

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 11**

**NOVEMBER 2010**

**PHYSICAL SCIENCES P1  
MEMORANDUM**

**MARKS: 150**

This memorandum consists of 8 pages.

**SECTION A**

**QUESTION 1 ONE-WORD ITEMS**

- |                    |        |     |
|--------------------|--------|-----|
| 1.1 transverse ✓   | 11.2.1 | (1) |
| 1.2 lhs ✓          | 11.2.1 | (1) |
| 1.3 acceleration ✓ | 11.2.1 | (1) |
| 1.4 dielectric ✓   | 11.2.1 | (1) |
| 1.5 doping ✓       | 11.2.1 | (1) |

**QUESTION 2: MULTIPLE-CHOICE QUESTIONS**

- |            |        |     |
|------------|--------|-----|
| 2.1 A ✓ ✓  | 11.1.3 | (2) |
| 2.2 C ✓ ✓  | 11.2.2 | (2) |
| 2.3 B ✓ ✓  | 11.2.3 | (2) |
| 2.4 B ✓ ✓  | 11.1.2 | (2) |
| 2.5 B ✓ ✓  | 11.1.2 | (2) |
| 2.6 C ✓ ✓  | 11.1.2 | (2) |
| 2.7 A ✓ ✓  | 11.2.2 | (2) |
| 2.8 B ✓ ✓  | 11.1.3 | (2) |
| 2.9 A ✓ ✓  | 11.2.1 | (2) |
| 2.10 A ✓ ✓ | 11.2.1 | (2) |
|            | 11.3.3 | (2) |

[20]

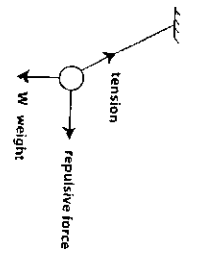
**TOTAL SECTION A: 25**

**SECTION B**

**QUESTION 3**

- 3.1 Since C is positively charged, it will induce ✓ negative charges on the side of S facing C. As unlike charges attract, ✓ S is attracted towards C. 11.2.2 (2)
- 3.2 Sphere C +2 x 10<sup>6</sup> C ✓  
Sphere S +2 x 10<sup>6</sup> C ✓ 11.2.3 (2)
- 3.3  $F = \frac{kQ_1Q_2}{r^2}$  ✓  
 $= \frac{(9,0 \times 10^9)(2 \times 10^{-6})(2 \times 10^{-6})}{(3 \times 10^{-3})^2}$  ✓  
 $= 3,6$  N ✓ repulsion ✓ or to the right. 11.2.3 (6)

3.4

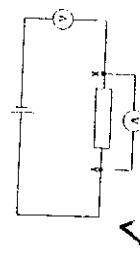


No direction - no marks

3.5 Lightning/thunderstorm ✓

QUESTION 4

4.1 4.1.1



11.1.4 (3)  
11.3.3 (1)  
[14]

$$R = \frac{V}{I} \quad \checkmark$$

4.1.2

11.1.1 (1)

4.1.3 What is the relation between electrical resistance and temperature?  
OR  
Does electrical resistance increase/decrease with rise in temperature? ✓ ✓

11.1.1 (1)

4.1.4

- (a) Increases, ✓ because current decreases ✓  
(b) Decreases, ✓ because current increases ✓

11.1.1 (2)  
11.1.4 (2)  
11.1.4 (2)

4.2 4.2.1

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} \quad \checkmark$$

$$\frac{1}{R_p} = \frac{1}{6} + \frac{1}{6} \quad \checkmark$$

$$\frac{1}{R_p} = \frac{2}{6}$$

$$R_p = 3 \Omega \quad \checkmark$$

$$\therefore R_{TOTAL EXTERNAL} = 3 \Omega + 6 \Omega = 9 \Omega \quad \checkmark$$

$$V = IR = 2(9) = 18 V \quad \checkmark$$

11.1.3 (3)

4.2.3

$$EMF = IR + Ir \quad \checkmark$$

$$24 = 2(9) + 2r \quad \checkmark$$

$$r = 3 \Omega \quad \checkmark$$

11.2.3 (3)

11.2.3 (3)  
[17]

QUESTION 5

5.1 To step down ✓ (the alternating voltage from a high value to a low value) ✓  
11.2.2 (2)

5.2 To reduce heat losses ✓ in the cable since a low current ✓ will now flow in the cables.  
OR power  
11.1.4 (2)

5.3 If the cable is thicker, resistance is lower. ✓ Therefore the loss of energy is less. ✓  
11.1.4 (2)

$$5.4 \frac{N_s}{N_p} = \frac{V_s}{V_p} \quad \checkmark$$

$$N_p = \frac{(48\,000)(20)}{(275)} \quad \checkmark$$

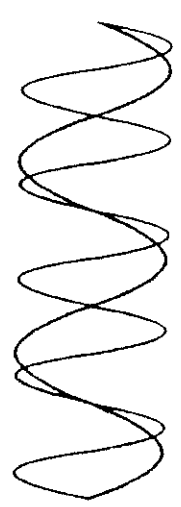
$$= \text{turns} \quad \checkmark$$

11.2.3 (4)  
[10]

QUESTION 6

6.1 wavelength  $\lambda = \frac{53}{2.5} \quad \checkmark = 21.2 \text{ mm} \quad \checkmark$   
11.2.3 (2)

6.2  $v = f\lambda \quad \checkmark = (20) \left(\frac{21.2}{1\,000}\right) \quad \checkmark = 0.42 \text{ m.s}^{-1} \quad \checkmark$   
11.2.3 (3)

