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**Gas Laws Practice – All work must be shown!**

1. My pet squirrel Randy ate a 12 gram carbon dioxide paintball cartridge. Given that the normal body temperature of a squirrel is 37 degrees Celsius and his internal pressure is typically 1.1 atm, what will the final volume of the squirrel be if the paintball cartridge opens up in his belly?

2. If I initially have 4.0 L of a gas at a pressure of 1.1 atm, what will the volume be if I increase the pressure to 3.4 atm?

3. A small research submarine with a volume of 1.2 x 105 L has an internal pressure of 1.0 atm and an internal temperature of 150 C. If the submarine descends to a depth where the pressure is 150 atm and the temperature is 30 C, what will the volume of the gas inside be if the hull of the submarine breaks?

4. People who are angry sometimes say that they feel as if they’ll explode. If a calm person with a lung capacity of 3.5 liters and a body temperature of 380 C gets angry, what will the volume of the person’s lungs be if their temperature rises to 460 C. Based on this, do you think it’s likely they will explode?

5. I am considering remodeling my house, and have a 55 L tank of nitrogen in my shed. This tank contains 15 kilograms of nitrogen gas and can withstand a pressure of 150 atm before exploding. If I were to “accidentally” heat this tank to a temperature of 815 degrees Celsius, would this tank explode and save me the demolition cost for my coming addition?

6. I don't like my next door neighbor, but he doesn't know that. He's a stuntman, and recently hired me to fill the airbag into which he will fall during a “falling out of a building” stunt. I have filled the 144,000 liter airbag with 1500 kg of nitrogen gas at a temperature of 32 degrees Celsius. Given that my neighbor will only survive the fall if the pressure inside the airbag is between 1.2 and 1.4 atm, should I expect to get a new neighbor in the very near future?

7. A toy balloon has an internal pressure of 1.05 atm and a volume of 5.0 L. If the temperature where the balloon is released is 250 C, what will happen to the volume when the balloon rises to an altitude where the pressure is 0.65 atm and the temperature is –150 C?

Answers

1. The carbon dioxide in Randy would have a volume of 6.2 liters. Given that the volume of an extraordinarily large squirrel is 1 L, it's a good guess that Randy will be in pretty bad shape.

2. 1.3 L

3. 770 L

4. 3.6 L - This increase of 0.1 L is unlikely to cause the person to explode. However, given that the highest body temperature ever recorded in somebody who didn't die immediately thereafter was 46° Celsius, it would appear that this person's anger management problem would still be fatal.

5. At this temperature, the tank will have an internal pressure of 880 atm. As a result, it would probably be a good idea to move out of the area shortly after the fire starts to avoid the explosion.

6. Sadly, the pressure inside the airbag will be 0.93 atm (which, given the fact that airbags are floppy, means that it will look just a bit droopier than usual). This means that, while I'll be very sad about the tragedy, at least I can look forward to having a new neighbor!

7. 7.0 L