$v_f = v_i + gt$

$d = \frac{1}{2} g t^2$

Free Fall Problems Worksheet
Physics

Name Key
Period _____

For the following problems, show all work and write the answers in the correct blank.

1. An object falls from a high building. Ignoring air resistance, what will its velocity be after 6 seconds of falling?

$v_f = v_i + gt$

$v_f = 0 m/s + (-9.8 m/s^2)(6s)$

$-58.8 m/s^2$

2. An object falls from a high building and hits the ground in 9.0 seconds. Ignoring air resistance, what is the distance that it fell?

$d = \frac{1}{2} g t^2$

$d = \frac{1}{2}(-9.8 m/s^2)(9s)^2$

396.9 m

3. During a tornado in 2008 the Peachtree Plaza Westin Hotel in downtown Atlanta suffered damage. Suppose a piece of glass dropped near the top of the hotel falling 215 meters.
   A. Ignoring air resistance, how long would it take the piece of glass to hit the ground?

$d = \frac{1}{2} g t^2$

$215m = \frac{1}{2}(-9.8 m/s^2)(t)^2$

$-215m = -4.9(t)^2$

6.6 s

   B. Ignoring air resistance, what will the velocity of the piece of glass be when it strikes the ground?

$v_f = v_i + gt$

$v_f = 0 m/s + (-9.8 m/s^2)(6.6s)$

$v_f = -64.68 m/s$

$-64.68 m/s$

4. An object falls from the Transco Tower in Houston and takes 15 seconds to reach the ground.
   A. What is its velocity at impact if air resistance is ignored?

$v_f = v_i + gt$

$v_f = 0 m/s + (-9.8 m/s^2)(15s)$

$-147 m/s$

   B. How tall is the building?

$d = \frac{1}{2} g t^2$

$d = \frac{1}{2}(-9.8 m/s^2)(15s)^2$

1102.5 m

   C. What is its acceleration at the 2nd second? $-9.8 m/s^2$
   D. What is its acceleration at the 5th second? $-9.8 m/s^2$
   E. If the Transco Tower were actually 3,000 meters tall, how long would an object take to free-fall off of the top of the building? (ignoring air resistance)

$d = \frac{1}{2} g t^2$

$3000m = \frac{1}{2}(-9.8 m/s^2) t^2$

$\frac{-3000}{-4.9} = \frac{-4.9 t^2}{-4.9}$

$\sqrt{612.2} = \sqrt{t^2}$

$t = 24.7 s$

24.7 s

5. Wil-E-Coyote drops a bowling ball off a cliff to try to catch the Roadrunner. The cliff is 132m high.

A. How long does it take the ball to fall to the ground?

$d = \frac{1}{2}gt^2$

$\frac{-132m}{-4.9} = \frac{\frac{1}{2}(-9.8m/s^2)(t)^2}{-4.9}$

$\sqrt{26.9} = \sqrt{t^2}$

5.2s

B. What is its impact velocity?

$V_f = V_i + gt$

$V_f = 0 + (-9.8m/s^2)(5.2s)$

$V_f = -50.96 m/s$

-50.96 m/s

C. How far does it fall in the first 3.0 seconds?

$d = \frac{1}{2}gt^2$

$d = \frac{1}{2}(-9.8m/s^2)(3s)^2$

44.1 m

D. How fast is it going at the end of 3.0 seconds?

$V_f = V_i + gt$

$V_f = 0m/s + (-9.8m/s^2)(3s)$

$V_f = -29.4 m/s$

29.4 m/s

E. How long would it take the same ball to fall if the cliff was on the moon ($g = 1.63 m/s^2$)?

$d = \frac{1}{2}gt^2$

$-132m = \frac{1}{2}(-1.63m/s^2)(t)^2$

$\sqrt{\frac{-132}{-0.815}} = \frac{-0.815}{-0.815}\sqrt{t^2}$

12.7s

6. You drop your cell phone while in the bathroom in front of the mirror while the water is running in the sink below. If you are 0.45 meters above the sink, how long do you have before your cell phone is a gonner.

$d = \frac{1}{2}gt^2$

$-0.45m = \frac{1}{2}(-9.8m/s^2)(t)^2$

$\sqrt{\frac{-0.45m}{-4.9}} = \frac{-4.9\sqrt{t^2}}{-4.9}$

.3s