**Ratio and Proportion Problems**

1. 52 kg of a substance has a volume of 2.4 cubic metres. What would be the volume of 1.5 g of this substance.
	1. The volume of a beachball is proportional to the radius cubed. What effect on the volume does doubling the radius have?
	2. Calculate the new volume if the radius is increased from 19 cm to 25 cm if the original volume was 29 L.
	3. The kinetic energy of a bullet is proportional to its speed squared. What effect on the energy does tripling the speed have?
	4. A bullet with a speed of 55 m/s has an energy of 4.5 kJ. What energy does the same bullet have at a speed of 95 m/s?
2. A certain non-ideal gas has the property of its volume being inversely proportional to its pressure cubed. If 250 ml of this gas exerts a pressure of 73 kPa, what volume would exert a pressure of 21 kPa?
3. Assume that water pressure in a pipe is proportional to the length of the pipe raised to the fourth power and is inversely proportional to the diameter of the pipe squared. A 5.2 m long, 2.5 cm diameter pipe has a water pressure of 8.9 kPa. What would the pressure be if the length increased to 18.3 m and the diameter decreased to 2.2 cm?

**Challenge Ratio and Proportion Problems**

Given: $heat loss ∝surface area$

 $strength of a bar ∝cross-sectional area$

 $mass of an object ∝volume$

 $gravitational force ∝objects mass$

1. In many horror films, the heroes get attacked by giant spiders or ants. Explain why this concept is physically impossible. Use sample estimated numbers or rations to demonstrate the points you make.
2. Use statements of physics and ratios to answer and explain the following:
3. If you were to shrink to the size of a mouse would you require air conditioning or a winter coat?
4. Would it be more advantageous to shrink or magnify yourself in order to survive a 3-storey fall?
5. Could a giant fly walk across the ceiling?