Mark Scheme 4729
June 2007

1	40 cos35°	B1		
	WD = 40cos35° x 100	M1		
	3280 J	A1 **3**	ignore units	**3**

2	$0 = 12\sin27°t – 4.9t^2$ any correct.	M1	**or** $R = u^2\sin2\theta/g$ (B2)	
	t = 1.11 …..method for total time	A1	correct formula only	
	R = 12cos27° x t	M1	12^2 x sin54° / 9.8 sub in values	
	11.9	A1 **4**	11.9	**4**

3 (i)	WD = ½x250x150^2 –½x250x100^2	M1		
	1 560 000	A1	1 562 500	
	450 000 = 1 560 000/t	M1		
	3.47	A1 **4**		
(ii)	F = 450 000/120	M1		
	3750	A1		
	3750 = 250a	M1		
	15 ms^{-2}	A1 **4**		**8**

4 (i)	$x = 7t$	B1		
	$y = 21t – 4.9t^2$	M1	**or** – g/2	
		A1		
	$y = 21.x/7 – 4.9\,x^2/49$	M1		
	$y = 3x – x^2/10$	A1 **5**	**AG**	
(ii)	$–25 = 3x – x^2/10$ (must be -25)	M1	**or** method for total time (5.26)	
	solving quadratic	M1	**or** 7 x total time	
	36.8 m	A1 **3**		**8**

5(i)	½ . 70 .4^2	M1		
	560 J	A1 **2**		
(ii)	70 x 9.8 x 6	M1		
	4120	A1 **2**	4116	
(iii)	60d	B1		
	8000 = 560 + 4120 + 60d	M1	4 terms	
		A1 ♪	♪ their KE and PE	
	55.4 m	A1 **4**		**8**

6 (i)	$5\cos30° = 0.3 \times 9.8 + S\cos60°$	M1	res. vertically (3 parts with comps)
		A1	
	2.78 N	A1 **3**	
(ii)	$r = 0.4\sin30° = 0.2$	B1	may be on diagram
	$5\sin30° + S\sin60° = 0.3 \times 0.2 \times \omega^2$	M1	res. horizontally (3 parts with comps)
	9.04 rads^{-1}	A1 **3**	
(iii)	$v = 0.2 \times 9.04$	M1	**or** previous v via mv^2/r
	KE $= \frac{1}{2} \times 0.3 \times (0.2 \times 9.04)^2$	M1	
	0.491 J or 0.49	A1✓ **3**	✓ their ω^2 x 0.006 **9**

7 (i)	$1.8 = -0.3 + 3m$	M1	
	$m = 0.7$	A1 **2**	**AG**
(ii)	$e = 4/6$	M1	accept 2/6 for M1
	2/3	A1 **2**	accept 0.67
(iii)	$\pm 3f$	B1	
	1/3 ↺ f (◌ 1)	B1 **2**	
(iv)	$I = 3f \times 0.7 - - 3 \times 0.7$	M1	ok for only one minus sign for M1
		A1	
	$I = 2.1 (f + 1)$	A1 **3**	aef 2 marks only for $-2.1(f + 1)$
(v)	$0.3 + 6.3/4 = 0.3a + 0.7b$	M1	can be $-0.7b$
	$3a + 7b = 18.75$	A1 *	aef
	$2/3 = (a - b)/ 5/4$	M1	allow e=3/4 or their e for M1
	$3a - 3b = 5/2$	A1 *	aef * means dependent.
	solve	M1	
	$a = 2.5$	A1	(2.46) allow $\pm$ (59/24)
	$b = 1.6$	A1 **7**	(1.625) allow $\pm$ (13/8) **16**

8 (i)	com of hemisphere 0.3 from O	B1	**or** 0.5 from base
	com of cylinder $h/2$ from O	B1	
	$0.6 \times 45 = 40 \times 0.5 + (0.8 + h/2) \times 5$ **or**	M1	**or** $40 \times 0.3 - 5xh/2 = 45 \times 0.2$
	$45(h+0.2) = 5h/2 + 40(h+0.3)$	A1	**or** $5(0.2 + h/2) = 40 \times 0.1$
	$27 = 20 + (0.8 + h/2) \times 5$	M1	solving
	$h = 1.2$	A1 **6**	**AG**
(ii)	1.2 T	B1	
	0.8 F	B1	
	$0.8F = 1.2T$	M1	
	$F = 3T/2$	A1 **4**	aef
(iii)	$F + T\cos30°$	B1	**or** $45 \times 0.8 \sin30°$
	$45\sin30°$ must be involved in res.	B1	$T \times (1.2 + 0.8\cos30°)$
	resolving parallel to the slope	M1	mom. about point of contact
	$F + T\cos30° = 45\sin30°$ aef	A1	$45.0.8\sin30° = T(1.2 + 0.8\cos30°)$
	$T = 9.51$	A1	
	$F = 14.3$	A1 **6**	**16**
or	$T + F\cos30° = R\sin30°$	B1	res. horizontally
(iii)	$R\cos30° + F\sin30° = 45$	B1	res. vertically
	$\tan30° = (T + F\cos30°)/(45 - F\sin30°)$	M1	eliminating R