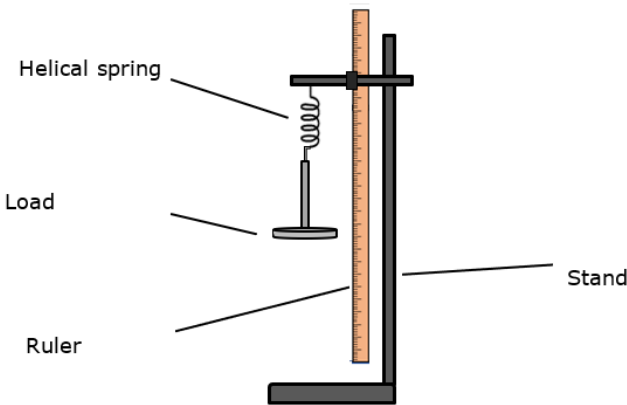


Annual Examinations for Secondary Schools 2022

**YEAR 11** **PHYSICS** **MARKING SCHEME**

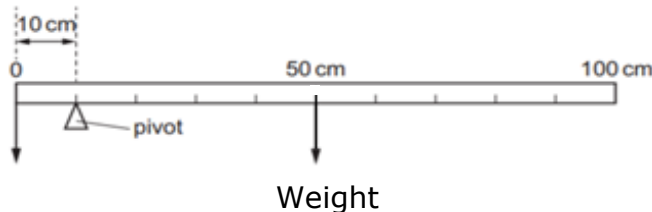
**Please Note:** When marking questions, apply the 'follow through' rule. This means that if a student gives a wrong answer for part (a) of a question and then uses it in subsequent answers, marks should be deducted for part (a) only. The subsequent parts should be given full marks if these are relatively correct.

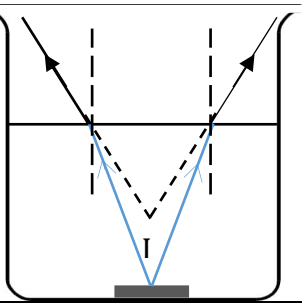
| SECTION A                           |                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |  | 40 MARKS                    |                                                  |                                     |         |   |                                                         |  |
|-------------------------------------|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|-----------------------------|--------------------------------------------------|-------------------------------------|---------|---|---------------------------------------------------------|--|
| Question                            |                                 | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |  | Mark                        | Additional Guidelines                            |                                     |         |   |                                                         |  |
| 1                                   | a                               | Non-renewable energy resources are available in limited supplies. Renewable resources are replenished naturally and over relatively short periods of time.                                                                                                                                                                                                                                                                                       |  |  | 1<br>1                      | Accept any reasonable answer                     |                                     |         |   |                                                         |  |
|                                     | b                               | <table><tr><td>Renewable sources of energy</td><td>Non-Renewable sources of energy</td></tr><tr><td>Hydroelectric<br/>Geothermal<br/>Wind</td><td>Nuclear</td></tr></table>                                                                                                                                                                                                                                                                      |  |  | Renewable sources of energy | Non-Renewable sources of energy                  | Hydroelectric<br>Geothermal<br>Wind | Nuclear | 2 | Award 1 mark if two or three correct answers are given. |  |
| Renewable sources of energy         | Non-Renewable sources of energy |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |  |                             |                                                  |                                     |         |   |                                                         |  |
| Hydroelectric<br>Geothermal<br>Wind | Nuclear                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |  |                             |                                                  |                                     |         |   |                                                         |  |
|                                     | c                               | Solar energy                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  | 1                           | Accept any reasonable answer                     |                                     |         |   |                                                         |  |
|                                     | d                               | Advantage: No Pollution<br>Disadvantage: Not always available                                                                                                                                                                                                                                                                                                                                                                                    |  |  | 1<br>1                      | Accept any reasonable answers related to part c) |                                     |         |   |                                                         |  |
|                                     | e                               | <p>The diagram illustrates the energy conversion process in a power plant. It starts with 'Gas' and 'Air' entering a 'Combustion Chamber'. 'Chemical energy' is labeled as the input to the combustion process. The 'Combustion Chamber' outputs to a 'Turbine'. 'Kinetic energy' is labeled as the input to the turbine. The 'Turbine' then outputs 'Thermal energy' to an 'Exhaust' and 'Electrical energy' to 'Electricity in our homes'.</p> |  |  | 1<br>1<br>1                 | Chemical<br>Kinetic<br>Electrical                |                                     |         |   |                                                         |  |

