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

Question Number	Answer	Acceptable answers	Mark
1(a)(ii)	either P = 2.5 x 0.2 or 2.5 = P / 0.2 (1) 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 • 2 MHz (1) and any **one** from: • has a higher intensity inside tissue (1) • less energy absorbed (1) • less attenuation (1) • penetrates furthest /deepest (1)	this frequency alone RA loses intensity more gradually highest penetration 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: **Diagnostic devices** • CAT scanners • Fluoroscopes • Thermal imagers / IR thermometers • Pulse oximeters • PET scanners • X-ray machines • Gamma cameras **Link to electromagnetic radiation** • Endoscopes use TIR of light in optical fibres • CAT scanners X- rays and computer to generate 3D images • Fluoroscopes use X- rays and a video camera • Thermal imagers use infrared emitted by a body • IR / red LEDs used to measure oxygen levels • PET scanners detect radiation emitted by electron-positron annihilation • Gamma cameras detect gamma rays from radioactive sources **Other factors for comparison** • Safety • Ease of use • Frequency / wave length • Intensity • Penetration • 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 • the answer communicates ideas using simple language and uses limited scientific terminology • 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 • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • 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. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, 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) 0.2÷0.5 evaluation (1) 0.4 / 40(%) / $^{2}/_{5}$	Give full marks for correct answer with no working	**(2)**

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

Question Number		Indicative content	Mark
QWC	***2(c)**	A description including some of the following points **Forms of energy** • gravitational potential energy • kinetic energy • elastic potential energy • heat(thermal) and sound **Location of energy** • gravitational potential energy of mass as it rises • kinetic energy of mass as it moves • Elastic potential energy stored in spring • Heat/sound dissipated to surroundings **Linked ideas** • As the pendulum falls, gravitational potential energy changes to kinetic energy. • the kinetic energy from the pendulum ends up as heat, warming the surroundings. • 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. • the answer communicates ideas using simple language and uses limited scientific terminology • 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. • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • 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 • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • 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 ignore wind/unqualified friction	**(1)**

Question Number	Answer	Acceptable answers	Mark
3(a)(ii)	substitution (1) 500 – 300 evaluation (1) 200 (N)	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) 54 × 10 × 5 evaluation (1) 2700	**Ignore** unit (J) even incorrect 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 • (some) KE at the ramp (1) • is transferred to GPE at top (1) • still has some KE at top (1) • some energy lost due to air resistance (1)	KE to GPE for 1 mark 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) 5040 = 240 × 10 × height transposition (1) 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	**(3)**

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

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