

Mark Scheme SUVAT Past Paper Questions

Jan 2002 to Jan 2009

7(a)(i) $E_p = mg\Delta h$ ✓ **Q7 Jun 2002**
 $= 5.8 \times 10^{-2} \times 9.8(1) \times 1.5 = 0.85 \text{ J}$ ✓

(ii) 0.85 J ✓
 (allow C.E. for value of E_p from (i))

(iii) (use of $E_k = \frac{1}{2}mv^2$ gives) $0.85 = 0.5 \times 5.8 \times 10^{-2} \times v^2$ ✓
 (allow C.E. for answer from (ii))
 $(v^2 = 29.3)$ $v = 5.4 \text{ m s}^{-1}$ ✓

(iv) (use of $p = mv$ gives) $p = 5.8 \times 10^{-2} \times 5.4$ ✓
 (allow C.E. for value of v from (iii))
 $= 0.31 \text{ N s}$ ✓ (7)

(b) $\left(\text{use of } F = \frac{\Delta(mv)}{\Delta t} \text{ gives} \right) F = \frac{0.31}{0.010}$ ✓
 (allow C.E. for value of p from (iv))
 $= 31 \text{ N}$ ✓

[or $a = \frac{5.4}{0.010} = 540 \text{ (m s}^{-2}\text{)}$ ✓

$F = 5.8 \times 10^{-2} \times 540 = 31 \text{ N}$ ✓] (2)

(c) egg effectively stopped in a longer distance ✓
 hence greater time and therefore less force on egg ✓
 [or takes longer to stop

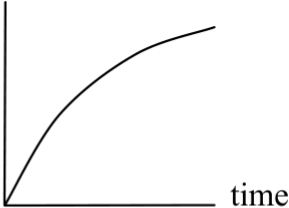
hence force is smaller as $F = \frac{\Delta(mv)}{t}$]

[or acceleration reduced as it takes longer to stop
 thus force will be smaller]

[or some energy is absorbed by container
 less absorbed by egg]

(2)
 (11)

Question 1	Q1 Jan 2006	
(a)	scales ✓ six points correctly plotted ✓ trendline ✓	3
(b)	average acceleration = $\frac{26}{25}$ ✓ $= 1.0(4) \text{ ms}^{-2}$ ✓ (allow C.E. for incorrect values used in acceleration calculation)	2
(c)	area under graph ✓ $= 510 \pm 30 \text{ m}$ ✓	2
(d)	(graph to show force starting from y-axis) decreasing (not a straight line) ✓ to zero (at end of graph) ✓	2
(e)	(since) gradient of a velocity-time graph gives acceleration ✓ first graph shows acceleration is decreasing ✓	2
	Total	11

Question 6	Q6 Jun 2006	
(a) (i)	(use of $a = \frac{\Delta v}{\Delta t}$ gives) $a = \frac{4.5}{3600}$ ✓ $= 1.25 \times 10^{-3} \text{ ms}^{-2}$ ✓	4
(ii)	(use of $v^2 = u^2 + 2as$ gives) $0 = 4.5^2 - 2 \times 1.25 \times 10^{-3} \times s$ ✓ $s \left(= \frac{20.25}{2.5 \times 10^{-3}} \right) = 8.1 \times 10^3 \text{ m}$ ✓	
(b)	<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;">distance</div>  <div style="margin-left: 20px;"> increasing curve ✓ correct curve ✓ </div> </div> <div style="text-align: center; margin-top: 10px;">time</div>	2
(c)	gradient (slope) of graph represents speed ✓ hence graph has decreasing gradient ✓	2
	Total	8

Question 2		Q2 Jan 2007	
(a)	(i) (use of $a = (v - u) \div t$ gives) acceleration = $29 \div 2.0 = 14.5 \text{ ms}^{-2}$	✓	4
	(ii) (use of $s = ut + \frac{1}{2} at^2$) $s = \frac{1}{2} \times 14.5 \times 2^2$ $s = 29 \text{ m}$	✓✓	
	(iii) (use of <i>distance = speed × time</i> gives) $s = 29 \times 15 = 435 \text{ m}$	✓	
(b)	(i) <p>reaction time acceleration over 2.0 s constant speed</p>	✓✓✓	6
	(ii) (use of <i>distance = average speed × time</i>) distance travelled by antelope = $2 \times 12.5 + 14.5 \times 25 = 387.5$ ✓	✓✓	
	(iii) distance = $100 + 387.5 - 464 = 23 \text{ m}$ ✓(23.5)	✓	
		Total	10

Question 1		Q1 Jun 2007	
(a)	gradient (or slope or steepness) is changing ✓ or graph a curve (or not a straight line)		1
(b)	$25 \pm 3 \text{ m}$ ✓		1
(c)	(use of <i>speed = distance ÷ time</i> gives) speed = $100 \div 11$ speed = $9.1 \pm 0.2 \text{ ms}^{-1}$ ✓		1
(d)	(i) constant acceleration ✓ or acceleration stays the same or velocity increases uniformly with time		3
	(ii) (use of $s = ut + \frac{1}{2} at^2$ gives) $a = 2 \times 100 \div (11^2)$ ✓ $a = 1.7 \text{ ms}^{-2}$ ✓		
		Total	6

Question 5		Q5 Jan 2008	
(a)	(i)	(use of $F = ma$) $a = 1.9 \times 10^5 / 5.6 \times 10^4 = 3.4 \text{ ms}^{-2} \checkmark$	3
	(ii)	(use of $v^2 = u^2 + 2as$) $82^2 = 2 \times 3.4 \times s \checkmark$ $s = 989 \text{ m} \checkmark$ c.e. from (i)	
(b)		air resistance increases with speed \checkmark hence runway will be longer \checkmark	2
(c)	(i)	(use of $F_h = F \cos \theta$) $F_h = 1.9 \times 10^5 \times \cos 22$ $F_h = 1.8 \times 10^5 \text{ N} \checkmark$	2
	(ii)	$F_v = 1.9 \times 10^5 \times \sin 22 = 7.1 \times 10^4 \text{ N} \checkmark$	
		Total	7