# Conceptual Physics Review (Chapter 3)

Chapter 2 (Review)

- Define speed, velocity, and acceleration and be able to give examples of units for each.
- Describe the difference between speed and velocity. Use the terms scalar and vector in your explanation.
- Describe the difference between instantaneous speed and average speed. Which one is shown on your car's speedometer? Which one is used in calculating distance traveled over a period of time?
- Describe what is meant by free fall. What affects a freely falling object?
- Be familiar with the relationships between the acceleration, velocity, and distance fallen for a freely falling object. What equations are useful when calculating these quantities?
- Be familiar with the graphs of velocity vs. time and distance vs. time for moving objects traveling at constant acceleration, and for objects traveling at constant velocity.

Chapter 3 (Focus Primarily on this Chapter)

- What is the difference between a scalar and a vector?
- Be able to combine vectors into their resultant vector, using the parallelogram rule.
- Be able to determine the horizontal and vertical components of a given vector, using the parallelogram rule.
- Know how to use the Pythagorean theorem to determine the lengths of sides of a right triangle.
- Describe the relationship between the vertical and horizontal components of motion for a projectile. Are they independent or are they affected by each other?
- Describe how a projectile's actual path relates to an imaginary line that it would follow if gravity were not affecting it.
- Discuss why satellites do not fall to earth. What is holding them up? Why don't they fall down?

Sample Calculations (Use Unit Conversions and Show Your Work)

1. How many seconds are in a year?

2. How many days are in a century?

3. How many millimeters are in a kilometer?

4. How many inches are in a mile?

5. How many Gm are there in $2.56 \times 10^{19}$ pm?

6. How many Mg are there in $3.7 \times 10^{5}$ kg?

7. How many nm are there in $8.64 \times 10^{9}$ μm?

8. How many mg are there in 2.89 cg?

9. Rochelle is flying to New York for her big Broadway debut. If the plane heads out of Los Angeles with a velocity of 220.0 m/s in a northeast direction, relative to the ground, and encounters a wind blowing head-on at 45 m/s, what is the resultant velocity of the plane, relative to the ground?

10. In her physics lab, Melanie rolls a 10-g marble down a ramp and off the table with a horizontal velocity of 1.2 m/s. The marble falls into a cup placed on the floor 0.51 m from the bottom of the table. How high is the table? Draw a picture of the situation.

11. Bert is standing on a ladder picking apples in his grandfather's orchard. As he pulls each apple off the tree, he tosses it into a basket that sits on the ground 3.0 m below at a horizontal distance of 2.0 m from Bert. How fast must Bert throw the apples (horizontally) in order for them to land in the basket? Draw a picture of the situation.

12. A cannon is fired up from the ground at an angle of 53° from the horizontal, with a velocity of 100 m/s. Draw a picture of the cannon and label the angle of launch and draw the velocity vector, in the direction the cannonball will be fired.

a. On your diagram above, draw and label the component vectors (horizontal and vertical) for the initial velocity of a cannonball to be fired from the cannon.

b. How long will it take the cannonball, after it is fired, to reach its highest point?

c. How long after being fired will the cannonball hit the ground?

d. How high above the ground is the cannonball at its highest point?

e. How far away from the cannon does the cannonball land (horizontal distance)?

f. On your diagram, draw the cannonball at one-second intervals and draw the horizontal and vertical components of its velocity (vectors) at each one-second interval.