Education

KwaZulu-Natal Department of Education
REPUBLIC OF SOUTH AFRICA

GR 10 PHYSICS P1

PHYSICAL SCIENCES P1 (PHYSICS)

COMMON TEST

MARCH 2017

NATIONAL SENIOR CERTIFICATE

GRADE 10

MARKS: 50

TIME: 1 hour

This question paper consists of 7 pages and 1 data sheet.

INSTRUCTIONS AND INFORMATION

1. Write your name in the appropriate spaces on the ANSWER BOOK.
2. Answer ALL the questions in the ANSWER BOOK.
3. You may use a non-programmable calculator.
4. You may use appropriate mathematical instruments.
5. Number the answers correctly according to the numbering system used in this question paper.
6. You are advised to use the attached data sheets.
7. Give brief motivations, discussions, et cetera where required.
8. Round off your answers to a minimum of 2 decimal places.

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 – 1.3) in the ANSWER BOOK, for example 1.4 C.

1.1 The maximum displacement of a particle from its equilibrium position along a wave train is best described as its...

A wavelength.
B pitch.
C amplitude.
D frequency. (2)

1.2 Sound travels...

A fastest through solids.
B faster through air than water.
C faster through water than air.
D. faster through water than solids. (2)

1.3 When moving in a vacuum, all electromagnetic waves have the same ...

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

2 x 3 = [6]

QUESTION 2

Two pulses A and B move towards each other through the same piece of rubber tubing. Pulse A is moving to the left with amplitude of +7 cm and pulse B is moving to the right with an amplitude of -10 cm. The pulses meet at point C. (Assume that all energy is conserved).

2.1 What is a pulse? (2)

2.2 State the principle of superposition of waves. (2)

2.3 Draw a labelled diagram to show the pulses at point C. (3)

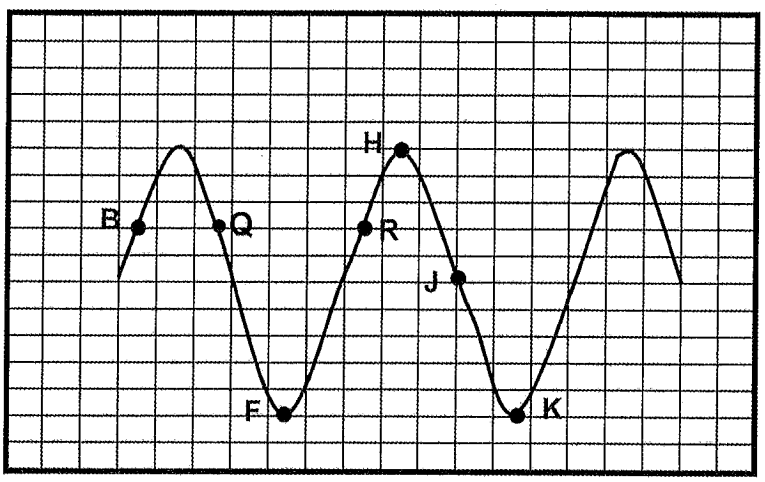
2.4 What type of interference takes place at point C? (1)

2.5 Calculate the resultant amplitude at the meeting point (point C). (1)

2.6 What is the amplitude and direction of pulse A after passing point C? (2)
[11]

QUESTION 3

Study the wave motion produced by a water wave.



3.1 What type of wave is a water wave? (1)

3.2 Using the diagram, identify a point:

3.2.1 that is a crest. (1)

3.2.2 where the particles of water are at rest. (1)

3.2.3 that is in phase with point F. (1)

3.2.4 that indicates a complete wave cycle with point R. (1)

3.3 In what direction is a particle at B about to move? (1)

3.4 How many wave cycles are shown in the diagram above? (1)

3.5 A water wave passes a point at a rate of 5 complete wave cycles per second. If the wavelength is 75 mm, calculate the:

3.5.1 frequency of the wave. (1)

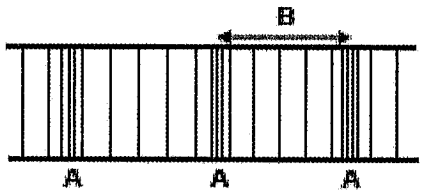
3.5.2 peed of the wave. (4)

3.5.3 distance covered by the wave in 4 minutes. (4)
[16]

QUESTION 4

A sound wave produced by a piano is represented in DIAGRAM 1 below.

