Motion Equation Sample Problems

Name Key
Date

1. A ball is dropped from a tall building. It takes the ball 4.5 seconds to hit the ground. How high is the building?

a. 99.3 m
b. 49.66 m
c. 12 m
d. 44.15 m

$d = v_0 t + \frac{1}{2} a t^2$

$d = \frac{1}{2}(-9.81)(4.5)^2 = \boxed{-99.3\ m}$

2. Refer to problem # 1. What was the velocity of the ball just before it hit ground?

a. 22 m/s
b. 4.4 m/s
c. 2.2 m/s
d. 44 m/s

$V = v_0 + at$

$= -9.81(4.5) = \boxed{-44.15\ m/s}$

3. A mass is given an initial velocity of 10 m/s, and shot straight up at an angle of 90 degrees. How much higher does an object travel if it is shot straight up at a velocity of 20 m/s?

a. 3X b. 6X c. 9X d. 4X

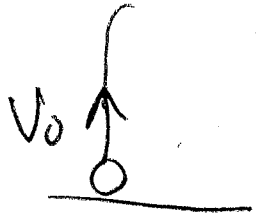
$d \propto v_0^2$

$v^2 - v_0^2 = 2ad$

$\frac{v_0^2}{2g} = d$

4. A mass is given an initial velocity of 20 m/s straight up in the air (@ $\theta = 90°$.) Calculate the total time of flight of the particle.

a. 2.04 s
b. 4.08 s
c. 1.52 s
d. 3.54 s

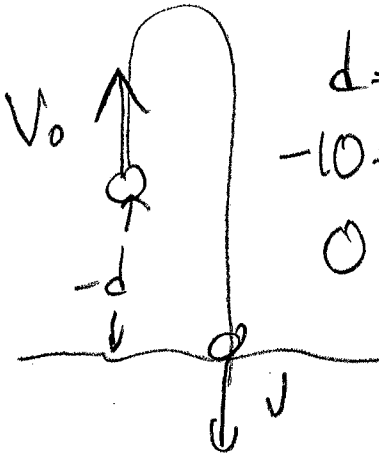


$V = v_0 + at$

$t = 2t_h = \boxed{4.08\ sec}$

$\frac{-v_0}{-9.81} = t_h \quad \frac{20}{9.81} = t_h = 2.04$

5. A ball is thrown up into the air with an initial velocity of 20 m/s at a height of 10 meters. Calculate the time it takes the ball to fall to the ground, and the velocity it has the moment it hits the ground.



$d = v_0 t + \frac{1}{2} a t^2$

$-10 = 20t - 4.905 t^2$

$0 = -4.905 t^2 + 20t + 10$

$\boxed{t = 4.53\ sec}$

$V = v_0 + at$

$= 20 - 9.81(4.53)$

$\boxed{V = -24.44\ m/s}$