education
Department: Education
GAUTENG PROVINCE

Gauteng Department of Education

GRADE 10

PHYSICAL SCIENCES CONTROL TEST MARCH 2025

MARKS : 100

TIME : 2 Hours

This paper consists of 10 pages including the cover page and one formula sheet.

INSTRUCTIONS AND INFORMATION

1. This question paper consists of TWO sections:
   SECTION A: MULTIPLE CHOICE [10]
   SECTION B: STRUCTURED QUESTIONS [65]

2. Answer ALL questions in both sections.

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 NOT use a programmable calculator.

6. You may use appropriate mathematical instruments.

7. You are advised to use the attached DATA SHEETS

8. Show ALL formulae and substitutions in ALL calculations.

9. Round off your final numerical answers to MINIMUM OF TWO decimal places.

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

11. Write neatly and legibly.

SECTION A

QUESTION 1: MULTIPLE-CHOICE QUESTION

Four possible options are provided as answers to the following questions. Each question has only ONE correct answer. Choose the answer and write it next to the question number (1.1 – 1.5) on your answer book (i.e. 1.6 E)

1.1 The lower limit of frequency that can be heard by the average human is about:

A. 2 Hz

B. 20 Hz

C. 200 Hz

D. 2 000 Hz

1.2 Which electromagnetic wave is responsible for causing sunburns?

A. Radio waves

B. Infrared

C. Visible light

D. Ultraviolet

1.3 The energy of a photon of light with a wavelength of 660 nm is?

A. $3.0 \times 10^{-26}\ J$

B. $3.0 \times 10^{-17}\ J$

C. $3.0 \times 10^{-19}\ J$

D. $3.0 \times 10^{-39}\ J$

1. 4 Which electromagnetic wave has the highest energy and is commonly used in cancer treatment (radiation therapy)?

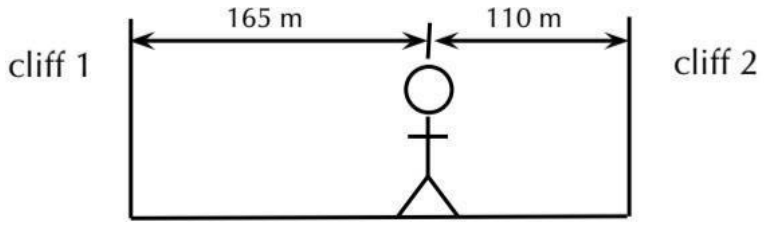
A. Radio waves

B. Microwaves

C. Gamma rays

D. Infrared

1.5 A man stands between two cliffs as shown in the diagram and claps his hands once.



Assuming that the velocity of sound is 330 m·s−1, what will be the time interval between the two loudest echoes?

A. $t = 2/3$ s

B. $t = 1/6$ s

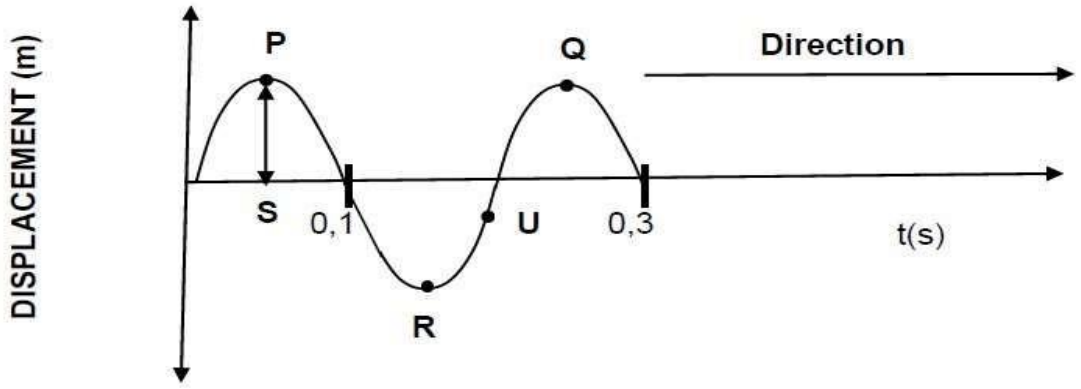
C. $t = 1$ s

D. $t = 1/3$ s

[10]

QUESTION 2 (Start on a new page.)

