

## Forces and Motion 2 chpt 1 - 4 Answers

1)	(a) (i)	acceleration OR increasing speed	C1
		constant acceleration OR constant rate of increase in speed	A1
	(ii)	decreasing acceleration OR decreasing rate of increase in speed NOT deceleration	B1
	(b)	mention of air resistance AND weight (of object) / force due to gravity	B1
		acceleration at start (of fall) is acceleration of gravity / $10 \text{ m/s}^2$ / a maximum / $g$ OR acceleration decreases (as it falls)	B1
		air resistance increases as speed increases/as it accelerates	B1
		acceleration zero/terminal velocity/constant speed/maximum speed when air resistance = weight	B1
			<b>[Total: 7]</b>
2)	(a)	dots farther apart (in 2nd time interval) owtte	B1
	(b) (i)	(average speed =) $d \div t$ , in any form, e.g. words, symbols, numbers  0.095 m/s	C1  A1
	(ii)	(average speed =) 0.29 m/s	B1
	(c)	$(a =) (v - u) \div t$  = (candidate's <b>(b)(ii)</b> – candidate's <b>(b)(i)</b> ) $\div$ 0.02  correct value calculated from candidate's values in <b>(b)(i)(ii)</b> , expect $9.5 \text{ m/s}^2$	C1  C1  A1
3)	(a) (i)	horizontal line at 10 m/s	B1
	(ii)	straight line from origin to (5.0, 25)	B1
	(b) (i)	50 m	B1
	(ii)	area of triangle OR $\frac{1}{2} \times 25 \times 5.0$  62.5 m OR 63 m	C1  A1
	(iii)	when areas under graphs are equal 4.0 s	C1 A1
			<b>[Total: 7]</b>

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- 4)
- (a) point marked P (on line or time axis) at  $t \geq 2.0$  s B1
- (b) (i) attempt at gradient OR  $(a =) \Delta v / t$  OR  $(v - u) / t$  OR  $240 (-0) / 2.0$   
OR division of correct points on graph C1  
 $120 \text{ m/s}^2$  A1
- (ii) suggestion of area (under graph) in words or formula or numbers C1  
OR  $0.5 (120 + 240) \times 1.0$  OR  $[(120 \times 1.0) + (0.5 \times 120 \times 1.0)]$  C1  
 $180 \text{ m}$  A1
- (c) mass of sled changes/decreases OR fuel used up B1
- [Total: 6]**
- 5)
- (a) (i) any scalar quantity other than mass B1
- (ii) any vector quantity other than force B1
- (b)  $F = ma$  in any form OR  $(a =) F / m$  C1  
 $50\,000 / 290\,000$  OR  $50 / 290$  C1  
 $a = 0.17 \text{ m/s}^2$  A1
- 6)
- (a) (i) (it/comet) travels in a straight line B1
- (ii) area (under graph) OR  $s = vt$  in any form OR  $vt$  C1  
 $220\,000 \text{ m}$  OR  $220 \text{ km}$  A1
- (b) negative acceleration OR deceleration OR (it/the comet) is slowing down B1  
acceleration/deceleration (only accept **it** if acc/decel already mentioned) B1  
not constant allow either increasing or decreasing B1
- (c) attempt at gradient OR  $(a =) \Delta v / \Delta t$  OR  $(0-)12\,000 / 2.0$  OR other correct values for  $\Delta v / \Delta t$  C1  
 $(-)6000 \text{ m/s}^2$  tolerance  $5000 - 7000 \text{ m/s}^2$  A1
- (d) (it/comet) hits surface (of planet) B1  
OR stops o.w.t.t.e. B1
- [Total: 8]**
- 7)
- (a) speed is constant/uniform/unchanging OR terminal velocity/speed B1  
no net/resultant force OR air resistance cancels/equals weight B1
- (b) P between  $0.25 \text{ s}$  and  $1.90 \text{ s}$  (inclusive) B1
- (c) (i)  $(a =) \Delta v / t$  OR  $2.5 / 0.25$  OR other point on correct section of line B1  
 $9.6$  to  $10 \text{ m/s}^2$  (inclusive) B1
- (ii) area under graph OR attempt at counting squares OR between  $16.2$  and  $17.5 \text{ m}$  C1  
(inclusive) C1  
between  $16.5$  and  $17.1 \text{ m}$  (inclusive) A1
- [Total: 7]**

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- 8) (a) underline or circle force B1  
 underline or circle velocity B1
- (b) (i) 4.07 – 4.1 (s) B1
- (ii)  $(v - u)/t$  OR  $\Delta v/t$  OR in words OR use of  $40 \div$  (ans. to (b)(i))  
 OR other correct values from graph C1  
 answer between 9.7 and 10 m/s<sup>2</sup> or m/s/s A1
- (iii) area under graph OR  $\frac{1}{2}(u + v)t$  OR  $\frac{1}{2} \times 40 \times$  (ans. to (b)(i)) C1  
 OR  $s = ut + \frac{1}{2}at^2$  OR  $v^2 = u^2 + 2as$  OR numbers substituted A1  
 82 m
- (c) graph continues in straight line to 6 s B1

**[Total 8]**

- 9) (a) measure area (under curve) B1 [1]
- (b) draws tangent at steepest part by eye, within thickness of lines  
 accept triangle/lines to indicate values on straight steepest part of curve B1
- finds  $\Delta v$  and  $\Delta t$  from tangent or at straight steepest part of curve B1
- any  $v$  divided by any  $t$  or in equation B1
- 3.0 – 4.2 m/s<sup>2</sup> B1 [4]
- (c) uses 62 and 10 NOT  $2 \times 62$  C1  
 6.2 m/s A1 [2]

**[Total: 7]**