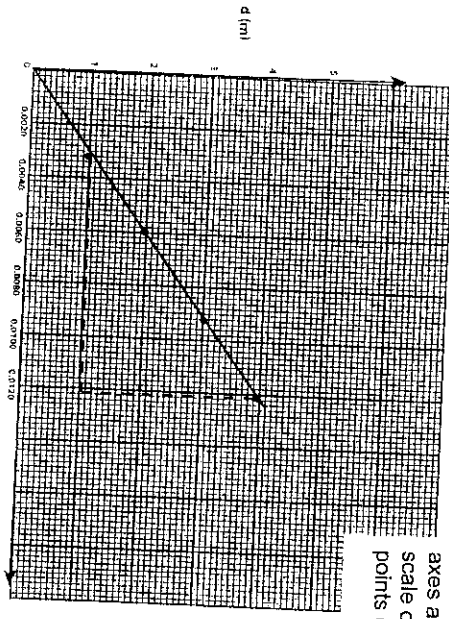


Same Amplitude ✓  
Half wavelength  
OR Frequency is double ✓  
11.2.2 (2)

6.3.2 wavelength = 10.6 mm ✓  
11.2.3 (1)  
[8]

QUESTION 7

7.1 7.1.1



axes are labelled ✓  
scale on both axes ✓  
points correct ✓✓✓

7.1.2 Speed of sound in air = gradient of graph ✓  
11.1.2 (5)

7.1.3 The time measured will be very short - difficult ✓  
OR  
The walls of the building produce echoes.  
11.1.2 (3)

7.2 7.2.1 Decreases ✓  
11.1.1 (1)

7.2.2 Speed of sound in water is greater than the speed of sound in air ✓  
11.2.2 (1)

7.3 7.3.1 Exposure to loud noise ✓  
11.2.2 (1)

7.3.2 Diaphragm ✓  
11.3.2 (1)

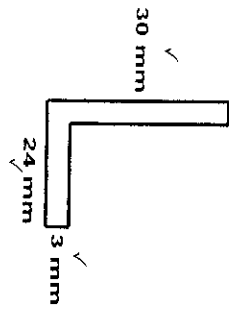
7.3.3 Ultra sound ✓  
11.2.1 (1)

7.3.4 Treat kidney stones ✓/to exam unborn babies ✓/to see organs in human body which cannot be seen by x-rays.  
11.3.3 (1)  
[15]

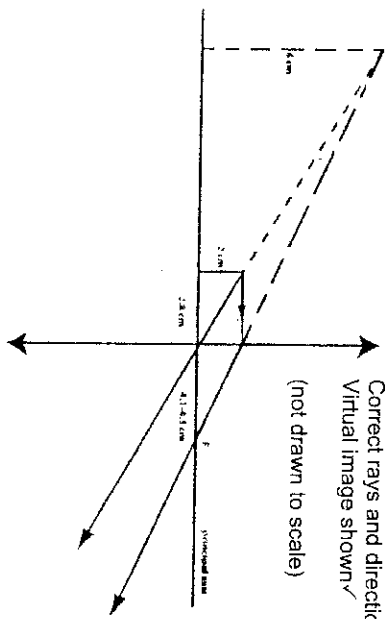
QUESTION 8

8.1 8.1.1 Convex/converging lens. ✓✓  
11.2.1 (2)

8.2 8.2.1



8.3 8.3.1  
11.1.2 (3)



Correct rays and directions ✓✓✓  
Virtual image shown ✓  
(not drawn to scale)

8.3.2 4.1 to 4.3 cm ✓✓  
11.1.2 (4)

9.1 0 ✓  
11.1.2 (2)

9.2  
11.2.1 (1)

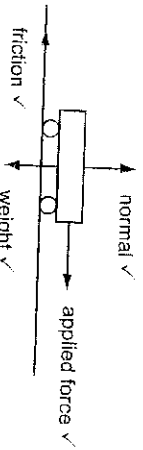
11.1.3 (6)  
[7]

**QUESTION 10**

- 10.1 Acceleration is directly proportional to force.  
OR  
Acceleration is inversely proportional to force. ✓✓

10.2 mass ✓

10.3



10.4 Newton's Second Law ✓

10.5 Increases ✓

**QUESTION 11**

- 11.1 In an isolated system the total linear momentum remains constant in both magnitude and direction. ✓✓

11.2

- 11.3 Follow at a safe stopping distance/adapt speed to conditions of road/increase following distance in wet weather. (Any 2) ✓✓

**QUESTION 12**

- 12.1 Two bodies in the universe attract each other with a force which is directly proportional to the product of their masses and inversely proportional to the square of their distances between their centres. ✓✓

12.2

- 12.3 By FOUR. ✓  
12.4 Remains the same. ✓

**QUESTION 13**

- 13.1 Class 1 ✓ Fulcrum is between the load and the effort. ✓

13.2 Moment = force x perpendicular distance ✓

$$= 12\ 000 \times 20 = 240\ 000\ \text{N.m} \checkmark$$

- 13.3 To keep the arm in equilibrium ✓ OR to be able to vary the load carried by moving the counterweight. ✓

**QUESTION 14**

- 14.1 They become better conductors ✓ as their temperature increases. ✓

14.2 Germanium OR Silicon ✓

14.3 14.3.1 Diode ✓

- 14.3.2 It allows electric current to flow only in one direction. ✓

14.4 14.4.1 Connect positive terminal of a battery to the n-type ✓ and the negative terminal to the p-type side. ✓

14.5 14.5.1 Electrons/holes ✓

14.5.2 Ions ✓

TOTAL SECTION B: 125

GRAND TOTAL: 150

- 11.2.3 (4)  
11.2.2 (1)  
11.2.2 (1)  
11.2.2 (1)  
[8]

[9]

(2)

(4)

(1)

(1)

(1)

[8]