13–3 Practice Problems

1. A gas occupies a volume of 458 mL at a pressure of 1.01 kPa and temperature of 295 K. When the pressure is changed, the volume becomes 477 mL. If there has been no change in temperature, what is the new pressure?

2. A gas occupies a volume of 2.45 L at a pressure of 1.03 atm and a temperature of 293 K. What volume will the gas occupy if the pressure changes to 0.980 atm and the temperature remains unchanged?

3. The cylinder of a car's engine has a volume of 0.6250 L when the piston is at the bottom of the cylinder. When the piston is at the top of the cylinder the volume is 0.0600 L. If the cylinder is filled with air at an atmospheric pressure of 765.1 mm Hg when the piston is at the bottom, what is the pressure in units of kPa when the piston is at the top of the cylinder?

4. A discarded spray paint can contains only a small volume of the propellant gas at a pressure of 34,470 Pa. The volume of the can is 473.18 mL. If the can is run over by the garbage truck and flattened to a volume of 13.16 mL, what is the pressure in Pa assuming the can doesn't leak?

5. A sample of 10.0 L of argon gas is stored in a cylinder at a room temperature of 23.8°C and a pressure of 78.6 lb/in². The sample is transferred completely to another 2.8 L cylinder. Several hours after the transfer, the second cylinder has also attained room temperature. What is the pressure in the second cylinder in units of kPa?

6. What will be the volume of a gas sample at 309 K if its volume at 215 K is 3.42 L? Assume that pressure is constant.

7. A gas sample at 83°C occupies a volume of 1400 m³. At what temperature will it occupy 1200 m³?

8. A tank of compressed CO_2 has a temperature of 23.6°C and a volume of 31.4 L. The CO_2 is completely transferred into a smaller tank that has a volume of 25.0 L. Assuming none of the CO_2 escapes during the transfer, what is the temperature of the CO_2 in the smaller tank if the temperature is lowered to achieve the same pressure as in the larger tank?

9. A tube of mercury at a room temperature of 22.4°C has a volume of 10.6 mL between the sealed end of the tube and the mercury. The sun rises and shines through a window on the tube and warms it to 27.8°C. If the atmospheric pressure remains constant, what is the new volume between the sealed end of the tube and the mercury?

10. A gas occupies 0.105 dm³ at 100. K. At what Celsius temperature will its volume be 0.140 dm³? Assume that pressure remains constant.

13-3 Practice Problems (continued)

11. At 75°C, a gas has a volume of 3.22 dm^3. What volume will it occupy at 75 K?

12. A gas at 300. K occupies 6.50 dm^3. What will its volume be at 250. K?

13. What is the pressure of a mixture of helium, nitrogen, and oxygen if their partial pressures are 600. mm Hg, 150. mm Hg, and 102 mm Hg?

14. A flask contains a mixture of hydrogen and oxygen. The pressure being exerted by these gases is 785 mm Hg, as determined by a manometer. If the partial pressure of the hydrogen in the mixture is 395 mm Hg, what is the partial pressure of the oxygen?

15. An environmental testing lab uses a pump and cylinder to collect a sample of air near a leaking natural gas line. The lab finds the total pressure in their sample cylinder is 776.134 mm Hg. Analyzing the sample, they find it contains oxygen, nitrogen, and methane. What is the partial pressure of the methane in units of Pascal if the partial pressure of oxygen is 253.948 mm Hg and the partial pressure of nitrogen is 515.390 mm Hg?

16. The barometer shows the atmospheric pressure to be 762 mm Hg. What is the partial pressure of nitrogen if nitrogen makes up 78 percent of the air?

17. What partial pressure of oxygen is a scuba diver breathing if the total pressure is 6.3 atm, and 20. percent of the air is oxygen?

18. What is the atmospheric pressure if the partial pressures of nitrogen, oxygen, and argon are 77.75 kPa, 19.94 kPa, and 1.99 kPa, respectively?

19. The gases carbon dioxide, oxygen, and argon are mixed in a container. All gases have the same partial pressure, and the total pressure of the container is 32,680 Pa. What is the partial pressure of argon?

20. The partial pressure of water vapor in a greenhouse is 139.0 mm Hg, which is 18 percent of the total pressure. What is the total pressure in the greenhouse?