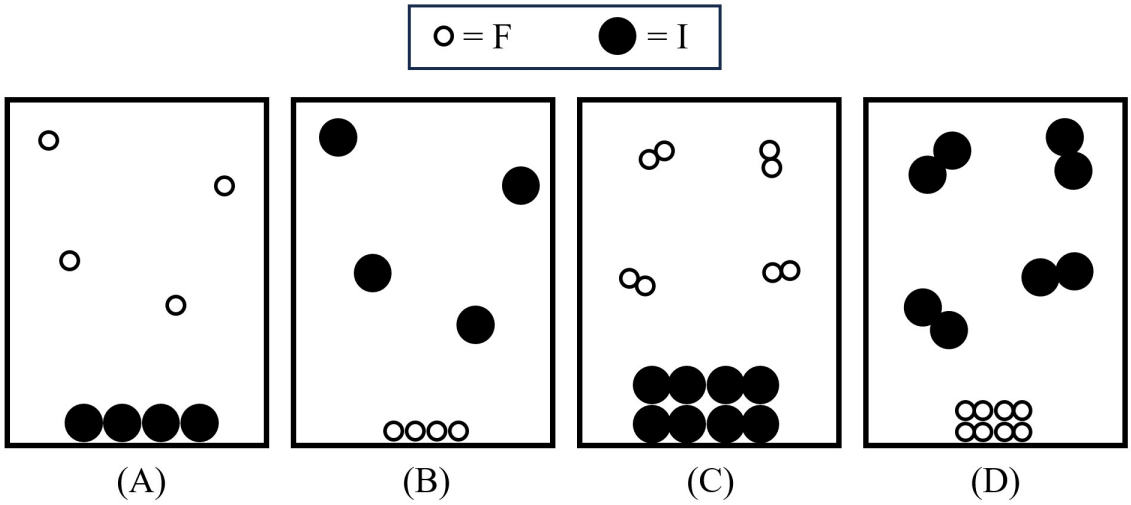
Topics 3.3 – 3.6: MCQ Practice

Substance	Melting Point	Boiling Point
F_2	54 K	85 K
I_2	387 K	457 K

1. Based on the information in the table above, which of the following particulate diagrams is the best representation of an equimolar mixture of F_2 and I_2 at a temperature of 200 K?



Data for Four Different Samples of Helium Gas			
Sample	Volume (L)	Temperature (K)	Pressure (atm)
1	2.00	200	3.0
2	3.00	250	2.0
3	4.50	300	2.0
4	6.00	500	4.0

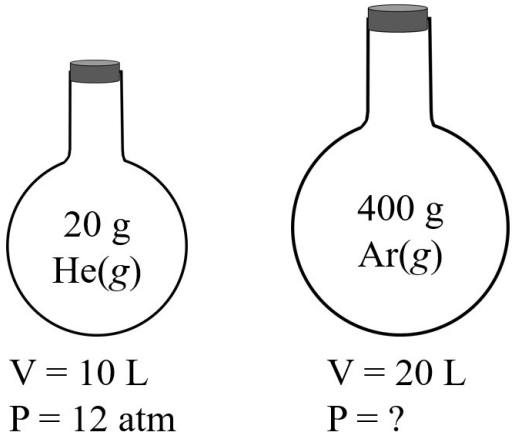
2. Based on the information in the table above, which two gas samples contain the same number of moles of helium gas?

   (A) Samples 1 and 2

   (B) Samples 1 and 3

   (C) Samples 2 and 3

   (D) Samples 2 and 4



3. Based on the information in the diagram above, which of the following choices correctly compares the pressure of Ar(*g*) with the pressure of He(*g*) and provides the correct justification? Assume that both gases are at the same temperature and behave ideally.

	Pressure of Ar(*g*)	Justification
(A)	less than 12 atm	Ar(*g*) particles are more massive than He(*g*) particles, which results in a slower average particle speed and a lower frequency of collisions.
(B)	less than 12 atm	Pressure and volume are inversely proportional, and the volume of the Ar(*g*) sample is greater than the volume of the He(*g*) sample.
(C)	equal to 12 atm	If two gases are at the same temperature, they will have the same values for both pressure and average kinetic energy.
(D)	equal to 12 atm	Compared to the He(*g*) sample, the Ar(*g*) sample contains twice as many gas particles and occupies a volume that is also twice as much.

4. The table below contains information about samples of three different gases. Each gas sample occupies the same volume and is at the same temperature.

