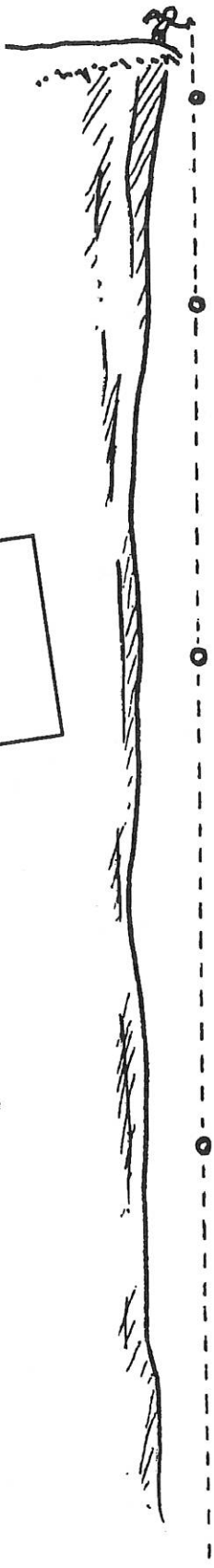
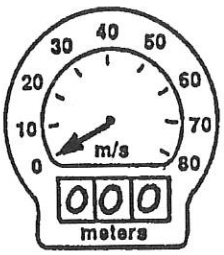
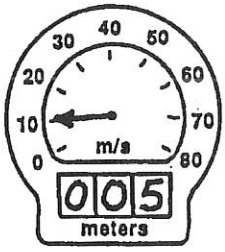
Free Fall

4. A rock dropped from the top of a cliff picks up speed as it falls. Pretend that a speedometer and odometer are attached to the rock to show readings of speed and distance at 1-second intervals. Both speed and distance are zero at time = zero (see sketch). Note that after falling 1 second the speed reading is 10 m/s and the distance fallen is 5 m. The readings for succeeding seconds of fall are not shown and are left for you to complete. So draw the position of the speedometer pointer and write in the correct odometer reading for each time. Use $g = 10\ m/s^2$ and neglect air resistance.

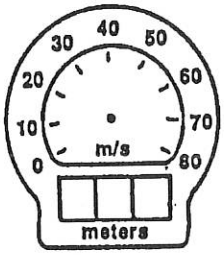




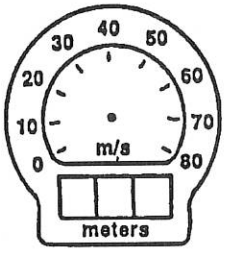
t = 0 s



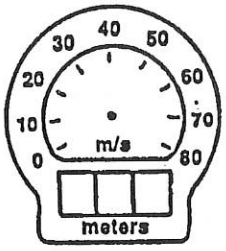
t = 1 s



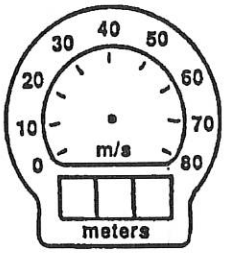
t = 2 s



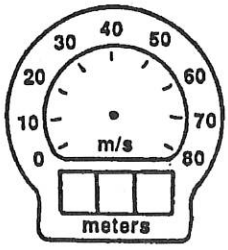
t = 3 s



t = 4 s



t = 5 s



t = 6 s

RELATIONSHIPS TO USE

Instantaneous speed of fall from rest: $v = gt$

Distance fallen from rest: $d = \frac{1}{2}gt^2$

a. The speedometer reading increases by the same amount, _____ m/s, each second. This increase in speed per second is called _____.

b. The distance fallen increases as the square of the _____.

c. If it takes 7 seconds to reach the ground, then its speed at impact is _____ m/s, the total distance fallen is _____ m, and its acceleration of fall just before impact is _____ m/s^2.

Conceptual PHYSICS