| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **1(a)(i)** | ☒ **B** 2.5 ÷ 4 | | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **1(a)(ii)** | either<br>P = 2.5 x 0.2<br>or<br>2.5 = P / 0.2 (1)<br><br>0.5 (W) (1) | give full marks for correct answer, no working | **(2)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **1(b)(i)** | 3.0 +/- 0.5 (cm) | | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **1(b)(ii)** | an explanation linking<br>• 2 MHz (1)<br>and any **one** from:<br>• has a higher intensity inside tissue (1)<br>• less energy absorbed (1)<br>• less attenuation (1)<br>• penetrates furthest /deepest (1) | this frequency alone<br><br>RA<br><br>loses intensity more gradually<br><br>highest penetration<br><br>accept "2MHz and 4MHz" with correct reason for 1 mark | **(2)** |

| Question Number | | | |
|---|---|---|---|
| **QWC** | ***1(c)** | A comparison of endoscopes with any one of the following devices:<br>**Diagnostic devices**<br>• CAT scanners<br>• Fluoroscopes<br>• Thermal imagers / IR thermometers<br>• Pulse oximeters<br>• PET scanners<br>• X-ray machines<br>• Gamma cameras<br><br>**Link to electromagnetic radiation**<br>• Endoscopes use TIR of light in optical fibres<br>• CAT scanners X- rays and computer to generate 3D images<br>• Fluoroscopes use X- rays and a video camera<br>• Thermal imagers use infrared emitted by a body<br>• IR / red LEDs used to measure oxygen levels<br>• PET scanners detect radiation emitted by electron-positron annihilation<br>• Gamma cameras detect gamma rays from radioactive sources<br><br>**Other factors for comparison**<br>• Safety<br>• Ease of use<br>• Frequency / wave length<br>• Intensity<br>• Penetration<br>• Ionising / non-ionising | **(6)** |
| **Level** | **0** | No rewardable content | |
| **1** | **1 - 2** | • a limited comparison between an endoscope and one device e.g. endoscopes use light and CAT scanners detect broken bones<br>• the answer communicates ideas using simple language and uses limited scientific terminology<br>• spelling, punctuation and grammar are used with limited accuracy | |
| **2** | **3 - 4** | • a simple comparison between an endoscope and one device, linking them to the electromagnetic radiation used for both and a detail of use for one of them e.g. endoscopes use visible light to examine internal organs and CAT scans use X-rays<br>• the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately<br>• spelling, punctuation and grammar are used with some accuracy | |
| **3** | **5 - 6** | • a detailed comparison between an endoscope and one device, linking them to the electromagnetic radiation used for both and a detail of use for both of them e.g. endoscopes use visible light which is passed down optical fibres by TIR to examine internal organs. Fluoroscopes use X-rays and a video camera to show positioning of stents in arteries.<br>• the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately<br>ling, punctuation and grammar are used with few errors | |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **2(a)** | elastic potential energy | | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **2(b)(i)** | 0.3(J) (1) | 0.5-0.2 (J) | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **2(b)(ii)** | substitution (1)<br>0.2÷0.5<br><br>evaluation (1)<br>0.4 / 40(%) / $^{2}/_{5}$ | Give full marks for correct answer with no working | <br><br><br><br>**(2)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **2(b)(iii)** | Any two of the following<br>• thermal/heat (1)<br>• (idea that energy is) dissipated/spreads out (1)<br>• to the surroundings (1) | <br><br>Ignore transferred to<br><br>Atmosphere/air<br><br>**Accept**<br>makes surroundings warmer (2)<br>Ignore lost | <br><br><br><br><br><br>**(2)** |

| Question Number | | Indicative content | Mark |
|---|---|---|---|
| **QWC** | ***2(c)** | A description including some of the following points<br><br>**Forms of energy**<br>• gravitational potential energy<br>• kinetic energy<br>• elastic potential energy<br>• heat(thermal) and sound<br><br>**Location of energy**<br>• gravitational potential energy of mass as it rises<br>• kinetic energy of mass as it moves<br>• Elastic potential energy stored in spring<br>• Heat/sound dissipated to surroundings<br><br>**Linked ideas**<br>• As the pendulum falls, gravitational potential energy changes to kinetic energy.<br>• the kinetic energy from the pendulum ends up as heat, warming the surroundings.<br>• the elastic potential energy in the clockspring becomes kinetic energy of the pendulum to keep the pendulum swinging. | **(6)** |
| **Level** | **0** | no rewardable material | |
| **1** | **1-2** | • a limited description including the name of one form of energy that is involved in the pendulum swing eg. the pendulum has kinetic energy.<br>• the answer communicates ideas using simple language and uses limited scientific terminology<br>• spelling, punctuation and grammar are used with limited accuracy | |
| **2** | **3-4** | • a simple description of the pendulum swing indicating where the energy can be found **OR** a simple transfer eg. When the pendulum is moving it has kinetic energy / the pendulum is high at the side of the swing so it has gravitational potential energy / As the pendulum swings it loses heat to the air / kinetic energy changes to potential energy / KE to PE.<br>• the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately<br>• spelling, punctuation and grammar are used with some accuracy | |
| **3** | **5 - 6** | • a detailed description of an energy transfer indicating where the energy can be found **and** where the transfer takes place eg. as the pendulum swings to and fro, gravitational potential energy changes to kinetic energy / kinetic energy is dissipated as heat and sound to the surroundings<br>• the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately<br>• spelling, punctuation and grammar are used with few errors | |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **3(a)(i)** | (force of) water (on ski) | air resistance/drag<br><br>ignore wind/unqualified friction | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **3(a)(ii)** | substitution (1)<br>500 – 300<br><br>evaluation (1)<br>200 (N) | <br><br><br>give full marks for correct answer, no working | **(2)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **3(a)(iii)** | to the right | forward/direction skier is travelling/towards the boat | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **3(b)(i)** | **B** J | | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **3(b)(ii)** | substitution (1)<br>54 × 10 × 5<br><br>evaluation (1)<br>2700 | <br><br>**Ignore** unit (J) even incorrect<br><br>give full marks for correct answer, no working | **(2)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **3(b)(iii)** | A description including **two** of the following points<br><br>• (some) KE at the ramp (1)<br><br>• is transferred to GPE at top (1)<br><br>• still has some KE at top (1)<br><br>• some energy lost due to air ce (1) | <br><br>KE to GPE for 1 mark<br><br><br><br><br>air friction | **(2)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **4(a)(i)** | 1260 W | | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **4(a)(ii)** | substitution (1)<br>5040 = 240 × 10 × height<br><br>transposition (1)<br>height = $\frac{5040}{240 \times 10}$<br><br>evaluation (1)<br>2.1 (m) | <br><br><br>substitution and transposition in either order<br><br><br><br>give full marks for correct answer, no working | **(3)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **4(b)** | no movement (in direction of force) /<br>(work done=) weight x 0 = 0 | stationary<br>it is not changing height<br>is in same position<br><br>ignore ref to terminal velocity, force and acceleration | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **4(c)** | substitution (1)<br>240 × 6.4<br><br>evaluation (1)<br>1500<br><br><br>Unit (1)<br>kg m/s independent mark | <br><br><br>1536<br><br>give (2) marks for correct answer, no working<br><br><br>Ns | **(3)** |