

#2 Motion: Accelerated Motion and Freefall

Equations: $x = v_0t + \frac{1}{2}at^2$ $v = v_0 + at$ $v_f^2 = v_0^2 + 2a\Delta x$

- 1) A ball rolls down an incline and is accelerated at a constant rate of 2.0m/s.
 - a. What velocity did it have after 1,2,3,4, and 5 seconds?
 - b. What distance did it travel after 1,2,3,4, and 5 second?
- 2) A ball is dropped off of a cliff. What is its velocity as it hits the ground if it falls for 3.8s?
- 3) A ball is dropped off of a 158m cliff. What is its velocity just before it hits the ground?
- 4) An amusement park ride raises people up in the air 75m to the top and stops before releasing them. How long are the riders falling? What was their final speed at the bottom? If it takes 2.3 seconds to stop them, what was their acceleration?
- 5) A ball is thrown straight down off a bridge at 8.2m/s and it falls into the water below in 1.8s. What is the final velocity of the ball just before it hits the ground?
- 6) A helicopter is hovering over the ground. A man throws a piece of gum out at his commanding officer who is directly under the helicopter with a velocity of 15.2m/s. It lands next to his commanding officer 2.95s later. How high was the helicopter? If the commanding officer yells that the man is court-martialed and the speed of sound is 340m/s, how long before the man knows he is in trouble?
- 7) How long will it take an object dropped off of a building that is 25.0m high to hit the ground neglecting air resistance?
- 8) What was the initial velocity of an object that is now traveling at a speed of 32.3m/s after it traveled 45.8m and was accelerated at a rate of 1.80m/s²?
- 9) A ball is thrown straight up over the edge of a cliff at 30.m/s. What is its velocity at 3s? 6s? 8s?
- 10) A ball is thrown straight up over the edge of a cliff at 30.m/s. What is its displacement at 3s? 6s? 8s?
- 11) How high will a firework go neglecting air resistance if it is fired vertically with a speed of 95m/s?

Answers

- 1) a. 2m/s, 4m/s, 6m/s, 8m/s, and 10m/s
b. 1m, 4m, 9m, 16m, 25m
- 2) -38m/s
- 3) -56.2m/s
- 4) 3.9s, 39m/s, -17m/s²
- 5) 26m/s
- 6) 88.4m, 0.26s
- 7) 2.24s
- 8) 29.6m/s
- 9) 0m/s, -30m/s, -50m/s
- 10) 45m, 0m, -80m
- 11) 451.25m