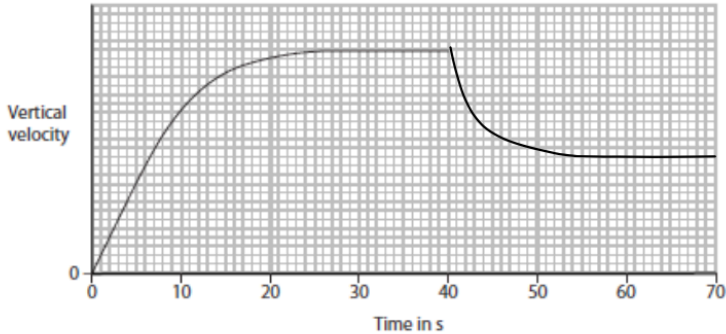
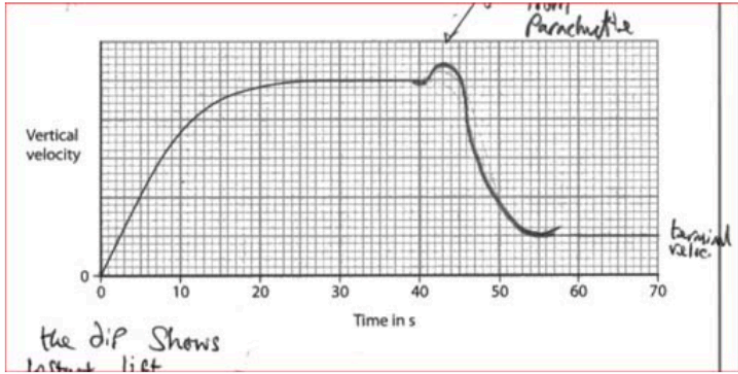


Question number			Answer	Notes	Marks
1	(a)	(i)	Weight = mass x g;	allow in accepted symbols ignore units, triangle eqns	1
		(ii)	700; N / newton(s);	ignore kg m/s ²	1 1
	(b)		<i>EXPANATIONS (not descriptions)</i> Any four from: MP1. Weight / resultant force downwards; MP2. so at first (skydiver) accelerates; MP3. but drag increases with speed; MP4. hence resultant force decreases; MP5. so acceleration then decreases; MP6. so forces eventually balanced; MP7. causing terminal velocity;	allow suitable labels on graph drag = weight allow constant speed for terminal velocity but not maximum speed	4

Question number	Answer	Notes	Marks
(c)	Arrow up labelled drag / air resistance/air friction; Arrow down labelled weight; arrows approximately equal length;	independent marks Judged by eye throughout No requirement for arrows to be attached to centre of mass	3
(d)	smooth reduction in velocity; to a new lower terminal/constant positive velocity; e.g.	any line or curve except along the $t = 40$ s line Ignore attempts to show effects of opening the parachute or reaching the ground	2
			

Total 12 marks

Question number	Answer	Notes	Marks
6 (a) (i)	gravitational potential energy = mass x gravitational field strength x height;	ALLOW standard symbols (m x g x h) DO NOT ALLOW 'gravity' for g	1
(ii)	substitution into correct equation; calculation; e. g.p.e. = 2000 x 10 x 128 2.56 (MJ)	answer given to at least 3 sf Allow J if correct (2560 000)	1 1
(b) (i)	2.56 (MJ);	Value from (a) (ii) / 2.6 MJ	1
(ii)	They are <u>equal</u> / k.e. = work done;		1
(iii)	work done = force x distance;	ALLOW standard symbols	1
(iv)	Substitution into correctly rearranged equation; Calculation; e. $d = W / F = 2\,560\,000 / 32\,000$ 80 (m)	Allow ecf for value of energy stated in (a) (ii) or (b) (i)	1 1

Question Number	Answer		Marks
6 (c)	Any TWO from (Windy) – (extra) drag / air resistance / friction; more energy wasted (overcoming friction); (Wet) – less friction / no friction / slipperier / less traction / less grip; less energy transferred to car (at launch);	ANSWERS SHOULD REFER TO THE SITUATIONS GIVEN	2
		Total	10

Question number	Answer	Accept	Reject	Marks
3 (a) (i)	momentum = mass x velocity;			1
(ii)	Substitution into correct equation; Calculation; e.g. momentum = $0.15 \times 6 = 0.9$;; Unit: kg m/s;	kg ms ⁻¹ Ns		3
(iii)	$0.9 = (0.15 + 0.05) \times v$; $v = 0.9 \div 0.2 = 4.5$ (m/s);	Ecf from 8(a) (ii) (i.e. answer for 8a ii $\div$ 0.2 or answer for 8a ii $\times$ 5)		2
(b)	The student is wrong; Because variables are not controlled; e.g. mass of cloth different, mass of (other) tins different, cloth velocity not measured	Student is right if the mass of the second cloth is 0.3 kg;; Student is right if the momentum of the second cloth is 1.8 kg m/s;; (assuming all tins are 0.05 kg/ throws new cloth with exactly the same velocity)		2

Total 8 marks