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

QUESTION 1

1.1   D ✓✓   (2)

1.2   C ✓✓   (2)

1.3   A ✓✓   (2)

1.4   C ✓✓   (2)

1.5   B ✓✓   (2)

                                                                            [10]

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 $\lambda = \dfrac{13,5}{2,25}$ ✓

              = 6 cm or 0,06 m ✓   (2)

       2.3.2 $T = \dfrac{2,5}{2}$ ✓

              = 1,25 s ✓   (2)

       2.3.3

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

                                                                            (3)

2.4   Distance $= \overset{✓}{5} \times \overset{✓}{6}$

              = 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 ✓

<div align="center">Or</div>   (1)

Direct proportion ✓

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

<div align="center">Or</div>

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 $speed = \dfrac{distance}{time}$ ✓

        $= \dfrac{1366}{4}$ ✓

    $= 341{,}5$ m.s^{-1} ✓   (3)

4.2 $speed = \dfrac{distance}{time}$

    ✓ $341{,}5 = \dfrac{distance}{3}$ ✓

  Distance $= 1024{,}5$ m

  X $= 1024{,}5 + 1366$ ✓

  $= 2390$ m ✓   (4)

                                    [7]

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 $Q = \dfrac{Q1 + Q2}{2}$ ✓

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

             $Q_R = 1{,}6 \times 10^{-5}$ C ✓   (4)

     5.3.2 $n = \dfrac{\Delta Q}{q_e}$ ✓

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

             $= 6 \times 10^{13}$ electrons ✓   (4)

5.4   Whilst walking on the carpet, <u>electrons are transferred to you</u>. ✓
         You <u>pick up a negative charge</u>, ✓ due to the excess electrons.
         When you touch the doorknob (a conductor) , the <u>quick movement of electrons</u>
         ✓ 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 $I = \dfrac{Q}{\Delta t}$ ✓

$= \dfrac{180}{90}$ ✓

$= 2A$ ✓   (3)

6.3

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

$= \dfrac{1}{3} + \dfrac{1}{6}$ ✓

$R_p = 2\ \Omega$ ✓   (2)

6.3.2   **POSITIVE MARKING FROM QUESTION 6.3.1**
Using Ratios
$V_1 = \dfrac{2}{6} \times 18$ ✓
$= 6\ V$ ✓
OR
Using Ohms Law
$V_1 = I \times R$
$= 2 \times 3$ ✓
$= 6\ V$ ✓   (2)

6.3.2
6.3.3   **POSITIVE MARKING FROM QUESTION 6.3.2**
Using Ratios
$V_{2\Omega} = \dfrac{2}{3} \times 6$ ✓
$= 4\ V$
$W = V \times Q$ ✓
$= 4 \times 180$ ✓
$= 720\ J$ ✓

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