KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 10

PHYSICAL SCIENCES P1

COMMON TEST

JUNE 2023

MARKING GUIDELINE

MARKS: 75

DURATION: 1,5 hours

Stanmorephysics

QUESTION 1

1.1 D ✓✓ (2)

1.2 C ✓✓ (2)

1.3 A ✓✓ (2)

1.4 C ✓✓ (2)

1.5 B ✓✓ (2)

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QUESTION 2

2.1 4 cm or 0,04 m ✓ (1)

2.2 The distance between two successive/consecutive points in phase. ✓✓ (2)

2.3 **POSITIVE MARKING FOR QUESTION 2.3**

2.3.1 $\lambda = \frac{13,5}{2,25}$ ✓

= 6 cm or 0,06 m ✓ (2)

2.3.2 $T = \frac{2,5}{2}$ ✓

= 1,25 s ✓ (2)

2.3.3

OPTION 1	**OPTION 2**
$f = \frac{1}{T}$	Speed = $\frac{distance}{time}$ ✓
$= \frac{1}{1.25}$	$= \frac{0.12}{2,5}$ ✓
= 0.8 Hz	= 0,048 m.s^{-1} ✓
v = f × λ ✓	
= 0,8 × 0,06 ✓	
= 0,048 m.s^{-1} ✓	

(3)

2.4 Distance = 5 x 6 ✓ ✓

= 30 cm or 0,3 m ✓ (3)

[13]

QUESTION 3

3.1

3.1.1 What is the relationship between the frequency and energy of a photon? ✓✓ (2)

3.1.2 The energy of a photon is directly proportional to the frequency ✓

Or (1)

Direct proportion ✓

3.1.3 The graph is a straight line ✓ starting from the origin ✓. (2)

Or

As the frequency increases the energy increases ✓ proportionally ✓.

3.1.4 $c = f \times \lambda$ ✓.

$3 \times 10^{8} = 3 \times 10^{14} \times \lambda$ ✓.

$\lambda = 1 \times 10^{-6}$ m ✓. (3)

3.2

3.2.1 Gamma rays ✓. (1)

3.2.2 $2{,}65 \times 10^{-27}$ J ✓. (1)

3.2.3 $E = h \times f$ ✓.

$4{,}64 \times 10^{-18} = 6{,}63 \times 10^{-34} \times f$ ✓.

$f = 7 \times 10^{15}$ Hz ✓. (3)

[13]

QUESTION 4

4.1 $\text{speed} = \frac{\text{distance}}{\text{time}}$ ✓

$= \frac{1366}{4}$ ✓

$= 341{,}5 \text{ m.s}^{-1}$ ✓ (3)

4.2 $\text{speed} = \frac{\text{distance}}{\text{time}}$

✓ $341{,}5 = \frac{\text{distance}}{3}$ ✓

Distance = 1024,5 m

X = 1024,5 + 1366 ✓

= 2390 m ✓ (4)

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QUESTION 5

5.1 $Q = n \times q_e$ ✓

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

$= 3,2 \times 10^{-6}$ C ✓

Therefore charge on sphere P is $-3,2 \times 10^{-6}$ C. (3)

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

5.3 **POSITIVE MARKING FROM QUESTION 5.1**

5.3.1 $Q = \frac{Q1 + Q2}{2}$ ✓

✓ $6,4 \times 10^{-6} = \frac{-3,2 \times 10^{-6} + Q_R}{2}$ ✓

$Q_R = 1,6 \times 10^{-5}$ C ✓ (4)

5.3.2 $n = \frac{\Delta Q}{q_e}$ ✓

$= \frac{6,4 \times 10^{-6} - 1,6 \times 10^{-5}}{1,6 \times 10^{-19}}$ OR $= \frac{6,4 \times 10^{-6} - (-3.2 \times 10^{-6})}{-1,6 \times 10^{-19}}$ ✓ ✓

$= 6 \times 10^{13}$ electrons ✓ (4)

5.4 Whilst walking on the carpet, electrons are transferred to you. ✓
You pick up a negative charge, ✓ due to the excess electrons.
When you touch the doorknob (a conductor) , the quick movement of electrons ✓ from you to the doorknob results in the sudden shock. (3)

[16]

QUESTION 6

6.1 The rate of flow of charge ✓✓ (2)

6.2 $I = \frac{Q}{\Delta t}$ ✓

$= \frac{180}{90}$ ✓

$= 2A$ ✓ (3)

6.3

6.3.1 $\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2}$

$= \frac{1}{3} + \frac{1}{6}$ ✓

$R_p = 2\ \Omega$ ✓ (2)

6.3.2 **POSITIVE MARKING FROM QUESTION 6.3.1**

Using Ratios

$V_1 = \frac{2}{6} \times 18$ ✓

$= 6\ V$ ✓

OR

Using Ohms Law

$V_1 = I \times R$

$= 2 \times 3$ ✓

$= 6\ V$ ✓ (2)

6.3.2 **POSITIVE MARKING FROM QUESTION 6.3.2**

6.3.3 Using Ratios

$V_{2\Omega} = \frac{2}{3} \times 6$ ✓

$= 4\ V$

$W = V \times Q$ ✓

$= 4 \times 180$ ✓

$= 720\ J$ ✓

Using Ohms Law

$V_{2\Omega} = I \times R$

$= 2 \times 2$ ✓

$= 4\ V$

$W = V \times Q$ ✓

$= 4 \times 180$ ✓

$= 720\ J$ ✓ (4)

6.4 Increase. ✓
The total resistance decreases. ✓ (3)
Current is inversely proportional to resistance. ✓

[16]

TOTAL: 75