

KWAZULU-NATAL PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 10

**PHYSICAL SCIENCES
COMMON TEST
MARKING GUIDELINE
MARCH 2024**

MARKS: 100

DURATION: 2 hours

This marking guideline consists of 6 pages.



QUESTION 1:

- 1.1 C ✓✓ (2)
 1.2 B ✓✓ (2)
 1.3 C ✓✓ (2)
 1.4 A ✓✓ (2)
 1.5 D ✓✓ (2)
[10]

QUESTION 2

- 2.1 Principle of superposition. ✓ The algebraic sum of the amplitudes of two pulses ✓ that occupy the same space at the same time. ✓ (3)

OPTION 1

- 2.2 Let the amplitude of Pulse A = x
 The amplitude Pulse B = $-3x$
 $x + (-3x) \checkmark = -6 \checkmark$
 $x = 3 \text{ cm}$
 Amplitude of Pulse B = $3x$
 $= 3(3)$
 $= 9 \text{ cm} \checkmark$

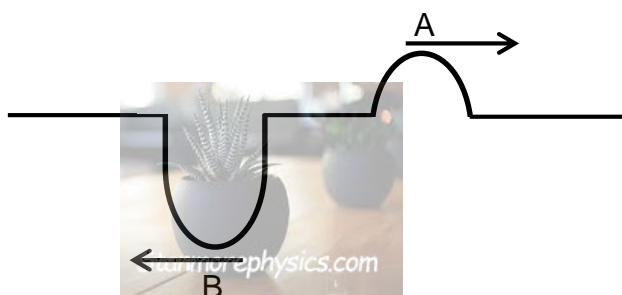
OPTION 2

- Let the amplitude of Pulse A = $\frac{1}{3}x$
 The amplitude Pulse B = $-x$
 $\frac{1}{3}x + (-x) \checkmark = -6 \checkmark$
 $x = 9 \text{ cm} \checkmark$

- 2.3 5 cm ✓ (1)

2.4 Criteria

- Pulse A drawn as crest and Pulse B drawn as trough with labels ✓
 Pulse B has a greater amplitude than A ✓
 Pulse B drawn left of A ✓ (3)

**[10]**

QUESTION 3

3.1

3.1.1

Longitudinal ✓

(1)

3.1.2

R – Compression ✓

(2)

S – Rarefaction ✓

3.1.3

$$\lambda = \frac{0,3}{2} \quad \checkmark$$

$$= 0,15 \text{ m} \quad \checkmark$$

(2)

3.1.4

POSITIVE MARKING FROM QUESTION 3.1.3**OPTION 1****OPTION 2**

$$v = f \times \lambda \quad \checkmark$$

$$1,5 = f \times 0,15 \quad \checkmark$$

$$f = 10 \text{ Hz}$$

$$T = \frac{1}{f}$$

$$T = \frac{1}{10}$$

$$T = 0,1 \text{ s} \quad \checkmark$$

$$\text{speed} = \frac{\text{distance}}{\text{time}} \quad \checkmark$$

$$1,5 \checkmark = \frac{0,15 \checkmark}{\text{time}}$$

$$T = 0,1 \text{ s} \quad \checkmark$$

(4)

3.2

3.2.1

0,1 m ✓

(1)

3.2.2

(point) F ✓

(1)

3.2.3

The number of wave pulses per second. ✓✓

(2)

3.2.4

$$T = \frac{1}{f}$$

$$= \frac{1}{2} \quad \checkmark$$

$$= 0,5 \text{ s}$$

$$\text{time} = 1,5 \checkmark \times 0,5 \checkmark$$

$$= 0,75 \text{ s} \quad \checkmark$$

(4)

3.2.5

OPTION 1**OPTION 2****POSITIVE MARKING FROM Q 3.2.4**

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

$$\text{speed} = \frac{1,2 \checkmark}{0,75 \checkmark}$$

$$= 1,6 \text{ m.s}^{-1} \quad \checkmark$$

$$\lambda = \frac{1,2}{1,5} = 0,8 \text{ m}$$

$$v = f \times \lambda$$

$$= 2 \checkmark \times 0,8 \checkmark$$

$$= 1,6 \text{ m.s}^{-1} \quad \checkmark$$

(3)

QUESTION 4

4.1



4.1.1

A reflection of sound waves. ✓✓

(2)

4.1.2

OPTION 1

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

$$340 \checkmark = \frac{\text{distance}}{2 \checkmark}$$

$$\text{Distance} = 680 \text{ m}$$

$$X + (X - 6) = 680 \checkmark$$

$$X = 343 \text{ m} \checkmark$$

OPTION 2
 $2X = \text{Distance of bat in 2s} + \text{distance of echo in 2s}$

$$2X = 6 + (2 \checkmark \times 340 \checkmark) \checkmark$$

$$X = 343 \text{ m} \checkmark$$

(4)

