

Mixed Law Problems

Directions: State the name of the law for each problem and then solve. Be sure to show your work or you will get no credit!!

- 1) A certain gas in a rigid container has a pressure of 2.5 atm at 200°C. What will the pressure of the gas be when it is cooled to 50°C?
- 2) The temperature inside my refrigerator is about 4⁰ Celsius. If I place a balloon in my fridge that initially has a temperature of 22⁰ C and a volume of 0.5 liters, what will be the volume of the balloon when it is fully cooled by my refrigerator? **0.47 L**
- 3) A man heats a balloon in the oven. If the balloon initially has a volume of 0.4 liters and a temperature of 20⁰C, what will the volume of the balloon be after he heats it to a temperature of 250⁰C? **0.71 L**
- 4) The pressure of compressed nitrogen gas in an industrial process is 250 kPa at 18°C, but it is then heated to 322°C in a strong, constant-volume vessel. What is its final pressure?
- 5) Divers get “the bends” if they come up too fast because gas in their blood expands, forming bubbles in their blood. If a diver has 0.05 L of gas in his blood under a pressure of 250 atm, then rises instantaneously to a depth where his blood has a pressure of 50.0 atm, what will the volume of gas in his blood be? Do you think this will harm the diver? **V = 0.25 L, yes**
- 6) A sample of hydrogen at 47°C exerts a pressure of 0.329 atm. The gas is heated to 77°C at constant volume. What will its new pressure be?
- 7) In a thermonuclear device, the pressure of 0.050 liters of gas within the bomb casing reaches 4.0×10^6 atm. When the bomb casing is destroyed by the explosion, the gas is released into the atmosphere where it reaches a pressure of 1.00 atm. What is the volume of the gas after the explosion? **2.0×10^5 L**
- 8) Synthetic diamonds can be manufactured at pressures of 6.00×10^4 atm. If we took 2.00 liters of gas at 1.00 atm and compressed it to a pressure of 6.00×10^4 atm, what would the volume of that gas be? **3.33×10^5 L**
- 9) A nearly empty aerosol can has a pressure of 1.01 atm at a temperature of 25°C. What would the pressure in the can be if it were tossed into an incinerator for disposal, which would raise its temperature to 1300°C? Why is the incineration of aerosol cans not recommended?
- 10) On hot days, you may have noticed that potato chip bags seem to “inflate”, even though they have not been opened. If I have a 250 mL bag at a temperature of 19⁰C, and I leave it in my car which has a temperature of 60⁰ C, what will the new volume of the bag be? **285 mL**
- 11) A soda bottle is flexible enough that the volume of the bottle can change even without opening it. If you have an empty soda bottle (volume of 2 L) at room temperature (25⁰C), what will the new volume be if you put it in your freezer (-4⁰C)? **1.81 L**
- 12) Some students believe that teachers are full of hot air. If I inhale 2.2 liters of gas at a temperature of 18⁰ C and it heats to a temperature of 38⁰ C in my lungs, what is the new volume of the gas? **2.35 L**
- 13) Part of the reason that conventional explosives cause so much damage is that their detonation produces a strong shock wave that can knock things down. While using explosives to knock down a building, the shock wave can be so strong that 12 liters of gas will reach a pressure of 3.8×10^4 mm Hg. When the shock wave passes and the gas returns to a pressure of 760 mm Hg, what will the volume of that gas be? **600 L**
- 14) Submarines need to be extremely strong to withstand the extremely high pressure of water pushing down on them. An experimental research submarine with a volume of 15,000 liters has an internal pressure of 1.2 atm. If the pressure of the ocean breaks the submarine forming a bubble with a pressure of 250 atm pushing on it, how big will that bubble be? **72 L**
- 15) Atmospheric pressure on the peak of Mt. Everest can be as low as 150 mm Hg, which is why climbers need to bring oxygen tanks for the last part of the climb. If the climbers carry 10.0 liter tanks with an internal gas pressure of 3.04×10^4 mm Hg, what will be the volume of the gas when it is released from the tanks? **2.0×10^3 L**