|                       |   |     |                                                                                                                                                                                                                                                                                                                                                            |          |                                          |     |     |   |   |   |   |                       |   |     |     |     |     |     |     |                |   |     |     |     |     |     |     |   |                                                 |
|-----------------------|---|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------------------------------------|-----|-----|---|---|---|---|-----------------------|---|-----|-----|-----|-----|-----|-----|----------------|---|-----|-----|-----|-----|-----|-----|---|-------------------------------------------------|
| 2                     | a |     | The load is directly proportional to the extension, provided that the elastic limit has not been exceeded.                                                                                                                                                                                                                                                 | 1<br>1   | Accept limit of proportionality.         |     |     |   |   |   |   |                       |   |     |     |     |     |     |     |                |   |     |     |     |     |     |     |   |                                                 |
|                       | b |     | <div><div>Helical spring</div><div>Load</div><div>Ruler</div><div>Stand</div></div>                                                                                                                                                                                      | 1<br>1   | 1 mark for each pair of correct answers. |     |     |   |   |   |   |                       |   |     |     |     |     |     |     |                |   |     |     |     |     |     |     |   |                                                 |
|                       | c |     | Read length at eye level to avoid parallax error.                                                                                                                                                                                                                                                                                                          | 1        | Accept any other related answers.        |     |     |   |   |   |   |                       |   |     |     |     |     |     |     |                |   |     |     |     |     |     |     |   |                                                 |
|                       | d | i   | <table><tr><td>Load (N)</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>Length of Spring (cm)</td><td>2</td><td>2.4</td><td>2.8</td><td>3.2</td><td>3.6</td><td>4.2</td><td>5.1</td></tr><tr><td>Extension (cm)</td><td>0</td><td>0.4</td><td>0.8</td><td>1.2</td><td>1.6</td><td>2.2</td><td>3.1</td></tr></table> | Load (N) | 0                                        | 1   | 2   | 3 | 4 | 5 | 6 | Length of Spring (cm) | 2 | 2.4 | 2.8 | 3.2 | 3.6 | 4.2 | 5.1 | Extension (cm) | 0 | 0.4 | 0.8 | 1.2 | 1.6 | 2.2 | 3.1 | 1 | All answers must be correct to obtain one mark. |
| Load (N)              | 0 | 1   | 2                                                                                                                                                                                                                                                                                                                                                          | 3        | 4                                        | 5   | 6   |   |   |   |   |                       |   |     |     |     |     |     |     |                |   |     |     |     |     |     |     |   |                                                 |
| Length of Spring (cm) | 2 | 2.4 | 2.8                                                                                                                                                                                                                                                                                                                                                        | 3.2      | 3.6                                      | 4.2 | 5.1 |   |   |   |   |                       |   |     |     |     |     |     |     |                |   |     |     |     |     |     |     |   |                                                 |
| Extension (cm)        | 0 | 0.4 | 0.8                                                                                                                                                                                                                                                                                                                                                        | 1.2      | 1.6                                      | 2.2 | 3.1 |   |   |   |   |                       |   |     |     |     |     |     |     |                |   |     |     |     |     |     |     |   |                                                 |
|                       | d | ii  | 0.02                                                                                                                                                                                                                                                                                                                                                       | 1        |                                          |     |     |   |   |   |   |                       |   |     |     |     |     |     |     |                |   |     |     |     |     |     |     |   |                                                 |
|                       | d | iii | 5                                                                                                                                                                                                                                                                                                                                                          | 1        |                                          |     |     |   |   |   |   |                       |   |     |     |     |     |     |     |                |   |     |     |     |     |     |     |   |                                                 |
|                       | e | i   | Graph B                                                                                                                                                                                                                                                                                                                                                    | 1        |                                          |     |     |   |   |   |   |                       |   |     |     |     |     |     |     |                |   |     |     |     |     |     |     |   |                                                 |
|                       | e | ii  | Graph A                                                                                                                                                                                                                                                                                                                                                    | 1        |                                          |     |     |   |   |   |   |                       |   |     |     |     |     |     |     |                |   |     |     |     |     |     |     |   |                                                 |