4.1.3

$$v = f \times \lambda$$

$$340 \checkmark = f \times 7,56 \times 10^{-3} \checkmark$$

$$f = 44\,973,5 \text{ Hz} \checkmark$$

The sound will not be heard; its frequency is greater than 20kHz. ✓

(4)

4.2

4.2.1

$$c = f \times \lambda \checkmark$$

$$3 \times 10^8 = f \times 7,5 \times 10^{-5} \checkmark$$

$$f = 4 \times 10^{12} \text{ Hz} \checkmark$$

(3)

4.2.2

$$E = h \times f \checkmark$$

$$= 6,63 \times 10^{-34} \times 8 \times 10^{15} \checkmark$$

$$= 5,304 \times 10^{-18} \text{ J} \checkmark$$

(3)

4.2.3

RADIATION 1 ✓

A higher frequency will result in greater energy of the photon OR

Energy of photon is directly proportional to the frequency. ✓

A greater energy of the photon increases the penetrating ability ✓

(3)

4.2.4

INCREASE ✓

The wavelength is inversely proportional to the frequency. ✓

(2)



QUESTION 5

5.1



5.1.1 Electrons will be transferred ✓ from the glass rod to the silk cloth ✓ (2)

5.1.2 The partial or complete polar separation of positive and negative electric charge in a system. ✓✓ (2)

5.1.3 Left ✓ (1)

5.2

5.2.1 $Q = n \times q_e$ ✓
 $-4 \times 10^{-6} = n \times 1,6 \times 10^{-19}$ ✓
 $n = 2,5 \times 10^{13}$ electrons ✓ (3)

5.2.2 A to B ✓ (1)

5.2.3 The net charge of an isolated system remains constant during any physical process ✓✓ (2)

5.2.4 $Q = \frac{Q_1 + Q_2}{2}$ ✓

$Q = \frac{-4 \times 10^{-6} + 8 \times 10^{-6}}{2}$ ✓
 $= 2 \times 10^{-6} \text{ C}$ ✓ (3)

5.2.5 $Q = \frac{Q_1 + Q_2}{2}$

$Q = \frac{-6 \times 10^{-6} + 2 \times 10^{-6}}{2}$ ✓

$Q_B = -2 \times 10^{-6} \text{ C}$

$n = \frac{\Delta Q}{q_e}$ ✓

$= \frac{-2 \times 10^{-6} - 2 \times 10^{-6}}{-1,6 \times 10^{-19}}$ ✓

$= 2,5 \times 10^{13}$ electrons ✓

OR

$= \frac{-2 \times 10^{-6} - (-6 \times 10^{-6})}{1,6 \times 10^{-19}}$ ✓
 $= 2,5 \times 10^{13}$ electrons ✓ (5)

**[19]**

QUESTION 6

6.1 The energy transferred per unit charge. ✓✓ (2)

6.2 V_2 ✓ (1)

6.3 $V = IR$ ✓
 $= 2 \checkmark \times (4+2+6) \checkmark$
 $= 24 \text{ V} \checkmark$ (4)

6.4 **POSITIVE MARKING FROM QUESTION 6.3**

6.4.1 $V = IR$
 $V_{4\Omega+2\Omega} = 3 \checkmark \times (4+2) \checkmark$
 $= 18 \text{ V}$
 $V_1 = 24 - 18 \checkmark$
 $= 6 \text{ V} \checkmark$ (4)

6.4.2 **OPTION 1**

$$\begin{aligned} V_{6\Omega} &= IR \\ 6 &= I \times 6 \checkmark \\ I_{6\Omega} &= 1 \text{ A} \\ I_{\text{Bulb}} &= 3 - 1 \checkmark \\ &= 2 \text{ A} \end{aligned}$$

$$\begin{aligned} V_{\text{Bulb}} &= IR \checkmark \\ 6 &= 2 \times R \checkmark \\ R_{\text{Bulb}} &= 3\Omega \checkmark \end{aligned}$$

6.4.3 **OPTION 1**

$$\begin{aligned} Q &= I \Delta t \\ &= 2 \times 60 \checkmark \\ &= 120 \text{ C} \\ W &= V Q \checkmark \\ &= 6 \times 120 \checkmark \\ &= 720 \text{ J} \checkmark \end{aligned}$$

OPTION 2

$$\begin{aligned} V_p &= IR \\ 6 &= 3 \times R_p \checkmark \\ R_p &= 2\Omega \\ \frac{1}{R_p} &= \frac{1}{R_1} + \frac{1}{R_2} \checkmark \\ \checkmark \frac{1}{2} &= \frac{1}{R_{\text{Bulb}}} + \frac{1}{6} \checkmark \\ R_{\text{Bulb}} &= 3\Omega \checkmark \end{aligned}$$

ACCEPT

$$\begin{aligned} W &= VI\Delta t \checkmark \\ &= 6 \checkmark \times 2 \times 60 \checkmark \\ &= 720 \text{ J} \checkmark \end{aligned}$$

(4)

[20]

TOTAL: 100