Container	Identity of Gas	Pressure (atm)	Mass of Sample (g)
1	He	8.0	4.0
2	O_2	1.0	4.0
3	?	2.0	4.0

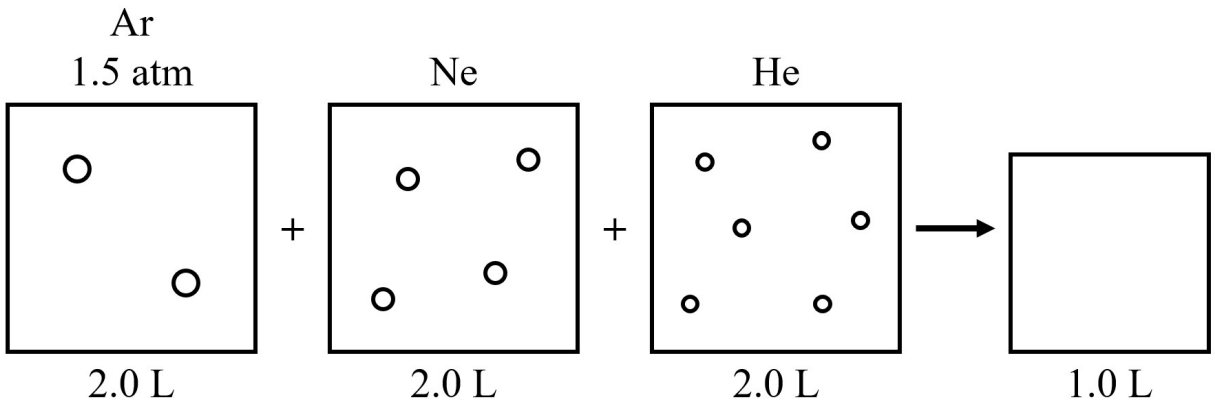
Which of the following is the most likely identity of the gas in container 3? Assume that all three gases behave ideally.

(A) H_2 (B) CH_4 (C) Ne (D) SO_2

Data for Two Different Gas Samples		
Identity of the Gas	$CH_4(g)$	$C_2H_6(g)$
Molar mass (g/mol)	16	30.
Volume of Gas Sample (L)	1.0	1.0
Temperature (°C)	27	27
Pressure (atm)	4.0	2.0

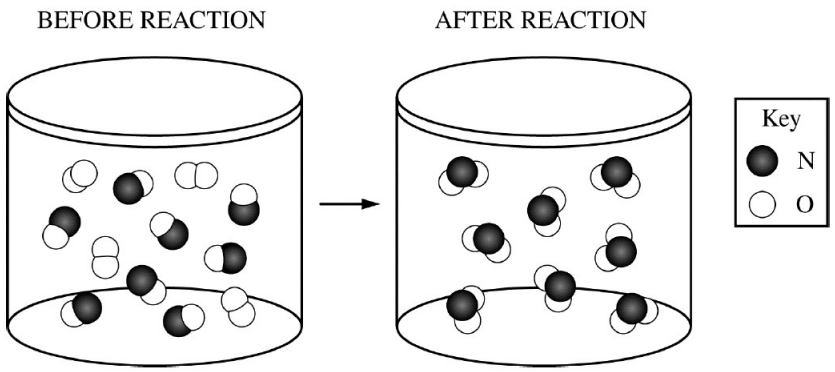
5. Based on the information in the table above, which of the following choices correctly identifies the sample that has a greater density, in g/L, and provides the correct justification? Assume that both gases behave ideally.

	Sample that has a Greater Density (g/L)	Justification
(A)	$CH_4(g)$	The mass of the $CH_4(g)$ sample is greater than the mass of the $C_2H_6(g)$ sample.
(B)	$CH_4(g)$	Molecules of CH_4 occupy a smaller volume than molecules of C_2H_6.
(C)	$C_2H_6(g)$	The molar mass of C_2H_6 is greater than the molar mass of CH_4.
(D)	$C_2H_6(g)$	The number of atoms in the $C_2H_6(g)$ sample is greater than the number of atoms than the $CH_4(g)$ sample.



6. The figure above represents three sealed 2.0 L vessels, each containing a different inert gas at 298 K. The pressure of Ar in the first vessel is 1.5 atm. The ratio of the numbers of Ar, Ne, and He atoms in the vessels is 1:2:3, respectively. After all the gases are combined in a previously evacuated 1.0 L vessel, what is the total pressure of the gases at 298 K?

(A) 4.5 atm (B) 6.0 atm (C) 9.0 atm (D) 18.0 atm



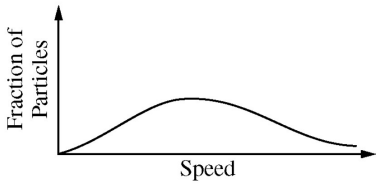
7. The reaction between NO(g) and O_2(g) to produce NO_2(g) in a rigid reaction vessel is represented in the diagram above. The pressure inside the container is recorded using a pressure gauge. Which of the following statements correctly predicts the change in pressure as the reaction goes to completion at constant temperature, and provides the correct explanation?