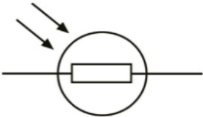
|   |   |     |                                                                            |   |                                     |
|---|---|-----|----------------------------------------------------------------------------|---|-------------------------------------|
| 3 | a | i   | Wavelength                                                                 | 1 |                                     |
|   |   | ii  | $\frac{10}{5} = 2 \text{ cm} = 0.02 \text{ m}$                             | 2 | Accept answers in cm or m           |
|   | b | i   | $\frac{2}{5} = 0.4 \text{ s}$                                              | 1 |                                     |
|   |   | ii  | $f = \frac{1}{T} = \frac{1}{0.4} = 2.5 \text{ Hz}$                         | 1 |                                     |
|   | c | i   | Decreases                                                                  | 1 |                                     |
|   |   | ii  | Decreases                                                                  | 1 |                                     |
|   |   | iii | Remains the same                                                           | 1 |                                     |
|   | d | i   | Amplitude is a point with the largest displacement from the rest position. | 1 | Accept any other correct definition |
|   |   | ii  | K.                                                                         | 1 |                                     |

|   |   |     |                                                                                                                                                                                                  |             |                                              |
|---|---|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------------------------------------|
| 4 | a | i   | He measures the distance from mic A to mic B.<br>He bursts the balloon using the pin and reads time from the timer.<br>He uses the equation $\text{speed} = \frac{\text{distance}}{\text{time}}$ | 1<br>1<br>1 | Accept any other correct answer.             |
|   |   | ii  | Read the distance from the ruler at right angles.                                                                                                                                                | 1           | Accept any other correct answer.             |
|   |   | iii | $\text{speed} = \frac{\text{distance}}{\text{time}} = \frac{0.82}{0.0024} = 341.67 \text{ m/s}$                                                                                                  | 2           | Deduct 1 mark for missing or incorrect unit. |
|   | b | i   | Reflection of sound                                                                                                                                                                              | 1           |                                              |
|   |   | ii  | Distance = $480 \times 2 = 960 \text{ m}$<br>$\text{speed} = \frac{\text{distance}}{\text{time}} = \frac{960}{3} = 320 \text{ m/s}$                                                              | 1<br>1      | Accept other correct methods                 |
|   |   | iii | In Elisa's method there is more human error.                                                                                                                                                     | 1           | Accept other correct answers.                |

|   |   |     |                                                                                                                                                  |        |                               |
|---|---|-----|--------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------------------------------|
| 5 | a |     | In equilibrium:<br>Total upward forces are equal to total downward forces.<br>Total clockwise moments are equal to total anti-clockwise moments. | 1<br>1 |                               |
|   | b | i   | Correct position of the weight.<br>                          | 1      |                               |
|   |   | ii  | If balanced:<br>Total clockwise moment = Total anti-clockwise moment<br>$W \times 40 = 5 \times 10$<br>$W = 1.25 \text{ N}$                      | 2      |                               |
|   |   | iii | Reaction = $5 + 1.25 = 6.25 \text{ N}$                                                                                                           | 1      |                               |
|   |   | iv  | Anti-clockwise                                                                                                                                   | 1      |                               |
|   | c | i   | Move the cue slowly on the pivot until it is balanced.                                                                                           | 2      | Accept other correct answers. |
|   |   | ii  | A point from which the weight of a body or system may be considered to act.                                                                      | 1      | Accept other correct answers. |

|   |   |     |                                                                                                              |        |                                                                                                                       |
|---|---|-----|--------------------------------------------------------------------------------------------------------------|--------|-----------------------------------------------------------------------------------------------------------------------|
| 6 | a | i   | Real                                                                                                         | 1      |                                                                                                                       |
|   |   | ii  | Apparent                                                                                                     | 1      |                                                                                                                       |
|   |   | iii | Virtual image                                                                                                | 1      |                                                                                                                       |
|   |   | iv  | $n = \frac{\text{Real depth}}{\text{Apparent depth}} = \frac{19.5}{15} = 1.3$                                | 2      |                                                                                                                       |
|   | b |     |                             | 3      | 1 mark for correct drawing of normals.<br>1 mark for correct refracted rays.<br>1 mark for correct position of image. |
|   | c |     | The incident ray in water has an angle larger than the critical angle, and total internal reflection occurs. | 1<br>1 |                                                                                                                       |

