Problem 1.1

Proposed standard for O_3 is 0.08 ppm

a) Express standard as $\mu g/m^3$ at 25°C, 1 atm

$$0.08 \cdot 10^{-6} \frac{m^3}{m^3} \times \frac{10^3 L}{m^3} * \underset{@25°C}{\frac{mole}{24.46 L}} * \frac{48 g\, O_3}{mole} = 1.569 \cdot 10^{-4} \frac{g}{m^3} \times \frac{10^6 \mu g}{1 g} = \underline{\underline{156.9 \mu g/m^3}}$$

b) Express standard as $\mu g/m^3$ at 15°C, 0.82 atm

$pV = nRT$ $T = 273.15$, $P = 1$ atm, $n = 1$ mol $V = 22.414$

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$\frac{(1 atm)(22.414 L)}{(273.15 K)} = \frac{(0.82 atm)(X L)}{(273.15+15)} \quad \text{solve for } X$$

$$\frac{(1)(22.414)(288.15)}{(0.82)(273.15)} = 28.835 L/mol$$

$$0.08 \cdot 10^{-6} \frac{m^3}{m^3} * \frac{10^3 L}{m^3} * \frac{mole}{28.835 L} * \frac{48 g\, O_3}{mole} = 1.3317 \cdot 10^{-4} \frac{g}{m^3} \times \frac{10^6 \mu g}{g} = \underline{\underline{133.1 \mu g/m^3}}$$

Problem 1.2

Exhaust from auto 1.0% by volume CO. Express as mg/m^3 @ 25°C, 1 atm

$$0.01 \frac{m^3}{m^3} * \frac{10^3 L}{m^3} * \underset{@25°C, 1 atm}{\frac{1 mole}{24.46 L}} * \frac{28 g\, CO}{mole} = 11.447 \frac{g}{m^3} * \frac{10^3 mg}{g} = \underline{\underline{11,447 mg/m^3}}$$

Problem 1.3

Average SO_2 is 400 $\mu g/m^3$ @ 25°C, 1 atm. Does this exceede 24-hr standard of 0.14 ppm?

$$400 \cdot 10^{-6} \frac{g\, SO_2}{m^3} * \frac{1 m^3}{1000 L} * \frac{24.46 L}{1 mole} * \frac{1 mole}{64 g\, SO_2} = 1.53 \cdot 10^{-7} \frac{m^3}{m^3} * 10^6 = 0.152 ppm$$

Yes 0.15 ppm > 0.14 ppm; concentration exceedes standard