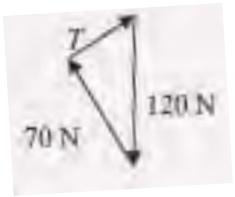
Question			Expected Answers	Marks	Additional Guidance
1	a		A quantity with magnitude / size <u>and</u> direction Suitable example: displacement / velocity / acceleration / force / weight etc	B1 B1	
	b	i	$F_x = F\cos\theta$ $7.0 = F \times \cos 30$ F = 8.1 (N) or 8.08 (N)	C1 A1	**Allow**: 1 mark for 'radian' error; answer is 45.3 (N) **Note**: No marks for '7.0 × cos30 = 6.06 N'
		ii	**1** $W = 7.0 \times 5.0$ or $W = 8.08 \times 5.0 \times$ <u>cos30</u> work done = 35 (J) **2** 'power' = 35/4.2 = 8.3 (W)	C1 A1 B1	Possible ecf **Note**: If answer for **(b)(i)** is 6.06 (N), then '6.06 × 5.0 × <u>cos30</u> = 26.2 (J)' scores 2/2 because of ecf Possible ecf
	c	i	Magnitude is 120 (N) / equal to weight Direction is (vertically) up / opposite to weight	B1 B1	
		ii	Correct diagram Correct detail on diagram  $120^2 = 70^2 + T^2$ T = 97 (N) or 97.5 (N)	M1 A1 C1 A1	**Note**: For the M1 mark, the basic diagram must have all sides labelled (70, 120 and T) <u>and</u> the angle between 70 (N) and T is judged by eye to be 90° **Note**: For the A1 mark, all the arrows are marked and cyclic **Note**: For the C1 A1 marks, $T = \sqrt{120^2 + 70^2} = 140$ scores zero **Allow:** 2 marks for T in the range of 94 (N) to 100 (N) if scale drawing is done
			Total	**13**	

Question			Answer	Marks	Guidance
2	(a)		(1 watt is equal to) 1 joule (of energy transferred) per second	B1	**Allow**: (1) J s^{-1} **Not**: '1 J (of energy transferred) in 1 s' because the per or rate idea is not clear **Note**: Do not allow mixture of quantity and unit. Eg: '1 J per unit time' or 'energy per second'
	(b)	(i)	$E_p = 700 \times 9.81 \times 8.5$ $E_p = 5.8(4) \times 10^4$ (J)	B1	
		(ii)	output power = $\frac{5.84 \times 10^4}{45}$ output power = 1.3×10^3 (W)	B1	Possible ecf from **(i)**
		(iii)	input power = $1.3 \times 10^3 / 0.3$ input power = 4.3×10^3 (W)	B1	Possible ecf from **(ii)**
			Total	**4**	

Question			Answer	Marks	Guidance
3	(a)	(i)	(work done =) Fx and $F = ma$ (Allow any subject)	B1	**Allow**: d or s instead of x
		(ii)	(E_k =) max or (work done =) max (Allow any subject)	B1	**Note**: This mark is for substituting 'ma' into the equation 'Fx'
			$v^2 = 2ax$	B1	
			Use of $v^2 = 2ax$ and $E_k = max$ to show KE = ½ mv^2	B1	**Note**: This B1 mark is for manipulation of equations leading to KE = ½ mv^2 **Allow** full credit for alternative approaches
	(b)		The (braking) distance is more (than 50m)	B1	
			KE = Fx	B1	Alternative: Fx = ½ mv^2 B1
			Correct reasoning for longer braking distance, eg: (KE increases and) $x \propto$ KE	B1	*Correct reasoning for longer braking distance, eg:* $x \propto m$ B1
			Or		
			The (braking) distance is more (than 50m)	B1	
			The van has smaller deceleration (for the same force)	B1	**Allow**: smaller acceleration
			Correct reasoning for longer braking distance in terms of $v^2 = u^2 + 2as$	B1	**Allow**: Correct reasoning for longer distance in terms of equations of motion
			Total	**7**	