|   |   |  |                                                                                                                          |        |                                                 |
|---|---|--|--------------------------------------------------------------------------------------------------------------------------|--------|-------------------------------------------------|
| 7 | a |  | $\frac{1}{R_{total}} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{12} + \frac{1}{6} = \frac{3}{12}$ $R_{total} = 4 \Omega$ | 1<br>1 | Deduct one mark for missing or incorrect units. |
|   | b |  | $V = IR$<br>$V = 2 \times 4$<br>$V = 8 \text{ V}$                                                                        | 1<br>1 | Deduct one mark for missing or incorrect units. |
|   | c |  | $V = V_1 + V_2$<br>$12 = 8 + V_2$<br>$V_2 = 12 - 8 = 4 \text{ V}$                                                        | 1      |                                                 |
|   | d |  | $V = IR$<br>$I = \frac{V}{R} = \frac{4}{3} \text{ A}$<br>$I = 1.33 \text{ A}$                                            | 1<br>1 | Deduct one mark for missing or incorrect units. |
|   | e |  | $I = 2 - 1.33 = 0.67 \text{ A}$                                                                                          | 1      |                                                 |
|   | f |  | $V = IR$<br>$R = \frac{4}{0.67}$<br>$R = 5.97 \approx 6 \Omega$                                                          | 1<br>1 |                                                 |

|   |   |     |                                                                                   |   |                                     |
|---|---|-----|-----------------------------------------------------------------------------------|---|-------------------------------------|
| 8 | a |     | $E = Pt = \frac{100}{1000} \times 2 \times 14 \times 24 = 67.2 \text{ kWh}$       | 3 | 1 mark for changing W to kW         |
|   | b |     | 1 kWh costs 13 cents<br>67.2 kWh costs $67.2 \times 13 = 873.6 \text{ c}$         | 2 | Accept also €8.74                   |
|   | c | i   | Light Dependent Resistor                                                          | 1 |                                     |
|   | c | ii  |  | 1 |                                     |
|   | c | iii | The bulbs will switch on for a number of hours only, so the cost will be less.    | 1 | Accept any other reasonable answer. |
|   | c | iv  | Light intensity meter                                                             | 1 | Accept any other reasonable answer  |
|   | c | v   | A non-ohmic conductor is one which does not obey Ohm's Law.                       | 1 |                                     |

| SECTION B |        |  | 45 MARKS |                       |
|-----------|--------|--|----------|-----------------------|
| Question  | Answer |  | Mark     | Additional Guidelines |

|   |   |     |                                                                                                              |        |                                                                                                                                    |
|---|---|-----|--------------------------------------------------------------------------------------------------------------|--------|------------------------------------------------------------------------------------------------------------------------------------|
| 9 | a | i   | $P = h\rho g = 1750 \times 1020 \times 10$<br>$= 17\,850\,000 \text{ Pa}$                                    | 2      | Deduct one mark for missing or incorrect unit                                                                                      |
| 9 | a | ii  | Due to atmospheric pressure acting on the sea surface                                                        | 1      |                                                                                                                                    |
| 9 | a | iii | $\frac{159\,000 \text{ cm}^3}{1\,000\,000} = 0.159 \text{ m}^3$                                              | 1      |                                                                                                                                    |
| 9 | a | iv  | $m = \frac{1300}{10} = 130 \text{ kg}$<br>$\rho = \frac{m}{V} = \frac{130}{0.159} = 817.61 \text{ kg / m}^3$ | 1      | Accept<br>$V = 0.159 \times 10$<br>$= 1.59 \text{ m}^3$<br>$\rho = \frac{m}{V} = \frac{1300}{1.59}$<br>$= 817.61 \text{ kg / m}^3$ |
|   |   |     |                                                                                                              | 1      |                                                                                                                                    |
| 9 | a | v   | Oil rises to surface as its density is less than that of water.                                              | 1      |                                                                                                                                    |
| 9 | b | i   | Liquids are incompressible and Pressure (acts)/(is transmitted) equally in all directions in liquids         | 1<br>1 |                                                                                                                                    |
| 9 | b | ii  | $P = \frac{F}{A} = \frac{250}{0.01} = 25000 \text{ Pa}$                                                      | 2      |                                                                                                                                    |
| 9 | b | iii | 25000 Pa                                                                                                     | 1      |                                                                                                                                    |
| 9 | b | iv  | $F = PA = 25000 \times 0.2 = 5000 \text{ N}$                                                                 | 2      | Deduct 1 mark for missing or incorrect unit.                                                                                       |
| 9 | b | v   | To recollect the oil when the lift is coming down                                                            | 1      | Accept other correct answers                                                                                                       |

