The Ideal Gas Law is a concept in chemistry that describes how a gas behaves in given conditions. The law states that

$$PV = nRT$$

where P is the pressure (in atmospheres), V is the volume of the gas (in liters), T is the temperature of the gas (in Kelvin), n is the amount of gas (in moles) and R is a constant equal to $0.0821 \frac{L \cdot atm}{mol \cdot K}$. This can be used to describe a variety of situations.

1. There was a story on the news about someone's can of dry shampoo that exploded when it was left in a hot car. Assume that the volume of the canister was $0.5L$ and $n = 0.2$. If the temperature was changing at a rate of $2K/min$ when it reached $380K$, how fast was the pressure increasing at that moment?

2. Now, consider an entirely different scenario. You blow up a balloon to a volume of $1L$ at a pressure of 1 atm and a temperature of $300K$. Then, you take the balloon into a diving pool and take it underwater. As the pressure increases, the volume of the balloon will decrease. If the pressure is increasing at a rate of 0.5 atm/min, how fast is the volume decreasing when the pressure reaches 1.2 atm? **Hint:** You'll need to use the gas law to solve for both the initial value of n, as well as the volume when the pressure is 1.2 atm.