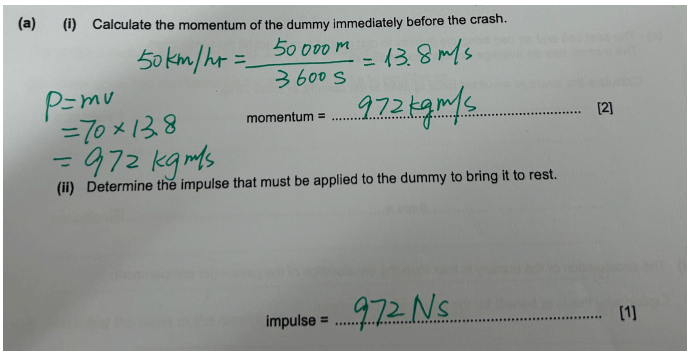
Example SQ MS

[1. Motion]

1	(a)	(i)	constant/steady/uniform speed/velocity OR speed/velocity = 2.5 (m/s) speed/velocity = 2.5 m/s accept fraction, average speed/velocity = 2.5 m/s	B1 B1	[2]
		(ii)	shape curving upward but not to vertical, at least to 3.5 s unless reaches 25 m	B1	[1]
	(b)		horizontal (straight) line OR careful sketch accept parallel to time/*x*-axis	B1	[1]
	(c)		tolerance on both axes ± ½ small square throughout both parts		
		(i)	horizontal straight line at 2.5 m/s from 0 to 2 s, ecf from **(a)(i)**	B1	
		(ii)	straight line rising to the right as far as the edge of the graph area Δv = 4 m/s or gradient clearly 2 m/s^2	M1 A1	[3]
	(d)		horizontal (straight) line at 0 m/s accept for both marks: line in/along time/*x*-axis OR line with y/v = 0 OR careful sketch	M1 A1	[2]

[Total: 9]

[2. Momentum]



[3. Moment]

2	(a)	upwards force = downwards force or no resultant force opposing moments equal or A.C.M. = C. M.	B1 B1	[2]
	(b)	30 x spring balance reading = 40 x 6.0 or equivalent spring balance reading = 8.0 N	C1 A1	[2]
	(c)	0.5 N downwards	B1 B1	[2] Total [6]

[4. Hooke's Law]

Question	Answer	Marks
2(a)	extension is (directly) proportional to load (if elastic limit is not exceeded)	B1
2(b)(i)	0 to 20.5 + / – 0.5 N	B1
2(b)(ii)	(k =) *F* / *x* OR (k =) 1 / gradient	C1
	140 N / m OR 0.14 N / mm	A1
2(b)(iii)	60 OR 61 OR 62 OR 63 (mm) seen	C1
	180 mm OR 0.18 m	A1
2(c)	W = mg in any form OR (m =) W / g OR (m) = 4 / 8.7	C1
	0.46 kg	A1

[5. Pressure]

3	(a)	(i)	hdg or $70 \times 1050 \times 10$	C1	
			735 000 Pa or 7.35×10^5 Pa accept N/m^2 for Pa	A1	
		(ii)	8.35×10^5 Pa OR his **(a)(i)** + 1.0×10^5 accept N/m^2 for Pa	B1	
	(b)		pressure × area or P = F/A or $6.5 \times 10^5 \times 2.5$	C1	
			1.625×10^6 N	A1	
	(c)		because density is less accept new calculation of pressure OR because salt water is denser	B1	[6]

[6. Energy and Work]

Question	Answer	Marks
2(a)	energy (of a mass/body/object) due to motion/speed/velocity	**B1**
2(b)(i)	$E = \frac{1}{2}mv^2$	**C1**
	$480 = \frac{1}{2} \times m \times 80^2$ so $m = 0.15$ kg	**A1**
2(b)(ii)	**1.** $E = mgh$ **or** $\Delta E = mg\Delta h$	**C1**
	$= 0.15 \times 9.81 \times 210$ $= 310$ J	**A1**
	2. work done $= 480 - 310$ $= 170$ J	**A1**
2(b)(iii)	work done = Fs	**C1**
	force $= 170 / 210$ $= 0.81$ N	**A1**
2(b)(iv)	curved line from positive value on v-axis to (T, 0)	**M1**
	magnitude of gradient decreases	**A1**
2(b)(v)	as shell rises force decreases and as shell falls force increases	**B1**
	as shell rises force is downward and as shell falls force is upward	**B1**
	or	
	as shell rises the force decreases and is downward	**(B1)**
	as shell falls the force increases and is upward	**(B1)**

[7. Thermal]

Question	Answer	Marks
4(a)	Molecules of hot liquid collide with (surface of) spoon	**B1**
	transfer energy / heat to (molecules of) spoon	**B1**
	(amplitude of) vibration of spoon's molecules increases / is faster (increasing spoon's temperature)	**B1**
4(b)	Molecules of hot liquid (also) transfer energy to (free) electrons in the spoon	**B1**
	These (free) electrons move through the metal	**B1**
4(c)	($Q =$) $mc\Delta\theta$	**C1**
	$150 \times 4.2 \times (80 - 56)$	**C1**
	15000 J	**A1**

[8. Wave]

6(a)(i)	wavefronts semicircles or part semicircles centred on gap	**B1**
	wavelength of waves to right of barrier same as wavelength of incident wave	**B1**
6(a)(ii)	1 wavelength shorter	**B1**
	correct refraction	**B1**
	2 direction of travel perpendicular to wavefronts	**B1**
6(b)	any **two** from: • particles (in transverse waves) vibrate perpendicular to the direction of travel (of the wave) OR particles in longitudinal waves vibrate parallel to the direction of travel of the wave • longitudinal waves have compressions and rarefactions • transverse waves have troughs and crests	**B2**
6(c)(i)	1000 m / s ⩽ value ⩽ 2000 m / s	**B1**
6(c)(ii)	molecules closer together / water has greater density	**B1**