

Gas Laws Podcast #2: Boyles-Charles-Gay-Lussac; SC6 a,b,c

1. You are now wearing scuba gear and swimming under water at a depth of 66.0 ft. You are breathing air at 3.00 atm and your lung volume is 10.0 L. Your scuba gauge indicates that your air supply is low so, to conserve air, you make a terrible and fatal mistake: you hold your breath while you surface. What happens to your lungs? Why?

2. A gas with a volume of 4.0 L at a pressure of 0.90-atm is allowed to expand until the pressure drops to 0.20-atm. What is the new volume?

3. A given mass of air has a volume of 6.0 L at 1.0-atm. What volume will it occupy at 190 mm Hg if the temperature does not change?

4. The pressure of air in an automobile tire is 2.0-atm at 27° C. At the end of a journey on a hot sunny day the pressure has risen to 2.2-atm. What is the temperature of the air in the tire? (Assume that the volume of the tire has not changed.)

5. Five liters of air at -50°C is warmed to 100°C. What is the new volume if the pressure remains constant?

6. A gas cylinder contains nitrogen gas at 10-atm pressure and a temperature of 20°C. The cylinder is left in the sun, and the temperature of the gas increases to 50°C. What is the pressure in the cylinder?

7. A bike tire has a volume of 0.850L at a pressure of 40 psi and 0°C. What will be the pressure of the tire at 35°C?
8. A hot air balloon has a volume of 10,000-L when at 25°C. What will be the new volume if the air is heated up to 65°C?
9. A student holds the end of a bicycle pump and pumps the air in the pump. He holds on for as long as possible. Before pumping the pressure was 20-psi. The pressure gauge on the pump reads 80psi right before air escaped. By what fraction did he reduce the volume in the pump. Hint: Assume that you have 1-L of air and use Boyle's law to determine the number.
10. A tire pressure gauge is used to determine that the pressure in an automobile tire is 25 psi on a cold winter day (-10°C). After the car has driven a considerable distance the pressure was 30 psi. What is the temperature of the gas inside of the car tire?