|     |      |     |                                                                                                                                                                                                                                                                |                       |                                   |     |     |     |     |     |  |      |  |  |  |      |  |   |                                        |
|-----|------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------------------------|-----|-----|-----|-----|-----|--|------|--|--|--|------|--|---|----------------------------------------|
| 10  | a    | i   | Measure the ramp height using a ruler.<br>Release the pizza trolley and measure the stopping distance using a ruler (or measuring tape).<br>Repeat the experiment each time varying the ramp height.                                                           | 1<br>1<br>1           |                                   |     |     |     |     |     |  |      |  |  |  |      |  |   |                                        |
| 10  | a    | ii  | Use the same trolley / same pizza box throughout the experiment.                                                                                                                                                                                               | 1                     | Accept any other correct answers. |     |     |     |     |     |  |      |  |  |  |      |  |   |                                        |
| 10  | b    | i   | <table border="1"><tr><td>0.2</td><td>0.3</td><td>0.4</td><td>0.5</td><td>0.6</td><td>0.7</td><td>0.8</td></tr><tr><td></td><td>0.36</td><td></td><td></td><td></td><td>1.04</td><td></td></tr></table>                                                        | 0.2                   | 0.3                               | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 |  | 0.36 |  |  |  | 1.04 |  | 1 | Award mark if both answers are correct |
| 0.2 | 0.3  | 0.4 | 0.5                                                                                                                                                                                                                                                            | 0.6                   | 0.7                               | 0.8 |     |     |     |     |  |      |  |  |  |      |  |   |                                        |
|     | 0.36 |     |                                                                                                                                                                                                                                                                |                       | 1.04                              |     |     |     |     |     |  |      |  |  |  |      |  |   |                                        |
| 10  | b    | ii  | <p>Graph</p> <ul style="list-style-type: none"><li>• has correctly labelled and positioned axes;</li><li>• is drawn over at least 70% of graph paper;</li><li>• has the correct title;</li><li>• is correctly plotted;</li><li>• best straight line.</li></ul> | 1<br>1<br>1<br>1<br>1 |                                   |     |     |     |     |     |  |      |  |  |  |      |  |   |                                        |
| 10  | b    | iii | Because the graph does not pass through the origin.                                                                                                                                                                                                            | 1                     |                                   |     |     |     |     |     |  |      |  |  |  |      |  |   |                                        |
| 10  | c    | i   | Newton's First law.                                                                                                                                                                                                                                            | 1                     | Accept law of inertia.            |     |     |     |     |     |  |      |  |  |  |      |  |   |                                        |
| 10  | c    | ii  | $W = m \times g = 0.4 \times 10 = 4 \text{ N}$<br>$\text{Resultant Force} = 4 \text{ N} - 1 \text{ N} = 3 \text{ N}$<br>$F = ma$<br>$3 = 0.4 \times a$<br>$\therefore a = 7.5 \text{ m/s}^2$                                                                   | 1<br>1<br>1           |                                   |     |     |     |     |     |  |      |  |  |  |      |  |   |                                        |

|    |   |     |                                                                                                                                                                                                                                                                                                                              |                  |                                |
|----|---|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------------------------------|
| 11 | a | i   | The electromagnet becomes magnetised, attracting the iron armature.<br>The springy metal strip is released breaking the circuit.                                                                                                                                                                                             | 1<br>1           |                                |
| 11 | a | ii  | Circuit is broken even when low currents flow.                                                                                                                                                                                                                                                                               | 1                |                                |
| 11 | b | i   | A – North, B – South                                                                                                                                                                                                                                                                                                         | 1                | Both need to be correct.       |
| 11 | b | ii  | Right hand grip rule                                                                                                                                                                                                                                                                                                         | 1                |                                |
| 11 | b | iii | <ul style="list-style-type: none"> <li>Electromagnet is magnetised attracting the iron rod.</li> <li>Contact at the contact screw is broken.</li> <li>The electromagnet becomes demagnetised.</li> <li>The springy metal strip returns the iron rod back to its original position closing the circuit once again.</li> </ul> | 1<br>1<br>1<br>1 | Accept similar correct answers |
| 11 | c | i   | <ul style="list-style-type: none"> <li>The coil experiences a force.</li> <li>The direction of the current in the coil determines the direction of the force.</li> <li>As the coil moves, the cone moves along with it.</li> </ul>                                                                                           | 1<br>1<br>1      | Accept catapult force          |
| 11 | c | ii  | Outwards                                                                                                                                                                                                                                                                                                                     | 1                |                                |
| 11 | c | iii | Fleming's left hand rule.                                                                                                                                                                                                                                                                                                    | 1                |                                |
| 11 | c | iv  | Any one of:<br>More turns of coil<br>Higher electric current<br>Stronger magnet.                                                                                                                                                                                                                                             | 1                |                                |