The diagram below shows a transverse wave travelling to the right with a speed of 0,25 $m.s^{-1}$.



2.1 Write down the letters of TWO points that are IN PHASE. (1)

2.2 In which direction is point **U** moving? Write only UPWARDS or DOWNWARDS. (1)

2.3 What does the length **SP** represent? (1)

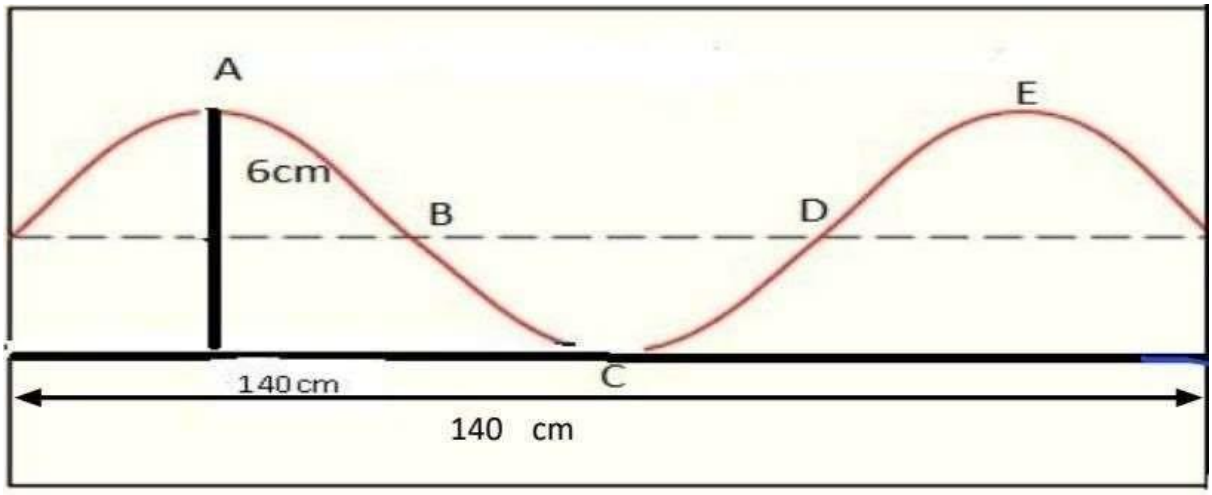
2.4 Provide a suitable label for **R**. (1)

2.5 Calculate the frequency of the wave. (3)

2.6 Calculate the distance between P and Q. (2)
[9]

QUESTION 3 (Start on a new page)

Study the diagram below and answer the questions that follow:



3.1 Define the following terms:

3.1.1 Frequency. (2)

3.1.2 Transverse wave. (2)

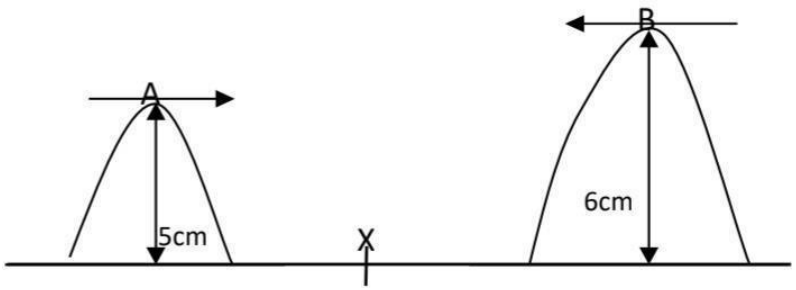
3.2 Use the diagram and the information given to determine values for:

3.2.1 Amplitude. (2)

3.2.2 Wavelength. (2)

3.2.3 If the speed of the waves is 18 $m.s^{-1}$, calculate the frequency of the waves. (3)

3.2.4 Calculate the period of the waves. (2)



3.3 Two pulses travel towards other as shown in the diagram above:

3.3.1 Draw the shape of the resulting pulse as the two pulses A and B cross each other at point X. Indicate the amplitude of the resulting pulse. (3)

3.3.2 Which property of waves is illustrated in 3.3.1 above? (1)

3.3.3 Name and describe the principle used in 3.3.1. (3)

[20]

Question 4 (Start on a new page)

Dolphins communicate through the emission and reception of sounds. A young dolphin was separated from its mother and started whistling at a frequency of 130 kHz to call her. The speed of sound in seawater is 1 480 $m \cdot s^{-1}$.

