Unit 9: Gas Laws and Gas Stoichiometry

Pre-AP Chemistry Free Response Review #1

Directions: The suggested time is about 15 minutes for answering the constructed response section of the chemistry test. The parts within a question may not have equal weight. For calculations, show all your work in the spaces provided after each part. Pay particular attention to the proper use of units. Be sure your final answer is rounded to the correct number of significant figures. Make sure your work is legible. Illegible work will receive a grade of zero.

Question 1 [10 POINTS]

Container	A	B	C
Gas	NH_3	Ar	He
Temperature (°C)	25	25	25
Pressure (atm)	2.0	1.0	1.0
Volume (L)	3.0	3.0	3.0
Molar Mass (g/mol)	17	40	4

Consider the three containers shown above. Assume that all gases exhibit ideal behavior.

A. Which of the container(s) of gas contains the fewest number of gas particles? Justify your answer. **[2 POINTS]**

Both containers B & C have fewest # particles, b/c all 3 containers have the same T & V, but containers B & C have ↓ P than A.

B. Which of the container(s) of gas contains the fastest moving gas particles? Justify your answer. **[2 POINTS]**

Container C, b/c all 3 containers are at the same T (i.e. same average KE), so gas with ↓ MM (He) will have ↑ velocity.

C. Which of the container(s) of gas would have the lowest average kinetic energy? Justify your answer. **[2 POINTS]**

None! All 3 containers are at the same T, so they all have the same average KE.

D. What change could be made that would decrease the average kinetic energy of the Ar(g) molecules in container B? **[1 POINT]**

↓T = ↓ average KE

E. If the volume of container C was decreased to 1.5 L at 298 K, what would be the change in each of the following variables? In each case, justify your answer.

V: 3 → 1.5 L = $\frac{1}{2}$V

i. The pressure within the container? **[2 POINTS]**

$P \propto \frac{1}{V}$ ⇒ ↓V by factor of 2 would

↑P by factor of 2 = 2 × 1.0 = 2.0 atm

ii. The average speed of the He(g) molecules. **[1 POINT]**

No change! Only changing T or MM could change the speed of the gas particles.