(A) The pressure will increase because the product molecules have a greater mass than either of the reactant molecules.

(B) The pressure will decrease because the product molecules have a lower average speed than the reactant molecules.

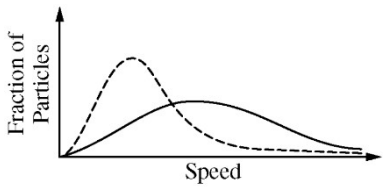
(C) The pressure will decrease because there are fewer molecules of product than reactants.

(D) The pressure will not change because the total mass of the product molecules is the same as the total mass of the reactant molecules.

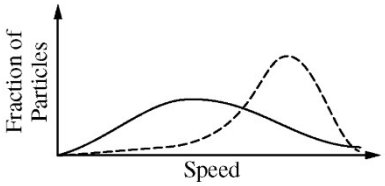


8. The distribution of speeds of H_2(g) molecules at 273 K and 1 atm is shown in the diagram above. Which of the following best shows the speed distribution of He(g) atoms under the same conditions of temperature and pressure?

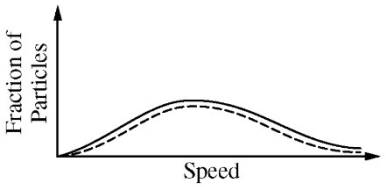
(A)



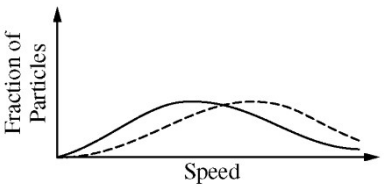
(C)

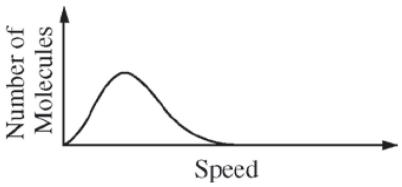


(B)

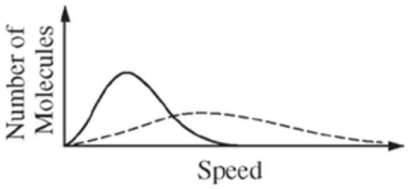


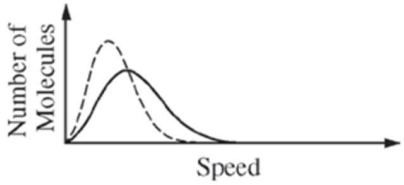
(D)

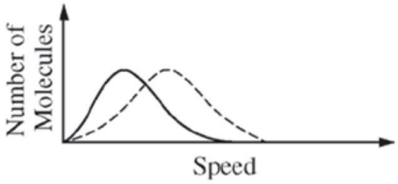


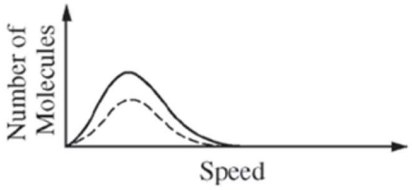


9. The graph above shows the speed distribution of molecules in a sample of gas at a certain temperature. Which of the following graphs shows the speed distribution of the same molecules at a lower temperature (as a dashed curve) ?

(A)


(C)


(B)


(D)


Identity of Gas	Amount of Gas (mol)	Volume (L)	Temperature (K)	Pressure Calculated from the Ideal Gas Law (atm)	Observed Gas Pressure (atm)
$CH_4(g)$	2.00	15.0	260	2.84	2.82
$NH_3(g)$	2.00	15.0	260	2.84	2.78

10. The experimental data in the table above indicates that $NH_3(g)$ shows a greater deviation from ideal gas behavior than $CH_4(g)$ does. Which of the following best explains this observation?

(A) The mass of the NH_3 molecule is greater than the mass of the CH_4 molecule.

(B) The bond energy of the N–H bond is greater than the bond energy of the C–H bond.

(C) The volume of the NH_3 molecules occupies a larger portion of the container volume than the volume of the CH_4 molecules does.

(D) The attractive forces between NH_3 molecules are stronger than the attractive forces between CH_4 molecules.

Identity of Gas	Amount of Gas (mol)	Volume (L)	Temperature (K)	Pressure Calculated from the Ideal Gas Law (atm)	Observed Gas Pressure (atm)
Ar(*g*)	15.0	5.00	575	142	145

11. The experimental data in the table above indicates that the observed pressure of Ar(*g*) is greater than the pressure calculated using the ideal gas law. Which of the following best explains this observation?

(A) A significant number of Ar_2 molecules form.

(B) The average speed of the Ar atoms increases as the temperature increases.

(C) The attractive forces between the Ar atoms cause them to collide with the walls of the container with less force.

(D) The combined volume of the Ar atoms is too large to be negligible compared with the total volume of the container.