education
Department: Education
GAUTENG PROVINCE

Gauteng Department of Education

Johannesburg North District (D10)

GRADE 10

PHYSICAL SCIENCES
CONTROL TEST
17 March 2023

MARKS: 75 **TIME: 1½ Hours**

INSTRUCTIONS AND INFORMATION

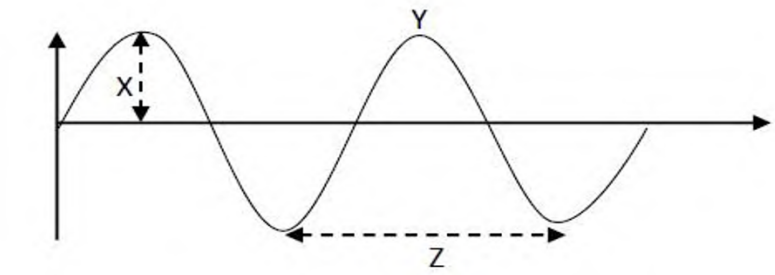
1. All questions are compulsory.
2. You may use an approved scientific calculator.
3. All information sheets, with formulae are included at the end of the paper.
4. Number the questions as they are numbered in the question paper.
5. Answer may be rounded off to 2 decimal places where possible.
6. Write neatly and legibly.

This question paper consists of 9 pages and 1 page information sheet.

QUESTION 1: MULTIPLE-CHOICE QUESTIONS

Four options are provided as possible answers to the following questions. Each question has only ONE correct answer. Write only the letter (A – D) next to the question number (1.1 – 1.5) in the answer sheet

1.1 The diagram below shows a transverse wave.



Which ONE of the following represents X, Y and Z respectively?

A Amplitude, Crest, Wavelength

B Amplitude, Crest, Frequency

C Crest, Wavelength, Amplitude

D Frequency, Crest, Wavelength (2)

1.2 In which ONE of the following do sound waves NOT travel?

A Air

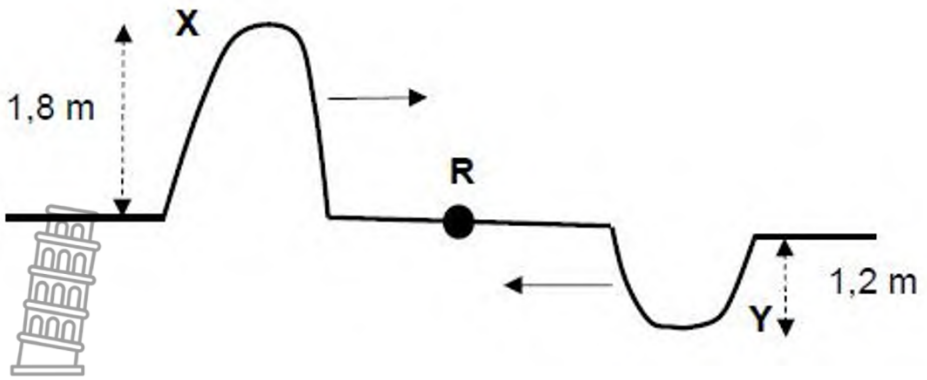
B Liquids

C Solids

D Vacuum (2)

1.3 Two pulses **X** and **Y** move towards each other at the same speed. The amplitude of pulse **X** is 1,8 m and the amplitude of **Y** is 1,2 m. The pulses

meet at point R.

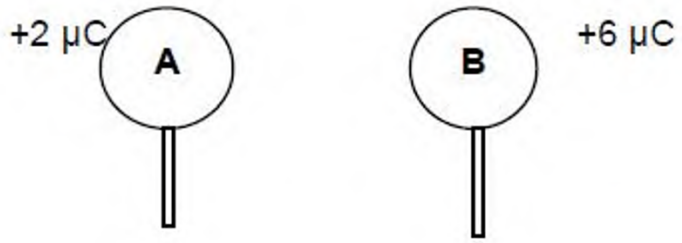


When the two pulses in the diagram meet at point **R**, the type of interference and the resultant amplitude of the disturbance will be …

	TYPE OF INTERFERENCE	AMPLITUDE (m)
A	Constructive	0,6
B	Constructive	3,0
C	Destructive	0,6
D	Destructive	3,0

(2)

1.4 Two identical spheres A and B placed on insulated stands, carry charges of +2 µC and +6 µC, respectively as shown below.



