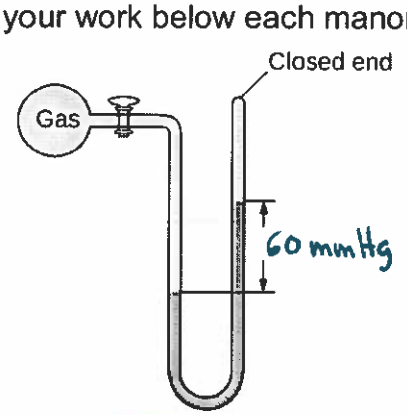
$\frac{v_1}{v_2} = \frac{\sqrt{M_2}}{\sqrt{M_1}}$ $P_1V_1=P_2V_2$

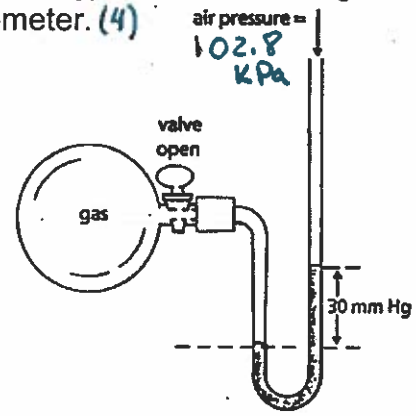
Intro to Gases quiz.

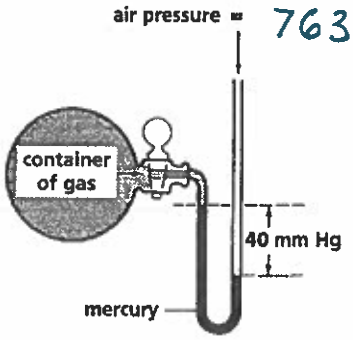
Name: _____

1.00 atm = 760 mm Hg = 101.3 kPa **Show your work.** **Round to sig.figs.**

1. Calculate the pressure **(in mm Hg)** of the enclosed gases in the manometers below. Show your work below each manometer. (4)







A) $P_G = h$

60 mmHg

B) $\frac{101.3\text{kPa}}{102.8\text{ kPa}} = \frac{760\text{ mmHg}}{x}$

$x = 771$ mmHg

$P_g = P_{atm} + h$

$= 771 + 30$

$P_g = 801$ mmHg

C) $P_g = P_{atm} - h$

$= 763 - 40$

$P_g = 723$

2. Calculate the ratio of the velocity of helium atoms to that of xenon atoms at the same temperature and pressure. (State your answer as: _____ diffuses x-times faster/slower than _____) (2)

$\frac{V_{He}}{V_{Xe}} = \frac{\sqrt{M_{Xe}}}{\sqrt{M_{He}}} = \frac{\sqrt{131.30}}{\sqrt{4.00}} = 5.73$

Helium diffuses 5.73 times faster than xenon.

3. Chlorine gas and an unknown gas (X) effuse through a hole pierced in the side of a container. What is the molar mass of the unknown gas with an effusion rate of 0.325 m/s and that of chlorine is 0.173 m/s? Which noble gas is it? (closest value) (2)

$\frac{V_x}{V_{Cl_2}} = \frac{\sqrt{M_{Cl_2}}}{\sqrt{M_x}}$ $\frac{0.325\text{ m/s}}{0.173\text{ m/s}} = \frac{\sqrt{70.90}}{\sqrt{M_x}}$ $M_x = 20.1$

$(\sqrt{M_x})^2 = (4.48214)^2$

Neon

4. A gas with a volume of 4.5 L at a pressure of 90 kPa is allowed to expand until the pressure drops to 20 kPa. What is the new volume? (2)

$P_1V_1 = P_2V_2$

$(90\text{ kPa})(4.5) = (20\text{ kPa})(V_2)$

$V_2 = 20.25\text{ L} \longrightarrow$ 20 L