Downloaded from SEE academy: www.seeacademy.coza

4.2 Listed below is information for two different types of electromagnetic radiations.

Radiation 1: frequency of 8×10^{15} Hz
Radiation 2: wavelength of $7,5 \times 10^{-5}$ m

4.2.1 Calculate the frequency of Radiation 2. (3)

4.2.2 Determine the energy of a photon of Radiation 1. (3)

4.2.3 Which radiation has a higher penetrating ability?
Choose from RADIATION 1 or RADIATION 2.
Give a reason for the answer. (3)

4.2.4 The frequency of Radiation 1 is halved. Will the wavelength of this radiation INCREASE, DECREASE or REMAIN THE SAME?
Give a reason for the answer. (2)

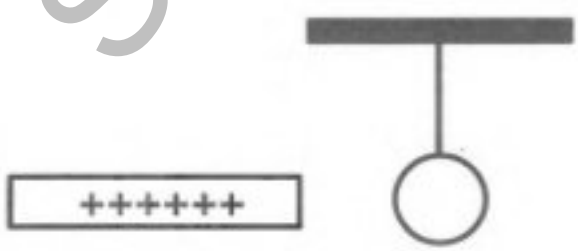
[21]

QUESTION 5 (Start on a new page.)

5.1 An uncharged glass rod is rubbed with a silk cloth resulting in the rod becoming positively charged.

5.1.1 Explain how the rod becomes positively charged. (2)

In the diagram below, the positively charged rod is now held to the left of a neutral sphere suspended by a light insulated string, causing the sphere to move.



5.1.2 Define the term *polarization* in words. (2)

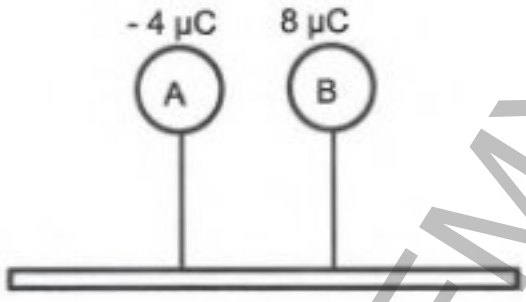
5.1.3 Will the sphere move to the LEFT or to the RIGHT? (1)

SEE ACADEMY

Copyright reserved

Downloaded from SEE academy: www.seeacademy.coza

5.2 A and B are two identical spheres, mounted on insulated stands, carrying charges of – 4 µC and 8 µC respectively.



5.2.1 Determine the number of excess electrons on sphere A. (3)

The spheres are allowed to touch and are then separated.

5.2.2 In which direction will electrons flow when the spheres are in contact with each other? Choose from: A to B OR B to A (1)

5.2.3 State the *principle of conservation of charge* in words. (2)

5.2.4 Calculate the new charge on sphere A. (3)

A third sphere, C, carrying a charge of – 6 µC, is now brought into contact with sphere B.

5.2.5 Calculate the number of electrons transferred when these spheres are in contact with each other. (5)

[19]

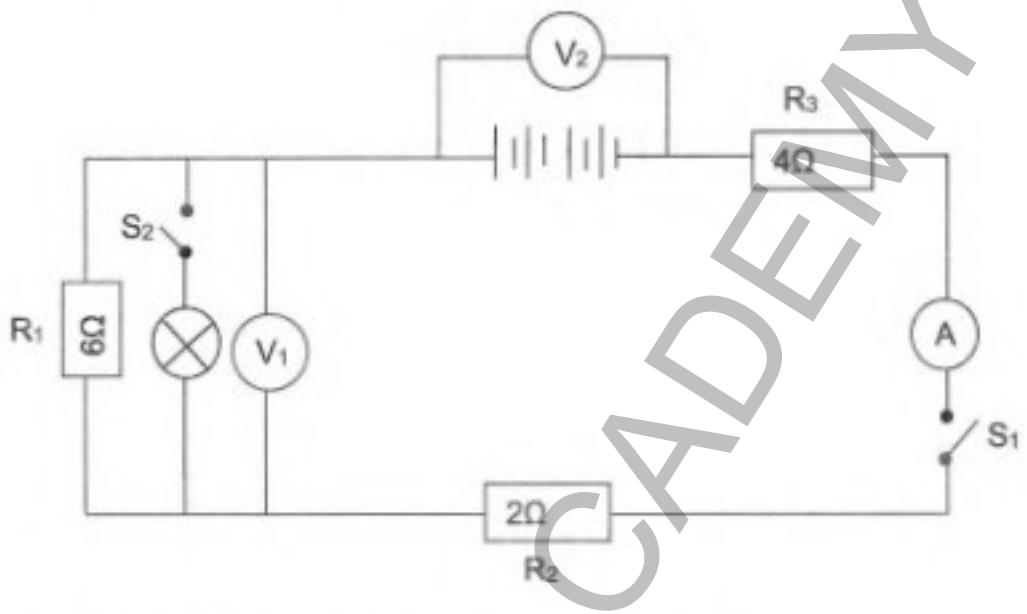
SEE ACADEMY

Copyright reserved

Downloaded from SEE academy: www.seeacademy.coza

QUESTION 6 (Start on a new page)

A battery consisting of 4 identical cells of unknown emf is connected to three resistors and a bulb, as shown in the circuit diagram below. The connecting wires and the battery have negligible resistance.



