

Question Number	Answer	Acceptable answers	Mark
<b>1(a)(i)</b>	<input checked="" type="checkbox"/> <b>B</b> $2.5 \div 4$		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>1(a)(ii)</b>	either $P = 2.5 \times 0.2$ or $2.5 = P / 0.2$ (1)  0.5 (W) (1)	give full marks for correct answer, no working	<b>(2)</b>

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

Question Number	Answer	Acceptable answers	Mark
<b>1(b)(ii)</b>	an explanation linking <ul style="list-style-type: none"> <li>• 2 MHz (1)</li> </ul> and any <b>one</b> from: <ul style="list-style-type: none"> <li>• has a higher intensity inside tissue (1)</li> <li>• less energy absorbed (1)</li> <li>• less attenuation (1)</li> <li>• penetrates furthest /deepest (1)</li> </ul>	this frequency alone  RA  loses intensity more gradually  highest penetration  accept "2MHz and 4MHz" with correct reason for 1 mark	<b>(2)</b>

Number			
<b>QWC</b>	<b>*1(c)</b>	<p>A comparison of endoscopes with any one of the following devices:</p> <p><b>Diagnostic devices</b></p> <ul style="list-style-type: none"> <li>• CAT scanners</li> <li>• Fluoroscopes</li> <li>• Thermal imagers / IR thermometers</li> <li>• Pulse oximeters</li> <li>• PET scanners</li> <li>• X-ray machines</li> <li>• Gamma cameras</li> </ul> <p><b>Link to electromagnetic radiation</b></p> <ul style="list-style-type: none"> <li>• Endoscopes use TIR of light in optical fibres</li> <li>• CAT scanners X- rays and computer to generate 3D images</li> <li>• Fluoroscopes use X- rays and a video camera</li> <li>• Thermal imagers use infrared emitted by a body</li> <li>• IR / red LEDs used to measure oxygen levels</li> <li>• PET scanners detect radiation emitted by electron-positron annihilation</li> <li>• Gamma cameras detect gamma rays from radioactive sources</li> </ul> <p><b>Other factors for comparison</b></p> <ul style="list-style-type: none"> <li>• Safety</li> <li>• Ease of use</li> <li>• Frequency / wave length</li> <li>• Intensity</li> <li>• Penetration</li> <li>• Ionising / non-ionising</li> </ul>	<b>(6)</b>
<b>Level</b>	<b>0</b>	No rewardable content	
<b>1</b>	<b>1 - 2</b>	<ul style="list-style-type: none"> <li>• a limited comparison between an endoscope and one device e.g. endoscopes use light and CAT scanners detect broken bones</li> <li>• the answer communicates ideas using simple language and uses limited scientific terminology</li> <li>• spelling, punctuation and grammar are used with limited accuracy</li> </ul>	
<b>2</b>	<b>3 - 4</b>	<ul style="list-style-type: none"> <li>• 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</li> <li>• the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately</li> <li>• spelling, punctuation and grammar are used with some accuracy</li> </ul>	
<b>3</b>	<b>5 - 6</b>	<ul style="list-style-type: none"> <li>• 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.</li> <li>• the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately</li> <li>• spelling, punctuation and grammar are used with few errors</li> </ul>	

Question Number	Answer	Acceptable answers	Mark
<b>2(a)</b>	elastic potential energy		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>2(b)(i)</b>	0.3(J) (1)	0.5-0.2 (J)	<b>(1)</b>

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

Question Number	Answer	Acceptable answers	Mark
<b>2(b)(iii)</b>	Any two of the following <ul style="list-style-type: none"> <li>• thermal/heat (1)</li> <li>• (idea that energy is) dissipated/spreads out (1)</li> <li>• to the surroundings (1)</li> </ul>	Ignore transferred to  Atmosphere/air  <b>Accept</b> makes surroundings warmer (2) Ignore lost	<b>(2)</b>



Question Number	Indicative content	Mark
<b>QWC</b>	<p><b>*2(c)</b> A description including some of the following points</p> <p><b>Forms of energy</b></p> <ul style="list-style-type: none"> <li>• gravitational potential energy</li> <li>• kinetic energy</li> <li>• elastic potential energy</li> <li>• heat(thermal) and sound</li> </ul> <p><b>Location of energy</b></p> <ul style="list-style-type: none"> <li>• gravitational potential energy of mass as it rises</li> <li>• kinetic energy of mass as it moves</li> <li>• Elastic potential energy stored in spring</li> <li>• Heat/sound dissipated to surroundings</li> </ul> <p><b>Linked ideas</b></p> <ul style="list-style-type: none"> <li>• As the pendulum falls, gravitational potential energy changes to kinetic energy.</li> <li>• the kinetic energy from the pendulum ends up as heat, warming the surroundings.</li> <li>• the elastic potential energy in the clockspring becomes kinetic energy of the pendulum to keep the pendulum swinging.</li> </ul>	<b>(6)</b>
<b>Level</b>	<b>0</b> no rewardable material	
<b>1</b>	<p><b>1-2</b></p> <ul style="list-style-type: none"> <li>• a limited description including the name of one form of energy that is involved in the pendulum swing eg. the pendulum has kinetic energy.</li> <li>• the answer communicates ideas using simple language and uses limited scientific terminology</li> <li>• spelling, punctuation and grammar are used with limited accuracy</li> </ul>	
<b>2</b>	<p><b>3-4</b></p> <ul style="list-style-type: none"> <li>• a simple description of the pendulum swing indicating where the energy can be found <b>OR</b> 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.</li> <li>• the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately</li> <li>• spelling, punctuation and grammar are used with some accuracy</li> </ul>	
<b>3</b>	<p><b>5 - 6</b></p> <ul style="list-style-type: none"> <li>• a detailed description of an energy transfer indicating where the energy can be found <b>and</b> 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</li> <li>• the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately</li> <li>• spelling, punctuation and grammar are used with few errors</li> </ul>	

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

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

Question Number	Answer	Acceptable answers	Mark
<b>3(a)(iii)</b>	to the right	forward/direction skier is travelling/towards the boat	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(b)(i)</b>	<b>B J</b>		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(b)(ii)</b>	substitution (1) $54 \times 10 \times 5$  evaluation (1) 2700	<b>Ignore</b> unit (J) even incorrect  give full marks for correct answer, no working	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(b)(iii)</b>	A description including <b>two</b> of the following points <ul style="list-style-type: none"> <li>• (some) KE at the ramp (1)</li> <li>• is transferred to GPE at top (1)</li> <li>• still has some KE at top (1)</li> <li>• some energy lost due to air ce (1)</li> </ul>	KE to GPE for 1 mark          air friction	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>4(a)(i)</b>	1260 W		<b>(1)</b>

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

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

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