

The Ideal and Combined Gas Laws

Use your knowledge of the ideal and combined gas laws to solve the following problems. Hint: Figuring out which equation you need to use is the hard part!

- 1) If four moles of a gas at a pressure of 5.4 atmospheres have a volume of 120 liters, what is the temperature?
- 2) If I initially have a gas with a pressure of 84 kPa and a temperature of 35⁰ C and I heat it an additional 230 degrees, what will the new pressure be? Assume the volume of the container is constant.
- 3) My car has an internal volume of 2600 liters. If the sun heats my car from a temperature of 20⁰ C to a temperature of 55⁰ C, what will the pressure inside my car be? Assume the pressure was initially 760 mm Hg.
- 4) How many moles of gas are in my car in problem #3?
- 5) A toy balloon filled with air has an internal pressure of 1.25 atm and a volume of 2.50 L. If I take the balloon to the bottom of the ocean where the pressure is 95 atmospheres, what will the new volume of the balloon be? How many moles of gas does the balloon hold? (Assume T = 285 K)

Using the Ideal Gas Equation in Changing or Constant Environmental Conditions

- 1) If you were to take a volleyball scuba diving with you what would be its new volume if it started at the surface with a volume of 2.00L, under a pressure of 752.0 mmHg and a temperature of 20.0°C? On your dive you take it to a place where the pressure is 2943 mmHg, and the temperature is 0.245°C.
- 2) What is the volume of 1.00 mole of a gas at standard temperature and pressure?
- 3) A 113L sample of helium at 27°C is cooled at constant pressure to -78.0°C. Calculate the new volume of the helium.
- 4) What volume of He is occupied by 2.35 mol of He at 25°C and a pressure of 0.980 atm?
- 5) An aerosol can contains 400.0 ml of compressed gas at 5.2 atm pressure. When the gas is sprayed into a large plastic bag, the bag inflates to a volume of 2.14 L. What is the pressure of gas inside the plastic bag?
- 6) At what temperature does 16.3 g of nitrogen gas have a pressure of 1.25atm in a 25.0 L tank?
- 7) You decide to go on a long hot air balloon ride, so you decide to bring some shampoo to wash your hair with. However there is some gas inside the shampoo bottle when you start to climb into the basket at the beginning of your journey. In fact, because you are a good scientist you decide to constantly take measurements of your surroundings. The shampoo bottle contains 435ml of gas, under a pressure of 1.10 atm, at a temperature of 30.0°C. When you climb high into the air the bottle starts to expand eventually exploding and covering you and your companions with Pert Plus. Eager to explain this phenomenon you take some measurements: the pressure, you note, has dropped to 0.734 atm and the temperature has dropped to 5.00°C. To what new volume did the gas inside the bottle expand?
- 8) What mass of CO₂ is needed to fill an 80.0 L tank to a pressure of 150.0 atm at 27.0°C?
- 9) Have you ever wondered what the pressure is under the glass bell jar when the vacuum pump is turned on? One way to measure it would be to see how a balloon changes when it is inside. At the beginning of the experiment you note that the volume of the balloon is 560.0 mL under standard pressure. When you turn on the vacuum pump the balloon grows to 780.0 ml. What is the pressure under the bell jar at this point?
- 10) At what temperature does 5.00g of H₂ occupy a volume of 50.0 L at a pressure of 1.01 atm?
- 11) How many moles of gas would you have if you had a volume of 38.0L under a pressure of 1432 mmHg at standard temperature?

Answers:	1) 0.477 L	2) 22.4 L	3) 73 L	4) 59 L	5) 0.97 atm	6) 655 K or 418°C
	7) 598 mL	8) 21,500 g or 21.5 kg		9) 0.7179 atm or 545.6 mmHg		
	10) 248 K or -24.9°C		11) 3.20 mol			