6.1 Define the *term potential difference* in words. (2)

6.2 Which voltmeter/s will provide a NON-ZERO reading when both switches S_1 and S_2 are opened? (1)

Switch S_1 is now closed while S_2 remains open. The ammeter reads 2A.

6.3 Calculate the reading on voltmeter V_2. (4)

Both switches S_1 and S_2 are now closed. The ammeter reads 3A.

6.4 Calculate the :

6.4.1 Reading on voltmeter V_1 (4)

6.4.2 Resistance of the bulb. (5)

6.4.3 Energy transferred to the bulb in 1 minute (4)
[20]

TOTAL: 100

SEE ACADEMY

Copyright reserved

Downloaded from SEE academy: www.seeacademy.coza

DATA FOR PHYSICAL SCIENCES GRADE 10
PAPER 1 (PHYSICS)

TABLE 1: PHYSICAL CONSTANTS

NAME	SYMBOL	VALUE
Acceleration due to gravity	g	9,8 $m.s^{-2}$
Speed of light in a vacuum	c	$3,0 \times 10^{8}$ $m \cdot s^{-1}$
Planck's constant	h	$6,63 \times 10^{-34}$ J·s
Charge on electron	q_e	$-1,6 \times 10^{-19}$ C
Electron mass	m_e	$9,11 \times 10^{-31}$ kg

TABLE 2: FORMULAE

WAVES, SOUND AND LIGHT

$v = f\lambda$ or $c = f\lambda$	$T = \frac{1}{f}$
E = hf	$E = \frac{hc}{\lambda}$

ELECTROSTATICS

$Q = n \times q_e$	$Q = \frac{Q1 + Q2}{2}$

ELECTRIC CIRCUITS

$Q = I \times \Delta t$	$\frac{1}{Rp} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots$
$R_s = R_1 + R_2 + \cdots$	$V = \frac{W}{Q}$
V = I x R	

SEE ACADEMY

Copyright reserved

Downloaded from SEE academy: www.seeacademy.coza

KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 10

PHYSICAL SCIENCES
COMMON TEST
MARKING GUIDELINE
MARCH 2024

SEE ACADEMY

MARKS: 100

DURATION: 2 hours

This marking guideline consists of 6 pages.

Copyright reserved

Downloaded from SEE academy: www.seeacademy.coza

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

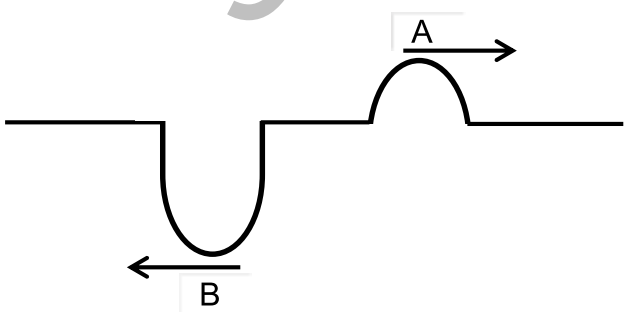
2.2

Let the amplitude of Pulse A = x	Let the amplitude of Pulse A = ⅓x
The amplitude Pulse B = - 3x	The amplitude Pulse B = - x
x + (-3x) ✓= -6 ✓	⅓x + (-x) ✓= -6 ✓
x = 3 cm	x = 9 cm ✓
Amplitude of Pulse B = 3x	
= 3(3)	
= 9cm ✓	

(3)

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]

SEE ACADEMY

Downloaded from SEE academy: www.seeacademy.coza

QUESTION 3

3.1

3.1.1 Longitudinal ✓ (1)

3.1.2 R – Compression ✓ (2)
S – Rarefaction ✓

3.1.3 $\lambda = \frac{0,3}{2}$ ✓
$= 0,15$ m ✓ (2)

3.1.4 **POSITIVE MARKING FROM QUESTION 3.1.3**

OPTION 1

$v = f \times \lambda$ ✓
$1,5 = f \times 0,15$ ✓
$f = 10$ Hz
$T = \frac{1}{f}$
$T = \frac{1}{10}$ ✓
$T = 0,1$ s ✓

