Gas Law Problems: IV

1. A container holds 43.8 L of a chlorine gas at a temperature of 43ºC and a pressure of 105 kPa. If R = 8.31 kPaL/mol K, how many moles of chlorine gas are there? (1.75 mol)

2. A syringe contains 30.0 mL of methane gas, CH_4, at a pressure of 105.0 kPa. The pressure is then reduced to 90.0 kPa, while the temperate remains constant. What is the new volume of the methane gas? (35 mL)

3. A rubber balloon contains 1.50 L of helium gas at a pressure of 100 kPa and a temperature of 22ºC. Upon release the balloon rises to an altitude where the temperature is 4ºC and the pressure of the helium is 60.0 kPa. What is the volume of the balloon at this altitude? (2.35 L)

4. Peroxyacetyl nitrate (PAN) produced in a chemical smog has a density of 1.85 g/L at 60 kPa and 112ºC. Find its molar mass. (99 g mol^{-1})

5. Dimenthyl sulfoxide has a mass composition of 30.7%C, 7.76%H, 41.1%S, 20.5%O. Its vapour has a density of 3.01 g/L at 151.99 ka and 200ºC. Calculate its molecular formula. (Molar mass = 78 g mol^{-1}, C_2H_6SO)

6. What volume of oxygen gas at STP is required for the complete combustion of 1.00 g of methane?

$$CH_4 + 2\,O_2 \longrightarrow CO_2 + 2\,H_2O$$

(2.8 L)

7. a) What is the pressure exerted by a mixture of 1.0g of hydrogen gas (H_2) and 5.0 g of helium gas (He), when the mixture is confined to a volume of 5.0 L at 20ºC? (852 L)

   b) What are the partial pressures of the hydrogen and the helium in the gas mixture?
   (p (hydrogen) = 243 kPa)
   (p (helium) = 609 kPa)