When the spheres are brought into contact, in which direction do electrons move?

A From **A** to **B**

B From **B** to **A**

C No movement as both spheres are positively charged

D No movement, electrons remain in A (2)

1.5 The unit of measurement of electric current is ampere (A). 1 A is equivalent

to ...

A $1\ J.C^{-1}$

B $1\ C.s^{-1}$

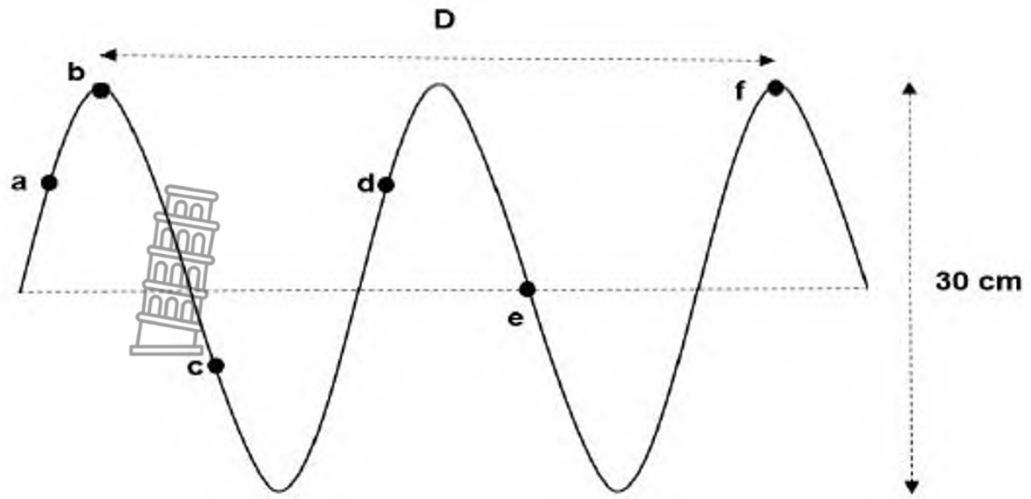
C $1\ s.C^{-1}$

D $1\ C.J^{-1}$

(2)
[10]

QUESTION 2

2.1 The figure below shows transverse wave motion. The period of the wave is 0,2 s.



2.1.1 Define the term *frequency.* (2)

Write down:

2.1.2 TWO pairs of points which are in phase. (2)

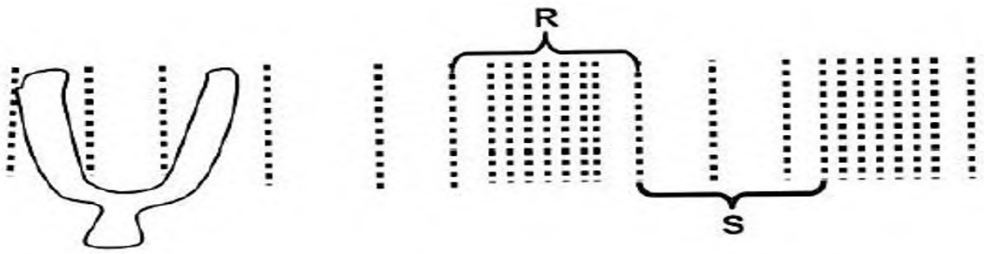
2.1.3 The amplitude of the wave (2)

Calculate the:

2.1.4 Frequency of the wave (3)

2.1.5 Speed of the wave if the distance **D** equals to 3 metres. (4)

2.2 A tuning fork with a frequency of 100 Hz, created a sound wave as illustrated in the sketch below.



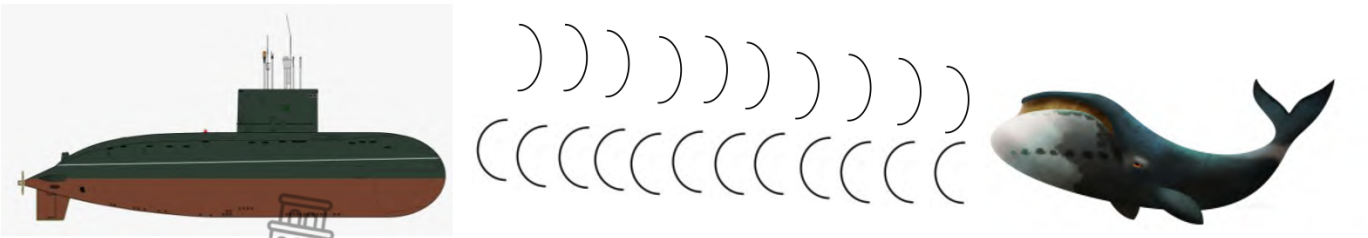
2.2.1 Define a longitudinal wave (2)