OPTION 2

$\text{speed} = \frac{\text{distance}}{\text{time}}$ ✓
$1,5$ ✓$= \frac{0,15}{\text{time}}$ ✓
$T = 0,1$ s ✓

(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 $T = \frac{1}{f}$
$= \frac{1}{2}$ ✓
$= 0,5$ s
time = 1,5 ✓x 0,5 ✓
$= 0,75$ s ✓ (4)

3.2.5 **POSITIVE MARKING FROM Q 3.2.4**

OPTION 1

$\text{speed} = \frac{\text{distance}}{\text{time}}$
$\text{speed} = \frac{1,2}{0,75}$ ✓
$= 1,6$ m.s^{-1} ✓

OPTION 2

$\lambda = \frac{1,2}{1,5} = 0,8\ m$
$v = f \times \lambda$
$= 2$ ✓ x 0,8✓
$= 1,6$ m.s^{-1} ✓

(3)

SEE ACADEMY

Downloaded from SEE academy: www.seeacademy.coza

[20]

QUESTION 4

4.1

4.1.1 A reflection of sound waves. ✓✓ (2)

4.1.2 **OPTION 1**

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

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

Distance = 680 m

X + (X – 6) = 680 ✓

X = 343 m ✓

OPTION 2

2X = Distance of bat in 2s + distance of echo in 2s

2X = 6 +(2✓ x 340✓) ✓

X = 343 m ✓ (4)

4.1.3 $v = f \times \lambda$

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

f = 44 973,5 Hz ✓

The sound will not be heard; its frequency is greater than 20kHz. ✓ (4)

4.2

4.2.1 $c = f \times \lambda$ ✓

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

$f = 4 \times 10^{12}$ Hz ✓ (3)

4.2.2 $E = h \times f$ ✓

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

$= 5{,}304 \times 10^{-18}$ J ✓ (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)

[21]

SEE ACADEMY

Downloaded from SEE academy: www.seeacademy.coza

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 $Q = n \times q_e$ ✓

$-4\times10^{-6} = n \times 1,6\times10^{-19}$ ✓

$n = 2,5 \times 10^{13}$ 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 $Q = \frac{Q1 + Q2}{2}$ ✓

$Q = \frac{-4\times10^{-6} + 8\times10^{-6}}{2}$ ✓

$= 2 \times 10^{-6}$ C ✓ (3)

5.2.5 $Q = \frac{Q1 + Q2}{2}$

$Q = \frac{-6\times10^{-6} + 2\times10^{-6}}{2}$ ✓

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

$n = \frac{\Delta Q}{q_e}$ ✓

$= \frac{-2\times10^{-6} - 2\times10^{-6}}{-1,6\times10^{-19}}$ ✓ ✓

$= 2,5 \times 10^{13}$ electrons ✓

OR

$= \frac{-2\times10^{-6} - (-6\times10^{-6})}{1,6\times10^{-19}}$ ✓ ✓

$= 2,5 \times 10^{13}$ electrons ✓ (5)

[19]

SEE ACADEMY

Downloaded from SEE academy: www.seeacademy.coza

QUESTION 6

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

6.2 V_2 ✓ (1)

6.3 V = IR ✓
= 2 ✓ x (4+2+6) ✓
= 24 V✓ (4)

6.4 **POSITIVE MARKING FROM QUESTION 6.3**

6.4.1 V = IR
$V_{4\Omega+2\Omega}$ = 3 ✓ x (4+2) ✓
= 18 V
V_1 = 24 – 18 ✓
= 6V ✓ (4)

6.4.2

OPTION 1	**OPTION 2**
$V_{6\Omega}$ = IR	V_p = IR
6 = I x 6 ✓	6 = 3 x R_p ✓
$I_{6\Omega}$ = 1A	R_p = 2Ω
I_{Bulb} = 3 – 1 ✓	$\frac{1}{R_P}=\frac{1}{R_1}+\frac{1}{R_2}$ ✓
= 2A	✓ $\frac{1}{2}=\frac{1}{R_{Bulb}}+\frac{1}{6}$ ✓
V_{Bulb} = IR ✓	R_{Bulb} = 3Ω ✓
6 = 2 x R ✓	
R_{Bulb} = 3Ω ✓	

(5)

6.4.3

OPTION 1	**ACCEPT**
Q = I Δt	W = VIΔt ✓
= 2 x 60 ✓	= 6 ✓x 2 x 60✓
= 120 C	= 720 J ✓
W = V Q ✓	
= 6 x 120 ✓	
= 720J ✓	

(4)

[20]

TOTAL: 100

SEE ACADEMY