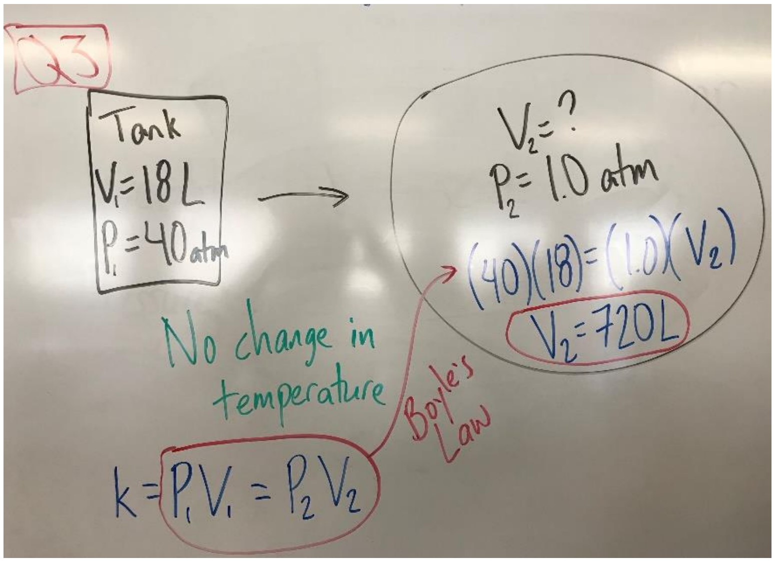
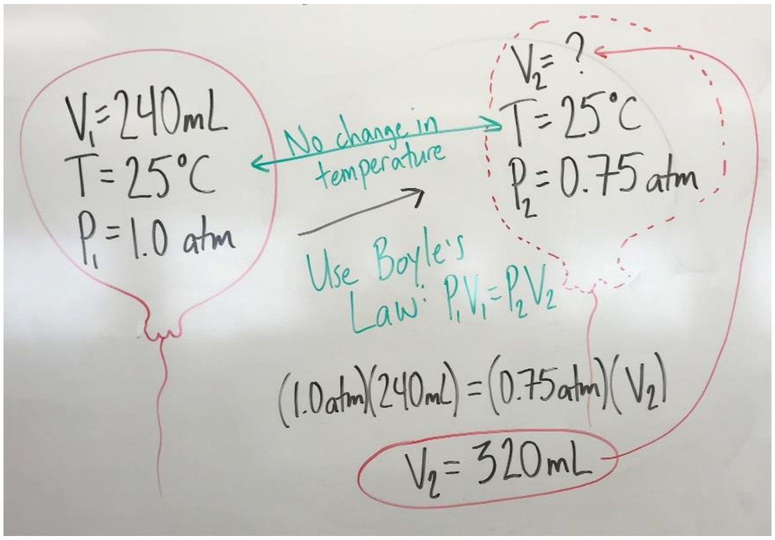
Lesson 59 Homework (pages 313, #3-5)

3. 720 L



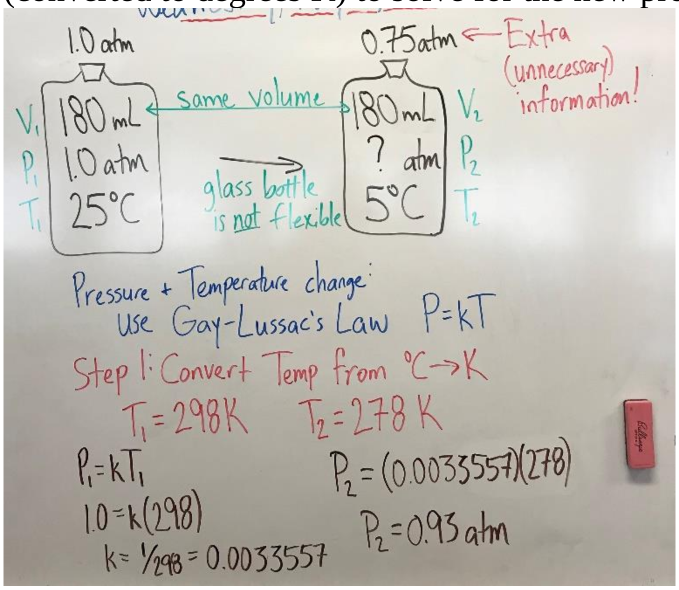
4. A. The pressure and volume of the balloon change but the temperature remains the same.
   B. Yes, the pressure on the inside of the balloon can change so that the pressures are equal because the balloon is a flexible container.
   C. The volume occupied by the air inside the balloon will increase because the pressure has decreased, and pressure and volume are inversely proportional.
   D. 320 mL



5. A. The volume of air inside the bottle stays the same because the bottle is a rigid container.
   B. Yes, the air inside the bottle will lose energy until it has the same temperature as its surroundings because glass does not insulate against temperature changes.
   C. Pressure and temperature are directly proportional. The pressure of air inside the bottle decrease as its temperature decreases.

D. 0.93 atm (solved two different ways, both making use of the proportionality constant, *k*).

Note: The problem involves a glass container (not flexible) filled with gas which is then taken to a colder environment where the air pressure is lower <u>outside</u> the bottle. The quantity of gas doesn't change, and neither does the volume. The temperature does change, so we need to use Gay-Lussac's Law of P=kT. The first of the two solutions involves solving for the proportionality constant, *k*, using the information provided in the initial set of conditions (P_1 and T_1, with T_1 converted to degrees Kelvin). The proportionality constant is then multiplied by T_2 (converted to degrees K) to solve for the new pressure <u>inside</u> the bottle.



The second method for solving the problem involves thinking about what the proportionality constant actually represents. In this example, the proportionality constant for Gay-Lussac's Law is a number that represents the relationship between Pressure and Temperature for a glass bottle filled with a fixed volume of a gas. When the container is moved to a new Temperature, the Pressure will change in response and the ratio of Pressure to Temperature at the new Temperature will have the same proportionality constant. Therefore, if $P_1/T_1 = k$ and $P_2/T_2 = k$ (the same *k*!), then $P_1/T_1 = P_2/T_2$.