**Quiz 5**

# Directions: Answer each of the following questions. Be sure to use complete sentences where appropriate. For full credit be sure to show all of your work. Where appropriate answers should be boxed for clarity, written to the correct number of significant figures, and, include the proper units.

1. Explain the difference between diffusion and effusion. How is the effusion rate of a gas related to its molar mass (3 points)?

The process by which gas molecules spread out in response to a concentration gradient is called diffusion. Effusion is the process by which a gas escapes from a container into a vacuum through a small hole. The rate of effusion is inversely proportional to the square root of the reciprocal molar mass of the gas.

1. A 118 mL flask is evacuated and found to have a mass of 97.129 g. When the flask is filled with 768 torr of helium gas at 35 °C, it is found to have a mass of 97.171 g. Was the helium gas pure (10 points)?

V = 118 mL

mflask = 97.129 g

P = 768 torr

mflask + gas = 97.171 g

mgas = mflask + gas + mflask = 97.171 g – 97.129 g = 0.042 g

$$PV=nRT \& D=\frac{m}{V}\& MM=\frac{m}{n} ⇒MM=\frac{DRT}{P} $$

$$MM=\frac{mRT}{VP}=\frac{\left(0.042 g\right)\left(0.0821 \frac{L atm}{mol K}\right)\left(35 ℃+273.15\right)}{\left(118 mL\right)\left(768 torr\right)}×\frac{1000 mL}{1 L}×\frac{760 torr}{1 atm}=8.9\frac{g}{mol} ∴No, helium has an atomic mass of 4.0026\frac{g}{mol}$$

1. At an underwater depth of 250. ft, the pressure is 8.38 atm (7 points).
	1. What should the mole percent of oxygen in the diving gas be for the partial pressure of oxygen in the gas to be 0.21 atm, the same as it is in air at 1.0 atm?

$$P\_{O\_{2}}=P\_{total}χ\_{O\_{2}}⟹χ\_{O\_{2}}=\frac{P\_{O\_{2}}}{P\_{total}}=\frac{0.21 atm}{8.38 atm}=0.025$$

$$\%O\_{2}=0.025×100\%=2.5\% O\_{2}$$

* 1. What depth in meters is the diver?

$$250 ft×\frac{12 in}{1 ft}×\frac{2.54 cm}{1 in}×\frac{1 m}{100 cm}=76.2 m$$