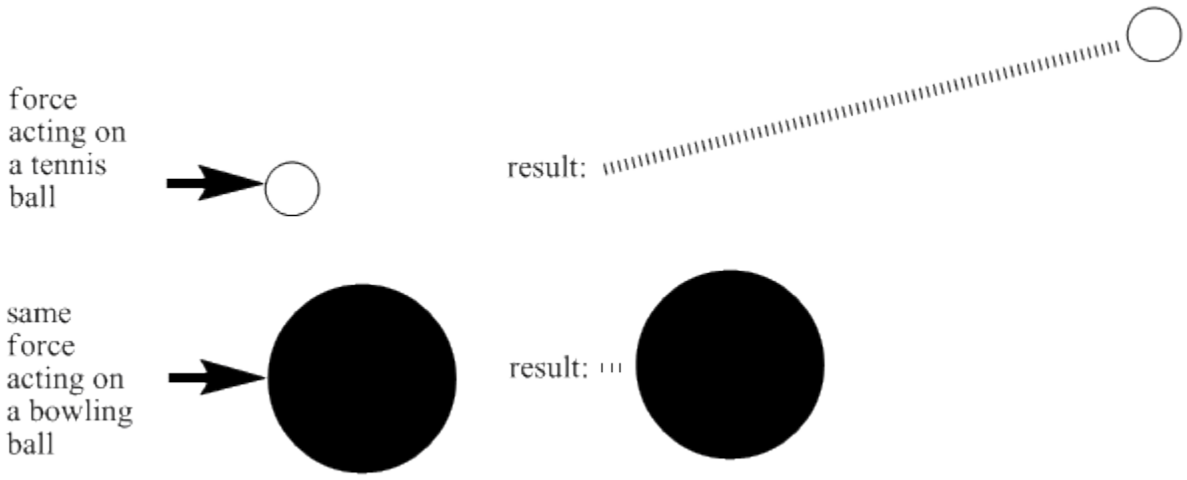
KINETIC-MOLECULAR THEORY

Temperature is an indicator of how much energy is available in the surroundings. The higher the temperature, the more energy there is available, and the faster molecules can go. Different kinds of matter require different amounts of energy to get moving. That's why some compounds are gases at room temperature while others are solids.

There are many reasons for these differences. One factor is the mass of a molecule. If you hit a tennis ball with a tennis racket, you can be sure that it will sail through the air, but the same thing might not be true if you hit a bowling ball with a tennis racket. By putting an equal amount of energy into a tennis ball and a bowling ball, you would make the tennis ball move much faster than the bowling ball. Lighter objects need less energy to reach high speeds.



For a molecular example, let's look at halogens. All the elemental halogens are simple diatomic molecules. Their chemical properties have many similarities, but they have very different boiling points and melting points. Iodine, with the greatest mass, is a solid at room temperature, while fluorine has the lowest mass and is a gas at pretty much all the temperatures you are likely to encounter on Earth.

Name & formula	MW, g/mol	mp, ° C	bp, ° C
fluorine, F_2	**38.0**	**-219.6**	**-188.4**
chlorine, Cl_2	**70.9**	**-100.98**	**-34.6**
bromine, Br_2	**159.8**	**-7.2**	**58.8**
iodine, I_2	**253.8**	**113.5**	**184.3**

Clearly the mass of a molecules influences its state. Does the mass of a molecule alone allow us to predict its behavior? No. A much more important factor involves another difference between gases, liquids and solids: attraction between molecules. The molecules in solids are not just sitting still; they are sitting still *together*. Getting a crystal of iodine to evaporate requires coaxing molecules away from each other, and overcoming this attraction between them.

There are many different types of intermolecular attractions. Let's simplify things and focus on just three general types: London dispersion interactions, dipole interactions, and hydrogen bonding.

Source : http://employees.csbsju.edu/cschaller/Principles%20Chem/imf/SP3kinetic%20molecules.htm