PHYSICAL SCIENCES  GRADE 10  JUNE EXAMINATION MEMO 2016

Note: Check the marking guidelines given in the examination guidelines (pages 33-34) before marking the scripts

QUESTION 1: MULTIPLE-CHOICE QUESTIONS

1.1 D √√  
1.2 A √√  
1.3 C √√  
1.4 B √√  
1.5 D √√  
1.6 D √√  
1.7 A √√  
1.8 A √√  
1.9 C √√  
1.10 A √√  

[20]

QUESTION 2

2.1 Equal/Same speed √√  
2.2 Marking Criteria
   Both pulse on the same side 
   Pulse A has a higher amplitude 
   Pulse B has a shorter amplitude 
   Direction of each pulse indicated  

2.3 Constructive Interference √√  
2.4 \( A = 0.1 \text{ m} \) √√ if \( A = 10 \text{ cm} \) (award one mark)  
2.5 STAY THE SAME. √√  

(2)
QUESTION 3

3.1.1 Distance between two consecutive points that are in phase ✓ ✓ (2)

3.1.2. \[ \lambda = \frac{120 \times 10^{-3}}{2} \sqrt{V} \]
\[ = 0.06 \text{ m} \] ✓ ✓ (3)

3.1.3. \[ T = 5 \text{ sec} \] ✓ (1)

3.1.4.

<table>
<thead>
<tr>
<th>Option 1</th>
<th>Option 2</th>
<th>Option 3</th>
</tr>
</thead>
</table>
| \[ v = f \lambda \sqrt{V} \]  
\[ = \frac{1}{5} (0.06) \]  
\[ = 0.012 \text{ m} \cdot \text{s}^{-1} \] ✓ ✓ ✓ | \[ v = \frac{\Delta x}{\Delta t} \sqrt{V} \]  
\[ v = \frac{120 \times 10^{-3}}{10} \sqrt{V} \]  
\[ v = 0.012 \text{ m} \cdot \text{s}^{-1} \] ✓ ✓ ✓ | \[ v = \frac{\Delta x}{\Delta t} \sqrt{V} \]  
\[ v = \frac{0.06}{5} \sqrt{V} \]  
\[ v = 0.012 \text{ m} \cdot \text{s}^{-1} \] ✓ ✓ ✓ |

3.2  

3.2.1 A wave in which particles of a medium move perpendicular to the direction of the propagation of a wave ✓ ✓ ✓ (2)

3.2.2 Q and S ✓ ✓ ✓ (2)

3.2.3 R ✓ ✓ ✓ (1)

3.2.4. \[ f = \frac{2}{0.8} \sqrt{V} \]
\[ f = 2.5 \text{ Hz} \] ✓ ✓ ✓ (3)

3.2.5 \[ v = f \lambda \sqrt{V} \] ✓ ✓ ✓ (4)
3.2.6 No Change √√ (2)
3.2.7 $a = 2(10 \times 10^{-2}) \sqrt$  
\[ a = 0.2 \text{ m} \sqrt \]  (2)

QUESTION 4
4.1 Longitudinal wave √ (1)
4.2 Reflected sound √ (1)
4.3 $v = \frac{\Delta s}{\Delta t} \sqrt$
\[ 1500\sqrt = \frac{\Delta s}{2(0.018)} \sqrt \]
\[ \Delta s = 54 \text{ m} \sqrt \]
The depth of the mineshaft is 54 m √ (5)
4.4 $v = f\lambda \sqrt$
\[ 1500 = 22 \times 10^2 \lambda \sqrt \]
\[ \lambda = 0.07 \text{ m} \sqrt \] (4)
4.5
4.5.1 Remains the same √√ (2)
4.5.2 Increases √√ (2)
4.6 Ultrasound √ (1)
4.7 Ultrasound scans are safe and painless, no harm is done to the human tissues √√ (2)

QUESTION 5 (Start on a new page.)
5.1.1 Microwaves √ (1)
5.1.2 Microwaves have longer wavelength than gamma rays √√ (2)
5.2.1 Photon is an energy carrying particle of no mass moving at a speed of light √ (2)
5.2.2. \[ v = f \lambda \sqrt{3 \times 10^8 = 2 \times 10^{-2} f} \sqrt{f = 1.5 \times 10^{10} \text{ Hz}} \] (4)

5.2.3. \[ E = hf \sqrt{E = 6.63 \times 10^{-34} (1.5 \times 10^{10})} \sqrt{E = 9.95 \times 10^{-24} J} \] (3)

QUESTION 6 (Start on a new page.)