2.2.2 Name the parts labelled **R** and **S**. (2)

2.2.3 Calculate the period of the sound wave produced by the fork. (2)

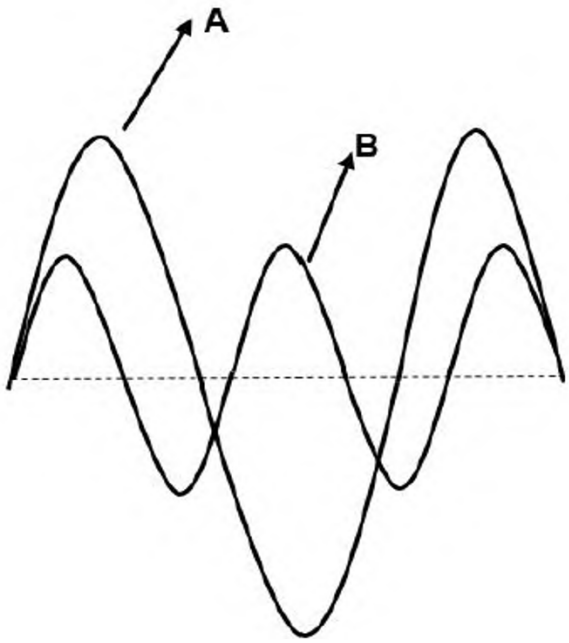
2.3 A group of scientists' on-board submarine want to locate a whale. A signal generator on a submarine sends a wave signal under water and a detector detects a wave reflected from the whale 3 seconds later. The speed of sound in

water is 1 480 m.s^{-1}.



Calculate how far in kilometres is the whale from the submarine. (4)

2.4 The diagram shows TWO sound waves measured for the same time interval.



2.4.1 Which ONE of the sound waves (A or B) has a HIGHER pitch? Explain the answer (3)

2.2.2 Which ONE of the sound waves (A or B), is LOUDER? (1)
[27]

QUESTION 3

The three appliances which emit different types of electromagnetic radiation are shown below.

Television remote control

Red laser pointer

Microwave oven

3.1 State the type of electromagnetic radiation that is emitted by:

3.1.1 Television remote control (1)

3.1.2 Laser pointer (1)

3.2 A television remote control emits photons with a wavelength of 320 THz.

3.2.1 Define the term *photon*. (2)

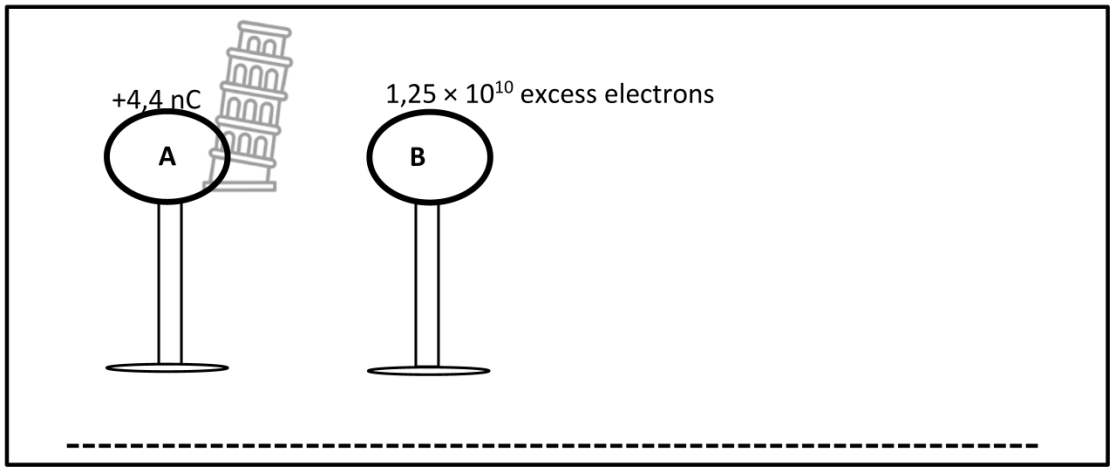
3.2.2 Calculate the energy of a photon emitted by television remote control. (4)

3.3 A microwave oven emits the waves with 2×10^{-23} J of energy. Calculate the wavelegth of these microwaves. (4)

[12]

QUESTION 4

Two identical metal spheres **A** and **B** are placed on insulated stands. Spheres **A** carries charge of +4,4 nC and sphere B has $1,25 \times 10^{10}$ excess electrons.



