible light	5×10^{-6}
Ultraviolet light	3×10^{-7}
X-rays	2×10^{-10}
Gamma rays	5×10^{-13}

5.1 How are electromagnetic waves generated? (1)

5.2 State ONE risk associated with overexposure to sunlight. (1)

5.3 From the table above name the type of electromagnetic radiation that:

5.3.1 Has the highest penetrating ability. (1)

5.3.2 Is used in television remote controls. (1)

5.4 If a photon of sunlight contains $6{,}63 \times 10^{-19}$J of energy determine which ONE of the radiations in the table above is mainly found in sunlight. Show all the necessary calculations in your answer. (5)
[9]

TOTAL MARKS: [50]

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DATA FOR PHYSICAL SCIENCES GRADE 10

PAPER 1 (PHYSICS)

GEGEWENS VIR FISIESE WETENSKAPPE GRAAD 10

VRAESTEL 1 (FISIKA)

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 vacuum*	c	$3{,}0 \times 10^{8}\ m{\cdot}s^{-1}$
Planck's constant *Planck se konstante*	h	$6{,}63 \times 10^{-34}\ J{\cdot}s$

TABLE 2: FORMULAE/*TABEL 2: FORMULES*

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

$v = f\lambda$	$T = \frac{1}{f}$
$v = \frac{\Delta x}{\Delta t}$	$E = hf$
$c = f\lambda$	$E = h\frac{c}{\lambda}$

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MARKING GUIDELINE

TIME : **1 Hour**

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These marking guideline consists of 4 pages.

QUESTION 1

1.1 C ✓✓ (2)

1.2 B✓✓ (2)

1.3 B ✓✓ (2)

1.4 A ✓✓ (2)
[8]

QUESTION 2

2.1

2.1.1 Transverse ✓ (1)

2.1.2 0,3s ✓ (1)

2.1.3



(1)

2.2.1 Destructive ✓ (1)

2.2.2 Crest ✓ (1)

2.2.3 To the left ✓ (1)

2.3 The pulse length / wave length has increased ✓✓ (2)
[8]

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QUESTION 3

3.1 The distance between two successive points in phase ✓✓ (2)

3.2.1 2 m ✓ (1)

3.2.2 10 cm ✓ (1)

3.3 Both have the same displacement ✓/ both have the same speed✓ / both have the same frequency ✓ (1)

3.4.1
$$T = \frac{1}{f} \checkmark$$
$$= \frac{1}{1,5}$$
$$= 0,67s$$
$$\therefore \Delta t_{3D} = (0,67 + 0,67 + 0,17)$$
$$= 1,51\ s \checkmark$$ (3)

3.4.2 $v = f\lambda$ ✓
$= 1,5 \times 2$
$= 3\ m.s^{-1}$✓ (3)

[11]

QUESTION 4

4.1.1 Longitudinal ✓ (1)

4.1.2 The vibrations travel through the particles in the wire ✓ and then cause the particles in the second cup to vibrate ✓ (2)

4.1.3
$$v = \frac{\Delta x}{\Delta t} \checkmark$$
$$4600 = \frac{10}{t} \checkmark$$
$$t = 2,17 \times 10^{-3} s$$ (3)

4.1.4 Greater than ✓ (1)

4.2.1 Rarefaction ✓ (1)

4.2.2
$$v = f\lambda \checkmark$$
$$4,80 = f \times 1,20 \checkmark$$
$$f = 4Hz$$ (3)

4.3 B ✓ It has a greater amplitude ✓ and greater frequency ✓ (3)

[14]

QUESTION 5

5.1 By accelerating charges ✓ **OR**
Electric and magnetic fields oscillating at 90° to each other ✓ (1)

5.2 Skin cancer ✓ **OR**
Damage eyes ✓ **OR**
Sunburn ✓ **OR** (1)

5.3.1 Gamma Rays ✓ (1)

5.3.2 Infrared ✓ (1)

5.4
$$E = \frac{hc}{\lambda} \checkmark$$
$$6,63 \times 10^{-19} = \frac{(6,63 \times 10^{-34})(3 \times 10^{8})}{\lambda} \checkmark \checkmark$$
$$\lambda = 3 \times 10^{-7} m \checkmark$$
therefore ultraviolet rays are mainly found ✓ (5)

[9]

TOTAL MARKS: 50