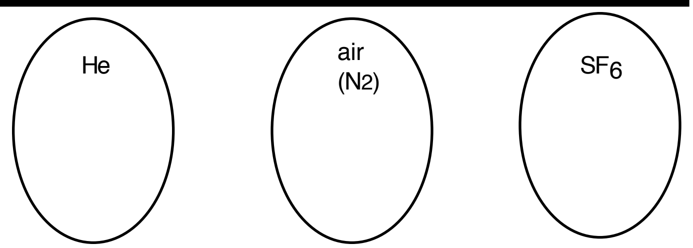
WS 6.6 Graham's Law

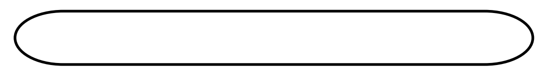
1. What exactly is temperature a measurement of? ______________________________
2. Why is it important to include the word "*average*" in your answer? ____________________
3. What two factors does an object's kinetic energy depend on? __________ and __________
4. What specifically is the equation for kinetic energy? ____________________
5. Which would increase the kinetic energy of an object more: doubling the object's *mass* or doubling the objects *velocity*? _________ Explain: ______________________________
6. State Graham's Law as an equation for two gases (A and B) at the same temp: ___________
7. ***Consider two gases, He and O_2, at the same temperature...*** (√ answer bank below)
   Which particles would have greater average kinetic energy? _______ Which particles are heavier? _____
   Which particles would have greater velocity? _____ Which gas would diffuse across the room faster? _____
8. ***Two gas samples, one H_2 and one CO_2, are such that their particles have the same velocity...***
   Which gas molecules have the greater average kinetic energy? _______
   Which gas is at the higher temperature? ________ Explain: ______________________________
9. Explain the following two demos using **words** and **diagrams**:

The He/SF_6 balloon demo:

	He	*air* (N_2)	SF_6
initial size:			
prediction:			
final size:			



The NH_3/HCl racing demo:



For the following questions, use the Graham's Law equation. Show all work.

10. At a certain temperature, O_2 molecules move with an average velocity of 345 mph. At that same temperature, what would be the average velocity of **a)** He atoms? **b)** CO_2 molecules?

Ans: **a)** ________ **b)** ________

11. At a certain temperature, CH_4 molecules move with an average velocity of 187 m/sec. At that same temp, gas X particles have an average velocity of 141 m/sec. **a)** Is gas X heavier or lighter than CH_4? **b)** What is the molecular weight of gas X? **c)** What is a possible identity of gas X?
(see choices in ans. bank)

Ans: **a)** ________ **b)** ________ **c)** ________

BONUS A sample of gas is at room temp (22˚C). to what temp (˚C) would it have to be taken to cause the average velocity of the particles to double? ______ ...triple? ______ (*Hint*: look back at your answers for #1 and 4)

Ans #7-8 (IRO): CO2 CO2 He He neither O2
Ans #10-11 (IRO+5): 28.1 32.3 294 469 976 CO2 He N2 F2 **Units (IRO)**: mph mph g/mol