4.1 State the principle of charge quantisation. (2)

4.2 Calculate the charge on sphere B. (3)

4.3 Write down the NAME of the type of FIELD around the charged spheres. Choose from MAGNETIC, ELECTRIC or GRAVITATIONAL. (1)

4.4 Give a reason why the charged spheres are placed on insulated stands. (2)

4.5 The spheres are brought into contact and then separated as shown below.

CONTACT SEPARATED

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

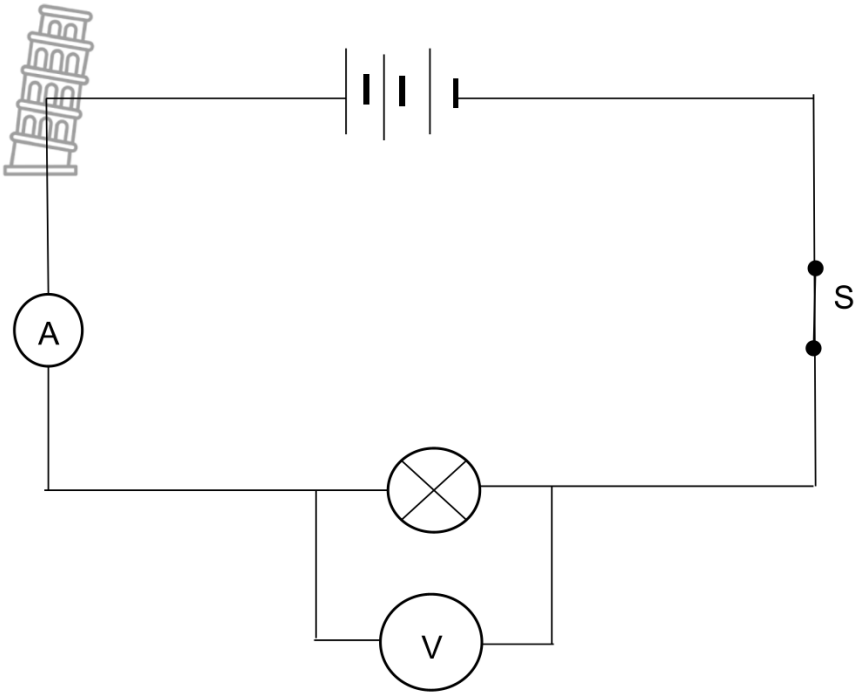
4.5.2 Which sphere loses electrons when the two spheres come into contact? (1)

4.5.3 Calculate how many electrons transferred from one sphere to the other when they come into contact. (5)

[16]

QUESTION 5

The circuit diagram below consists of a battery, switch, ammeter and a glowing light bulb connected in series. A voltmeter, V is connected across the light bulb.



5.1 Define the following terms:

5.1.1 *Potential difference* (2)

5.1.2 *Electric current* (2)

5.2 The reading on ammeter, A is 0,6 A. 486 J of energy is transferred to a light bulb in 3 minutes. Calculate the reading on voltmeter, V (6)

[10]

DATA FOR PHYSICAL SCIENCES GRADE 10

PAPER 1 (PHYSICS)

TABLE 1: PHYSICAL CONSTANTS

NAME	SYMBOL	VALUE
Speed of light in a vacuum	c	$3,0 \times 10^{8}$ m·s^{-1}
Planck's constant	h	$6,63 \times 10^{-34}$ J.s
Charge on electron	e^-	-1.6×10^{-19} C

TABLE 2: FORMULAE

WAVES, LIGHT AND SOUND

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

ELECTRICITY AND MAGNETISM

$I = \frac{Q}{\Delta t}$	$V = \frac{W}{Q}$	$R = \frac{V}{I}$	$Q = \frac{Q_1 + Q_2}{2}$
$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \ldots$	$R_s = R_1 + R_2 + \ldots$	$n = \frac{Q}{e}$	