Mark Scheme SUVAT Past Paper Questions

Jan 2002 to Jan 2009

Q7 Jun 2002

7(a)(i) $E_p = mg\Delta h$ ✓
$= 5.8 \times 10^{-2} \times 9.8(1) \times 1.5 = 0.85$ 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))
($v^2 = 29.3$) $v = 5.4$ 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))
$= 0.31$ 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))
$= 31$ N ✓

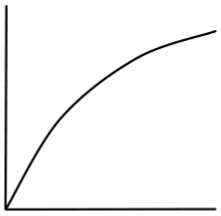
[or $a = \frac{5.4}{0.010} = 540$ (m s^{-2}) ✓
$F = 5.8 \times 10^{-2} \times 540 = 31$ N ✓] (*2*)

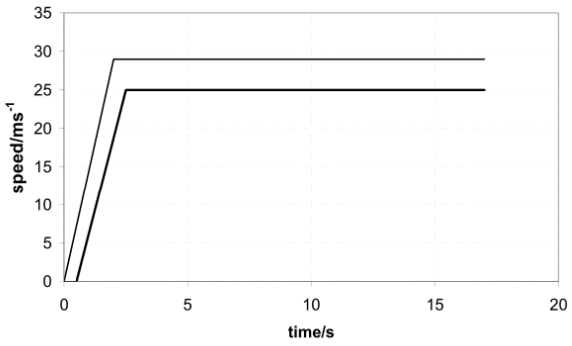
(c) egg effectively stopped in a longer distance ✓
hence greater time and therefore less force on egg ✓
[or takes longer to stop
hence force is smaller as $F = \frac{\Delta(mv)}{t}$]

[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 = $\frac{26}{25}$ ✓ $= 1.0(4)\ \text{m s}^{-2}$ ✓ (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) $a = \frac{4.5}{3600}$ ✓ $= 1.25 \times 10^{-3}\ \text{m s}^{-2}$ ✓	**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)		distance  time increasing curve ✓ correct curve ✓	**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 = $29 \div 2.0 = 14.5\,m\,s^{-2}$	✓	**4**
	(ii)	(use of $s = ut + \frac{1}{2}at^2$) $s = \frac{1}{2} \times 14.5 \times 2^2$ $s = 29\,m$	✓✓	
	(iii)	(use of *distance* = *speed* × *time* gives) $s = 29 \times 15 = 435\,m$	✓	
(b)	(i)	 reaction time acceleration over 2.0 s constant speed	✓✓✓	**6**
	(ii)	(use of distance = average speed × time distance travelled by antelope = 2 × 12.5 + 14.5 × 25 = 387.5 ✓	✓✓	
	(iii)	distance = 100 + 387.5 – 464 = 23 m ✓(23.5)	✓	
			Total	**10**

Question 1			
(a)		gradient (or slope or steepness) is changing ✓ **or** graph a curve (**or** not a straight line)	**1**
(b)		25 ± 3 m ✓ **Q1 Jun 2007**	**1**
(c)		(use of *speed* = *distance* ÷ *time* gives) speed = $100 \div 11$ speed = $9.1 \pm 0.2\,m\,s^{-1}$ ✓	**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) $a = 2 \times 100 \div (11^2)$ ✓ $a = 1.7\,m\,s^{-2}$ ✓	
		Total	**6**

Question 5		Q5 Jan 2008	
(a)	(i)	(use of $F = ma$) a = 1.9 × 10^5/5.6 × 10^4 = 3.4 m s^{-2} ✓	3
	(ii)	(use of $v^2 = u^2 + 2as$) 82^2 = 2 × 3.4 × s ✓ s = 989 m ✓ c.e. from (i)	
(b)		air resistance increases with speed ✓ hence runway will be longer ✓	2
(c)	(i)	(use of $F_h = F\cos\theta$) F_h = 1.9 × 105 × cos 22 F_h = 1.8 × 105 N ✓	2
	(ii)	F_V = 1.9 × 10^5 × sin 22 = 7.1 × 10^4 N ✓	
		Total	**7**