DIAGRAM 1



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

4.2 What is indicated by:

4.2.1 A? (1)

4.2.2 B? (1)

4.3 A piano produces a musical sound with a frequency of 440 Hz.

4.3.1 How long will it take to produce one complete wave cycle? (2)

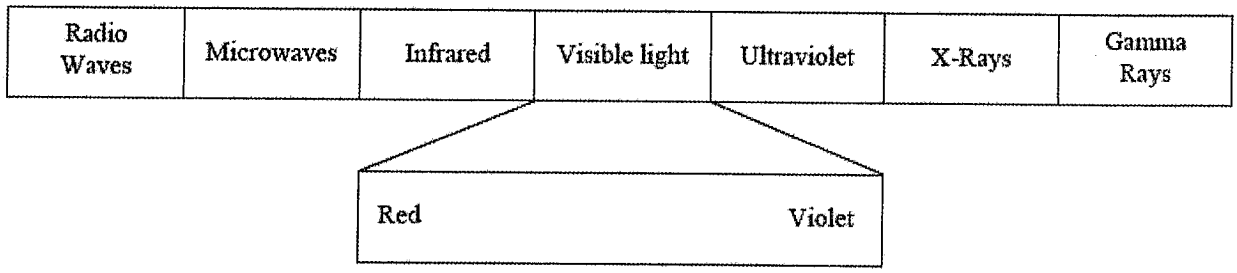
After a while, the listener realises that the pitch of the sound note is higher.

4.3.2 Has the FREQUENCY or the AMPLITUDE of the sound changed? Give a reason. (2)

[7]

QUESTION 5

The diagram below represents the electromagnetic spectrum.



5.1 Name the type of electromagnetic radiation that:

5.1.1 has the longest wavelength (1)

5.1.2 is used in the treatment of some cancers (1)

5.1.3 is used to send a signal from the remote control to the Television. (1)

5.2 A photon of electromagnetic radiation has a wavelength of 400 nm.

5.2.1 Define a photon. (1)

5.2.2 Calculate the frequency of this radiation. (3)

5.2.3 Determine the energy of a photon of this radiation. (3)
[10]

TOTAL MARKS: [50]

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*

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

GRADE 10 AND 11

GREENBURY

Education

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PHYSICAL SCIENCES P1 (PHYSICS)

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MEMORANDUM

MARCH 2017

NATIONAL SENIOR CERTIFICATE

GRADE 10

MARKS: 50

N.B. This memorandum consists of 4 pages.

QUESTION 1

1.1 C ✓✓ (2)

1.2 A ✓✓ (2)

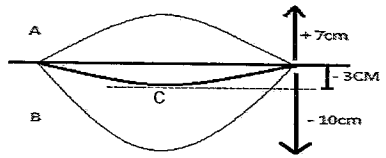
1.3 C ✓✓ (2)
[6]

QUESTION 2

2.1 A single disturbance in a medium. ✓✓ (2)

2.2 The algebraic sum of the amplitudes of two pulses that occupy the same space at the same time. ✓✓ ℓ or 0 (2)

2.3



Pulse A	✓
Pulse B	✓
Pulse C or -3cm	✓

(3)

2.4 Destructive interference. ✓ (1)

2.5 (+7) + (–10) = –3 cm ✓ (1)

2.6 +7cm ✓ to the left ✓ (2)
[11]

QUESTION 3

3.1 Transverse wave ✓ (1)

3.2

3.2.1 H ✓ (1)

3.2.2 J ✓ (1)

3.2.3 K ✓ (1)

3.2.4 B ✓ (1)

3.3 Upwards ✓ (1)

3.4 2,5 wave cycles ✓ (1)

3.5

3.5.1 f = 5 Hz ✓ (1)

3.5.2 $v = f \times \lambda$ ✓

$= 5$ ✓ $\times 0,075$ ✓

$= 0,375\ m.s^{-1}$ ✓ (4)

3.5.3 $v = \frac{\Delta x}{\Delta t}$ ✓

$0,375$ ✓ $= \frac{\Delta x}{4 \times 60}$ ✓

$\Delta x = 90$ m ✓ (4)

[16]

Please Turn Over

QUESTION 4

4.1 Longitudinal wave. ✓ (1)

4.2

4.2.1 Compression ✓ (1)

4.2.2 Wavelength ✓ (1)

4.3

4.3.1 $T = \frac{1}{f}$ ✓

$= \frac{1}{440}$

$= 2,27 \times 10^{-3}$ s ✓ (2)

4.3.2 Frequency ✓
The higher the frequency the higher the pitch. ✓ (2)

[7]

QUESTION 5

5.1

5.1.1 Radio waves ✓ (1)

5.1.2 Gamma rays or x-rays ✓ (1)

5.1.3 Infrared ✓ (1)

5.2

5.2.1 packet of energy found in light. ✓ (1)

5.2.2 $v = f \times \lambda$ ✓

$3 \times 10^8 = f \times 400 \times 10^{-9}$ ✓

$f = 7,5 \times 10^{14}$ Hz ✓ (3)

5.2.3 Mark positively from 5.2.2 **OR**

$E = hf$ ✓

$= 6,63 \times 10^{-34} \times 7,5 \times 10^{14}$ ✓

$= 4,97 \times 10^{-19}$ J ✓

$E = \frac{hc}{\lambda}$ ✓

$= \frac{6,63 \times 10^{-34} \times 3 \times 10^8}{400 \times 10^{-9}}$ ✓

$= 4,97 \times 10^{-19}$ J ✓

(3)

[10]

TOTAL MARKS: 50

Please Turn Over