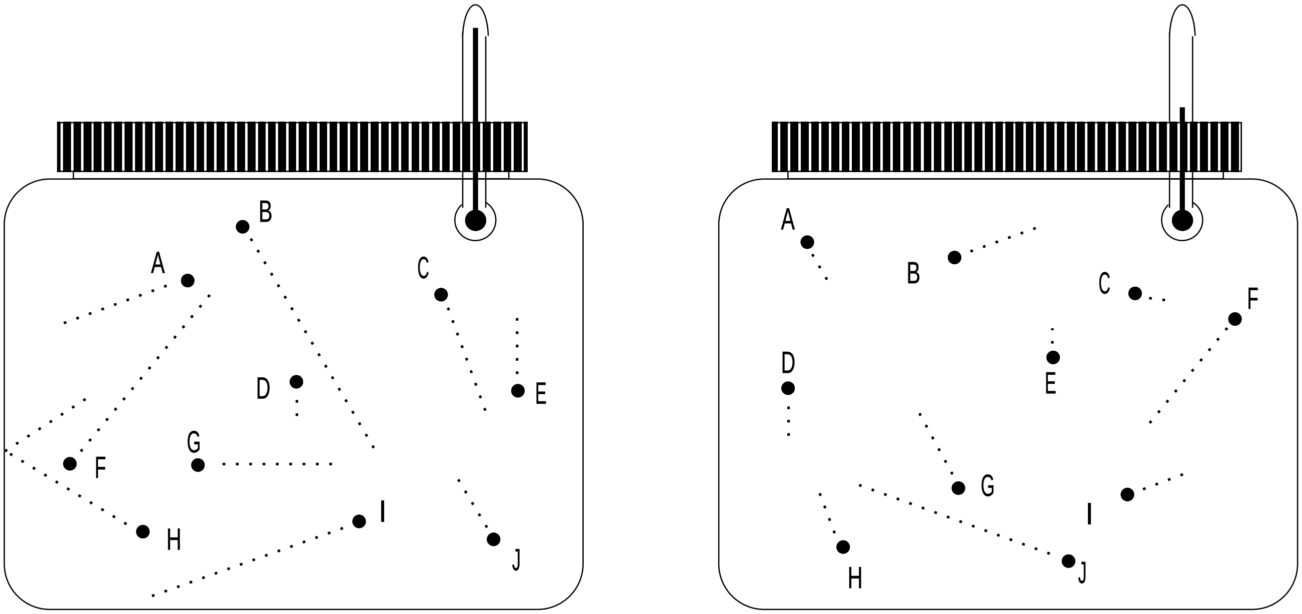
The Distribution of Molecular Speeds

Consider two jars containing equal amounts of helium. For purposes of this Springboard, the jars are very tiny and have been magnified many times. The magnification is so great that we can even see the atoms of the gas. One of the jars contains helium at a high temperature, while the other contains helium at a low temperature.



1. Given the speed of each atom , complete the following tables and graphs.

Atom	Speed
A	400
B	800
C	400
D	100
E	200
F	600
G	400
H	900
I	600
J	200

Speed	# of Atoms
100	
200	
400	
600	
800	
900	

Atom	Speed
A	200
B	400
C	100
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Speed	# of Atoms
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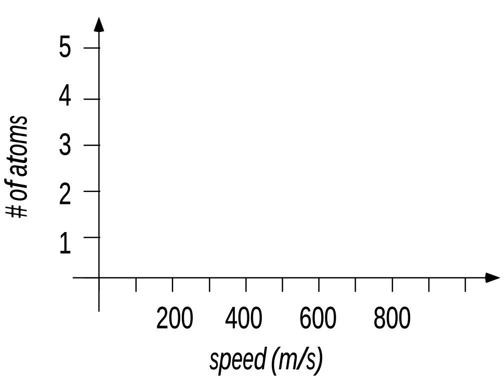
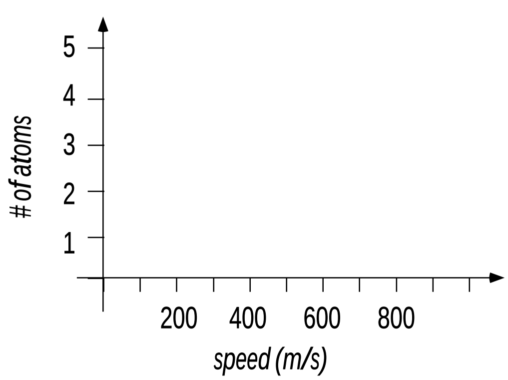




Peak
2. From the graphs on the other side, identify the speed that corresponds to the peak of the curve—the most "popular" speed (in statistics, this is called the *mode*).

*HOT:*____________________ *COLD:*____________________

Average Speed
3. Calculate the average speed of the atoms in each container and mark it on the graphs.

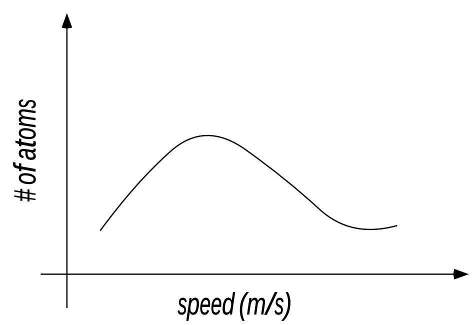
*HOT:*____________________ *COLD:*____________________

4. If the hot helium were further heated, explain how the following quantities would change.
a. The number of atoms

b. The peak of the speed distribution curve (the mode)

c. The average speed of the atoms

5. The graph below shows the atomic speed distribution in the hot helium. On the same axes, draw the graph of the hotter helium described above.



6. Going back to the original container of hot helium, describe the differences represented in a container with twice as much helium at the same temperature as our original hot helium.
a. The number of atoms

b. The peak of the speed distribution curve (the mode)

c. The average speed of the atoms

7. The graph below shows the atomic speed distribution in the original container of hot helium. On the same axes, draw the graph of the second container (with a greater quantity of helium) described above.