Question number	Answer	Mark
1(a)	B	(1)

Question number	Answer	Additional guidance	Mark
1(b)	Rearrangement (1) $V_2 = (p_1 \times V_1) \div p_2$ Substitution (1) $V_2 = (297 \times 10^3 \times 23.0) \div (101 \times 10^3)$ Evaluation (1) $V_2 = 67.6\,(cm^3)$	67.633	(3)

Question number	Answer	Mark
1(c)	An answer that combines the following points to provide a logical description of the plan: EITHER • (determine upthrust) by adding weights until the block of wood is fully immersed and recording the load required (1) • calculate upthrust by adding load and weight of block (1) OR • (determine the weight of water displaced) by using a ruler to measure the dimensions of the block and multiplying them together to find the volume (1) • calculate the weight of water from volume × density × g (1)	(2)

Question number	Ind	Mark
*1(d)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. **AO1 (3 marks)** • upthrust is the force on the submarine in the water (submerged) in a fluid • upthrust on the submarine and its weight act in opposite directions • upthrust is equal to the weight of water displaced by the submarine • the difference in pressures on the upper and lower surfaces of the submarine causes the upthrust **AO2 (3 marks)** • the volume of the submarine is fixed so the upthrust on the submarine is constant • increasing/decreasing volume of water in tanks increases/ decreases weight of submarine but does not affect upthrust • if weight increases to become greater than upthrust there is a resultant downward force on the submarine so the submarine sinks • if weight decreases to become less than upthrust there is a resultant upward force on the submarine so the submarine rises	**(6)**

Level	Mark	Descriptor
	0	No awardable content.
Level 1	1–2	• Demonstrates elements of physics understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • The explanation attempts to link and apply knowledge and understanding of scientific ideas, flawed or simplistic connections made between elements in the context of the question. (AO2)
Level 2	3–4	• Demonstrates physics understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • The explanation is mostly supported through linkage and application of knowledge and understanding of scientific ideas, some logical connections made between elements in the context of the question. (AO2)
Level 3	5–6	• Demonstrates accurate and relevant physics understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • The explanation is supported throughout by linkage and application of knowledge and understanding of scientific ideas, logical connections made between elements in the context of

Question number	Answer	Mark
2(a)(i)	pressure = force ÷ area	(1)

Question number	Answer	Additional guidance	Mark
2(a)(ii)	rearrangement (1) $(F =) P \times A$ calculation of area (1) $2.4 \times 1.5 = 3.6$ substitution (1) $(F =) 12\,000 \times 3.6$ answer (1) 43 200 (N)	award full marks for correct numerical answer without working maximum 3 marks if kPa not converted to Pa	(4)

Question number	Answer	Mark
2(a)(iii)	B	(1)

Question number	Answer	Mark
2(b)	An answer that combines the following points to provide a plan: • put weights on the plunger to increase the pressure of the trapped air (1) • use scale on syringe to measure the volume of trapped air (1) • calculate the pressure from P = weight added/area of plunger (1) • compare the increase in pressure to the volume of trapped air (1)	(4)