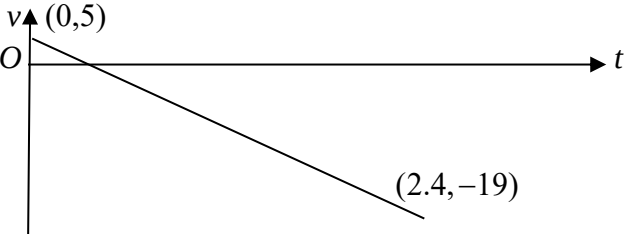


Question	Scheme	Marks	AOs
1.(a)	$19^2 = (-U)^2 + 2 \times 10 \times 16.8$ (Allow use of $g = 9.8$ for this M mark)	M1	2.1
	$U = 5 *$	A1*	1.1b
		(2)	
	For consistent use of $g = 9.8$ in parts (b), (c) and (d), treat as a MR. i.e. max (b) M1A0 (c)M1A0M(A)0A1ft (d)B1B1ft		
(b)	$19 = -5 + 10T$ OR $16.8 = \frac{(-5+19)}{2}T$ OR $16.8 = -5T + \frac{1}{2} \times 10T^2$ OR $16.8 = 19T - \frac{1}{2} \times 10T^2$	M1	2.1
	$T = 2.4$	A1	1.1b
		(2)	
(c)	$1.2 = -5t + \frac{1}{2} \times 10 \times t^2$	M1	2.1
	$5t^2 - 5t - 1.2 = 0$	A1	1.1b
		M(A)1	1.1b
	$t = 1.2$ (s)	A1	1.1b
		(4)	
(d)		B1 shape	1.1b
	(0,5) and (2.4,-19) Allow these to be marked on the axes.	B1ft	1.1b
		(2)	
(e)	Greater since air resistance would slow the ball down.	B1	3.5a
		(1)	
(f)	Take into account: spin, wind effects, use a more accurate value of g , not model the ball as a particle	B1	3.5c
		(1)	

(12 marks)

Notes:

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|-----|------|--|
| (a) | M1 | Complete method to find U , condone sign errors and use of $g = 9.8$ |
| | A1* | $U = 5$ cao correctly obtained – allow U^2 instead of $(-U)^2$. Allow verification. |
| (b) | M1 | Complete method to find T , condone sign errors |
| | A1 | $T = 2.4$ |
| (c) | M1 | Complete method to find t , condone sign errors |
| | A1 | Correct equation with at most one error |
| | (A)1 | Correct equation |
| | A1 | $t = 1.2$ (s) |
| (d) | B1 | Graph could be reflected in the t -axis. |
| | B1ft | Follow through on their T value.
If graph is reflected, $(0, -5)$ and $(2.4, 19)$ |
| (e) | B1 | Any similar appropriate comment |
| (f) | B1 | B0 if any incorrect extras e.g. weight/mass included |
| | | |