4.1 Explain the term ultrasound. (2)

4.2 Calculate the wavelength of the young dolphin's whistle. (3)

4.3 Another dolphin hears the distress call of the young dolphin 2 s later. How far apart are the two dolphins from each other? (4)

4.4 The speed of sound in air is 340 $m \cdot s^{-1}$. Briefly explain why the speed of sound in air is different from the speed of sound in seawater. (2)

4.5 Describe how dolphins use echolocation to hunt their prey. (3)

[14]

Question 5

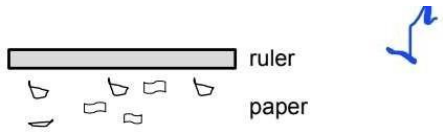
A neutral plastic ruler becomes charged when it is rubbed with a woolen cloth. After rubbing, the ruler has a charge of -3,5 x 10^{-6} C.

5.1 State the law of conservation of charge. (2)

5.2 Does the ruler GAIN or LOSE electrons? (1)

5.3 Calculate the number of electrons transferred during the process of rubbing. (3)

5.4 The charged ruler is now brought closer to pieces of paper. The pieces of paper are attracted to the ruler, as shown below.



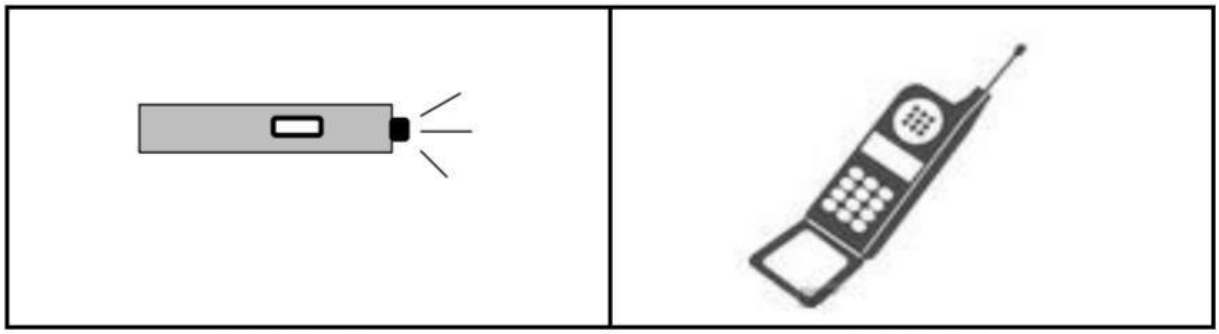
5.4.1 Explain why the pieces of paper are attracted to the ruler. (3)

5.4.2 Name ONE application of electrostatics in our daily lives. (1)

[10]

QUESTION 6 (Start on a new page)

Consider a laser pointer and cellphone, as shown below.



Laser pointer Cellphone

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

6.1.1 Laser pointer. (1)

6.1.2 Cellphone. (1)

6.2 A laser pointer uses red light photons with a wavelength of 620 nm.

6.2.1 Define the term photon. (2)

6.2.2 Calculate the energy of a red light photon. (5)

6.2.2 Refer to the answer to QUESTION 6.2.2. Explain why it is very dangerous to shine a laser pointer into a person's eyes. (2)

[12]

[TOTAL: 75]

GOOD LUCK!!!

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* $E_k = \frac{1}{2}mv^2$
$E_M = E_k + E_p$. OR $E_M = K + U$	

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

$v = f\lambda$	$T = \frac{1}{f}$
$E = hf$ or/*of* $E = h\frac{c}{\lambda}$	