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

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

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

Question Number	Answer	Acceptable answers	Mark
1(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
1(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 ce (1)	 KE to GPE for 1 mark air friction	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(a)(i)	B to the left ←		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(a)(ii)	A accelerating		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(a)(iii)	substitution 625x 10 (1) Evaluation 6250 (N) (1)	625 x 9.8 6125 (N) give full marks for correct answer, no working	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(b)(i)	 (1) air resistance (1)	upward arrow on any part of line vertical line from any point on the diagram air friction, upthrust, drag Ignore any downward arrow labelled weight or gravity	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(b)(ii)	Balanced (1) Zero (1)		**(2)**

Total for marks for question 1 = 8

Question Number	Answer	Acceptable answers	Mark
3 (a) (i)	C		**(1)**

Question Number	Answer	Acceptable answers	Mark
3 (a) (ii)	acceleration	Recognisable mis-spellings More than one word written scores zero EXCEPT for the phrase Acceleration due to gravity which scores 1 mark	**(1)**

Question Number	Answer	Acceptable answers	Mark
3 (b)	Substitution weight = 0.00008 x 10 (1) evaluation 0.0008 (N) (1)	8×10^{-4} 1/1250	**(2)**

Question Number	Answer	Acceptable answers	Mark
3 (c)	Substitution speed = 13 / 1.7 (1) evaluation 7.6 (m/s) (1)	An answer which rounds to 7.6 eg 7.647 7.65 7.7	**(2)**

Question Number		Indicative Content	Mark
QWC	*)	A explanation including some of the following points • drops near the top are accelerating • due to force of gravity • travel a greater distance in given time • there is air resistance on the drops as they fall • this increases with velocity • resultant force is downward • this reduces resultant force • eventually resultant force is zero • drops have reached terminal/ maximum velocity • drops near bottom are all travelling at terminal velocity • so travel same distance in given time	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited explanation such as one which correctly addresses either why the drops at the bottom are evenly spaced or why the drops at the top are not e. drops at bottom are all going at the same speed OR drops at top are speeding up • 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 explanation such as a correct comparison of the motion of the drops at top and bottom e.g. drops at bottom are travelling at terminal velocity whereas drops at top are still accelerating. **Or** a complete explanation of motion at either top or bottom e.g.at the bottom, air resistance and gravity forces are balanced so they travel at constant speed • 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 explanation such as one which explains why the motion of the drops at top and bottom are different e.g. The drops were initially accelerating due to a resultant force downwards. The acceleration decreased as they fell and eventually reached zero. With no acceleration their velocity was constant and so equal distance travelled in given time at the bottom. • 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	Additional guidance	Mark
4(a)	Rearrangement (1) $m = \frac{f}{a}$ Substitution and conversion (1) $m = \frac{1870}{1.83}$ Answer and rounding to 3 s.f. (1) 1020 (kg)	maximum 2 marks if kN not converted to N award full marks for correct numerical answer without working	**(3)**

Question number	Answer	Additional guidance	Mark
4(b)	Rearrangement of $\frac{(v-u)}{t} = a$ (1) $v = u + at$ Substitution (1) $v = 0 + 1.83 \times 16$ Answer (1) 29.3 (m/s)	award full marks for correct numerical answer without working	**(3)**

Question number	Answer	Mark
4(c)	Correctly identifies data points from the graph to calculate areas (1) Calculates area under AB (1) 240 m Calculates area under CD (1) 135 m distance travelled at constant speed = 240 m is greater than distance travelled when slowing down = 135 m (1)	**(4)**