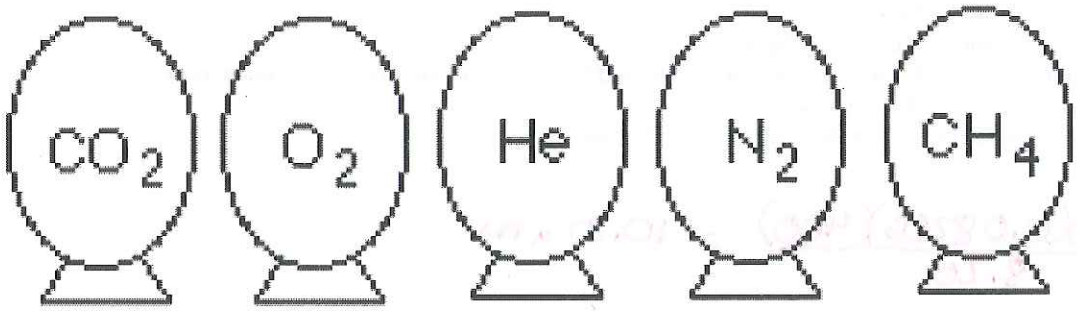
Name _____ Honors Chemistry __/__/__

Name _____



Represented above are five identical balloons, each filled to the same volume at 25°C and 1.0 atmosphere pressure with the pure gas indicated.

(a) Which balloon contains the greatest mass of gas? Explain.

(b) Compare the average kinetic energies of the gas molecules in the balloons. Explain.

(c) Which balloon contains the gas that would be expected to deviate most from the behavior of an ideal gas? Explain.

(d) Twelve hours after being filled, all the balloons have decreased in size. Predict which balloon will be the smallest. Explain your reasoning.

a. CO_2. Since Volume, Temp & Pressure are the same – the moles must be the same – so the one w/ the greatest molar mass (CO_2) must be the heaviest balloon.

b. All are at the same temperature – so they all have the same kinetic energy.

c. CO_2 deviates most from ideal behavior b/c it has the strongest intermolecular forces.

d. The He balloon will be the smallest. He has the smallest molar mass so it effuses the fastest

A rigid 8.20 L flask contains a mixture of 2.50 moles of H_2, 0.500 mole of O_2, and sufficient Ar so that the partial pressure of Ar in the flask is 2.00 atm. The temperature is 127°C.

(a) Calculate the total pressure in the flask.

(b) Calculate the mole fraction of H_2 in the flask.

(c) Calculate the density (in g L^{-1}) of the mixture in the flask.

The mixture in the flask is ignited by a spark, and the reaction represented below occurs until one of the reactants is entirely consumed. $2\ H_2(g) + O_2(g) \rightarrow 2H_2O(g)$

(d) Give the mole fraction of all species present in the flask at the end of the reaction.

a. $P_{H_2} = \frac{(2.5)(0.08206)(400)}{8.20} = 10.0$ atm

P_{O_2} $\frac{2.5}{10.0} = \frac{0.5}{x}$ $x = 2.0$ atm

$P_{total} = 10.0 + 2.0 + 2.0 =$ **14.0 atm**

b. n_{Ar} $\frac{0.5}{2.0} = \frac{x}{2.0}$ $x = 0.50$ mol Ar

$X_{H_2} = \frac{2.50}{3.50} = 0.71$ or $\frac{10.0}{14.0} = 0.71$

c. $2.5 \times 2.02 = 5.05$ g

$0.50 \times 32.0 = 16.00$ g

$0.50 \times 39.95 = 19.98$ g

41.03

$d = \frac{m}{V} = \frac{41.03}{8.20} =$ **5.00 g/L**

d.

	$2H_2$	+ O_2	→ $2H_2O$	Ar (unreactive)
I	2.5	0.50	∅	0.50
C	−2x	−x	+2x	∅
E	1.5	∅	1.0	0.50

$X_{H_2} = \frac{1.5}{3.0} = 0.50$

$X_{H_2O} = \frac{1.0}{3.0} = 0.33$

$X_{Ar} = \frac{0.50}{3.0} = 0.17$