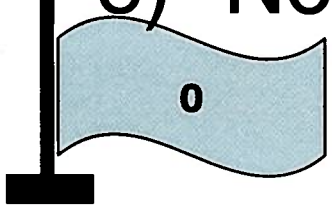
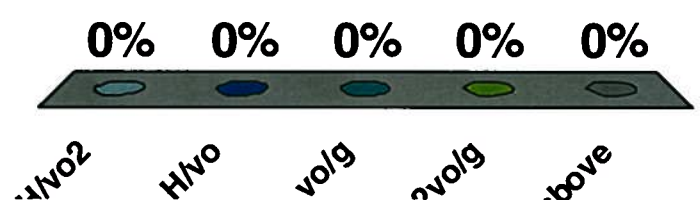
JGRIFFIN 2/22/08

Two similar objects of mass, M, and radius, R, are launched from the edge of a cliff with initial speed, v_o, one vertically upward and the other vertically downward. If both ultimately fall to the valley floor H meters below, how many seconds, Δt, is the object which was launched upward behind the other in hitting the valley floor? $\Delta t =$

a) gH/v_o^2
b) H/v_o
c) v_o/g
d) $2v_o/g$
e) None of the above





J. GRIFFIN 2/22/08 (b)

The correct delay time is d) $2v_o/g$; as follows.

- The object launched upward arrives at its maximum height at the time, t^{MAX}, when
- its vertical velocity falls to zero:
- Thus $v = 0 = v_o - g\, t^{MAX}$ implies $t^{MAX} = v_o/g$.
- Subsequently, it falls back to its launch height, arriving there at $2\, t^{MAX} = 2\, v_o/g$,
- but now with a downward velocity, v_o.
- Thence it follows the same trajectory of the downward launched particle, but delayed by $\Delta t = 2\, v_o/g$.