1. 

A Conch shell has an opening that is 3 in long, and weighs 4 lbs. A geometrically similar shell has an opening that is 5 cm. What do you estimate its weight to be?

2. A coffee company makes three sizes of coffee. Small is 8 oz, medium is 12 oz and large is 16 oz. If they are placed in in geometrically similar cups, and the small is 4 inches tall, how tall will the medium and large be?

3. While Galileo demonstrated that in the absence of air resistance falling objects should have the same acceleration regardless of their size or mass. This does not fit with our observations because air resistance is often important. Given enough time, all objects eventually reach terminal velocity. The terminal velocity of a falling object is directly proportional to the square root of its mass and inversely proportional to the square root of its surface area.

   (a) Write down an expression showing how terminal velocity an object depends on mass and surface area.

   (b) Two balloons have identical mass but one has twice the radius of the other. If the smaller balloon falls at 1.0 m/s, how fast does the larger balloon fall?

   (c) Two balls have identical radius, but one is twice the mass of the other. If the lighter ball falls at 4 m/s, how fast does the heavier ball fall?

   (d) In a light rain, small raindrops are 0.5 mm and fall at 3 m/s. Large raindrops are 2.0 mm. How much heavier are larger rain drops? How much more area do they have? With what speed to they fall?

4. A spherical raindrop evaporates at a rate which is directly proportional to its surface area. The evaporation rate is 1.0 mg/min for a raindrop with radius 2.0 mm.

   (a) Write down expression for the evaporation rate $E$ as a function of the radius of the drop $r$ in the form $E = kr^p$. Using the values given, find the value of the proportionality constant $k$.

   (b) If the radius of the raindrop were double the size, by what factor would the evaporation rate change?

   (c) If the volume of the raindrop were double the size, by what factor would the evaporation rate change?