10/19/07@

A pendulum (M=2 kg) at its lowest point has a speed, v = 3 m/s. How high does it rise before reversing it motion? H =

a) $v^2/g = 0.9$ m

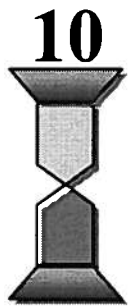
b) $(v^2/g)^{1/2} = 0.949$ m

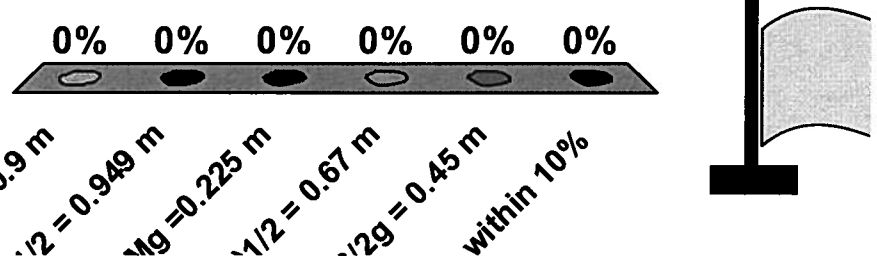
c) $v^2/2Mg = 0.225$ m

d) $(v^2/Mg)1/2 = 0.67$ m

✔ e) $v^2/2g = 0.45$ m

f) None within 10%





The correct answer is:

e) $H = v^2/2g = 0.45$ m

- By **Conservation of Mechanical Energy**, **(ME) = KE +PE = Constant** = $Mgh + Mv^2/2$;
- **Initially**, $h_i = 0$, & $(ME)_i = Mv^2/2$;
- **Finally,** height is $h_f = H$, & $v_f = 0$ (from $(KE)_f = 0$), so that **$(ME)_f$ =** $MgH + 0$ **= $(ME)_i$ =** $0 + Mv^2/2$;
- Therefore, **H** $= (Mv^2/2)/(Mg) = (v^2/2g) = 9/(2g)$ **=0.45 m**.
- NOTE that result is **independent of M =** mass of pendulum (just as is period, T_{pend}) since M occurs as factor in both KE and PE.
- Note also **only** answers **a) and e) have the required dimension** of Length: answers b), c), and d) can be rejected out of hand.