

# Molecules are in instant motion

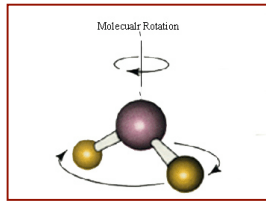
## Basic kinds of motion

### Translational Motion



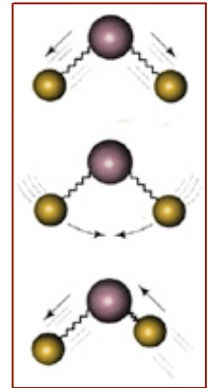
Called also **Brownian motion**, continues random movement of microscopic particles from one place to another

### Rotational Motion\*

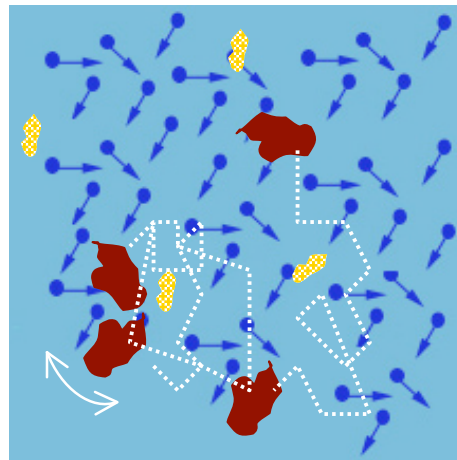


Constant rotation of a molecule around its center of mass

### Vibrational Motion\*



Constant back-and-force movement of covalently linked atoms relative to one another



Molecular motion increases with temperature. This explains why all chemical reactions and life itself takes place within a certain temperature range: too cold - molecules may not find each other; too hot - proteins can get denaturated.

All molecule in living cells, from small molecules of water to large biopolymers such as DNA or proteins, are involved in three kinds of molecular motion, moving non-stop from one place to another, rotating around the center of mass and vibrating due to the vibration of every covalently bound atom.

## Continuous random molecular movements in living cells help:

MOVE ENZYMES AND OTHER CHEMICALS INSIDE CELLS

ALLOWS ENZYMES TO MEET THEIR SUBSTRATES, ACTIVATORS OR INHIBITORS THEREFORE MAKING ENZYMATIC REACTIONS POSSIBLE

BRING PROTEIN BINDING SITES CLOSE TO EACH OTHER FOR SELF-ASSEMBLY

ALLOWS ASSEMBLING OF STRUCTURES SUCH AS VIRAL SHELLS OR ANTIBODIES, MAKING PARTS "FIT" BY BRINGING THEM CLOSE ENOUGH

UNWIND DNA DURING ITS REPLICATION

A CELL'S ENZYMES FACILITATE SEPARATION OF THE DNA STRANDS BUT KINETIC ENERGY OF MOLECULAR MOTION DOES THE JOB. (HARD)

FACILITATE EFFECTIVE COLLISIONS BETWEEN MOLECULES LEADING TO BIOCHEMICAL REACTIONS

THE MORE FREQUENTLY MOLECULES COLLIDE, THE MORE LIKELY THE REACTION WILL OCCUR