6.1 Water molecules are polarised by the rod, the positive pole of the water is attracted to the negative pole, causing stream of water to bend towards the rod. \( \sqrt{\) (3)

6.3 \[ Q = nq_e \sqrt{Q = 1 \times 10^{14}(-1.6 \times 10^{-19})} \sqrt{Q = -1.6 \times 10^{-5} \text{ C}} \] (3)

6.3.1 Sphere R \( \sqrt{\) (1)

6.3.2 Repel \( \sqrt{\) (1)

6.3.2 At stage 3 both spheres have the same charge \( \sqrt{\) (2)

6.3.4 The net charge of an isolated system remain the same during any physical process \( \sqrt{\) (2)

6.3.5 \[ Q_P = \frac{Q_P + Q_R}{2} \sqrt{Q_P = \frac{-3 \times 10^{-6} + 6 \times 10^{-6}}{2} \sqrt{Q_P = +1.5 \times 10^{-6} \text{ C}} \] (3)

6.3.6

<table>
<thead>
<tr>
<th>OPTION 1 Using charge P</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \Delta Q = nq_e \sqrt{+1.5 \times 10^{-6} - (-3 \times 10^{-5}) = n(-1.6 \times 10^{-19})} \sqrt{n = 2.8 \times 10^{13} \text{ electrons}} )</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OPTION 2 Using charge R</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \Delta Q = nq_e \sqrt{+1.5 \times 10^{-6} - (6 \times 10^{-6}) = n(-1.6 \times 10^{-19})} \sqrt{n = 2.8 \times 10^{13} \text{ electrons}} )</td>
</tr>
</tbody>
</table>
QUESTION 7

7.1 Marking Criteria
- Ammeter connected in series with the cell ✓
- Ammeter with correct label ✓
- Voltmeter across bulb 2 ✓
- Voltmeter with correct label ✓

(4)

7.2 \( I_C = 0,6 \, A. \) ✓

(1)

7.3 Type of material used. ✓
- Length of the conductor. ✓
- Thickness of the conductor ✓
- The temperature of the conductor. ✓

Any three (3 marks)

(3)

7.4 They glow with the same brightness ✓; same current pass though identical bulbs ✓ ✓

(3)

[11]

QUESTION 8 (Start on a new page.)

8.1 • **Emf** is the potential difference across the battery when no current flows in the circuit ✓ ✓

• **Terminal voltage** is the potential difference across the battery when current flows in the circuit ✓ ✓

(4)

8.2 \( R_P = \frac{(R_A + R_B)}{(R_A \times R_B)} \) ✓ ✓

\( R_P = \frac{2+2}{2\times2} \) ✓ ✓

\( R_P = 1\Omega \) ✓ ✓

(3)

8.3 \( R_T = R_P + R_C \) ✓ ✓

\( R_T = 1 + 3 \) ✓ ✓

\( R_T = 4\Omega \) ✓ ✓

(3)
8.4.1 \[ V_1 = 4 \times (1.5) \sqrt{\ldots} = 6 \sqrt{\ldots} \] (2)

8.4.2 \[ V_3 = 4.5 \sqrt{\ldots} \] ( voltage divides in the ratio of 1:3, the bigger resistor takes 4.5 V and the smaller takes 1.5 V) (2)

8.5.1 \[ Q = I\Delta t \sqrt{\ldots} \]
\[ Q = 1.5(2 \times 60) \sqrt{\ldots} \]
\[ Q = 180 \sqrt{\ldots} \] (3)

\[
\begin{array}{|c|c|}
\hline
\text{Option 1} & \text{Option 2} \\
\hline
W = VQ \sqrt{\ldots} & W = I^2 R t \\
= (4.5 \times 180) \sqrt{\ldots} = 810 J \sqrt{\ldots} & W = (1.5^2)(3)(120) \\
& W = 810 J \\
& \text{This method is not in gr 10} \\
\hline
\end{array}
\] (3)

8.6.1 Increases √ (1)
8.6.2 Increases √ (1)
8.6.3 Decreases √ (1)

[23]

QUESTION 9 (Start on a new page.)

9.1 Region in space where another magnet/ferromagnetic material will experience a magnetic force. √√ (2)

9.2 S Pole √ (1)
9.3 Ferromagnetic materials √ (1)
9.4

9.4.1 Criteria for marking the diagram

✓ Correct direction on both magnets
✓ Correct shape between magnets
✓ Field lines do not touch each other

(3)

9.4.2 Move Further Apart √ (1)

[8]

TOTAL 150