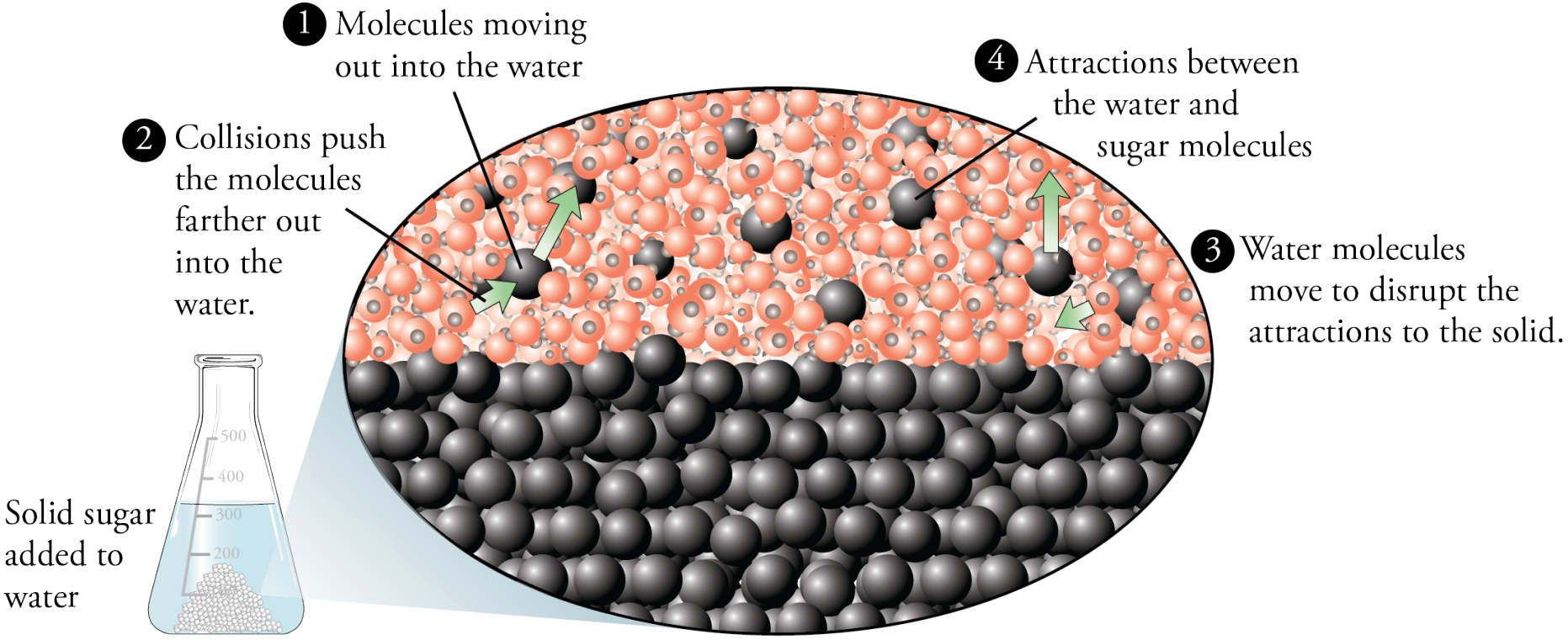
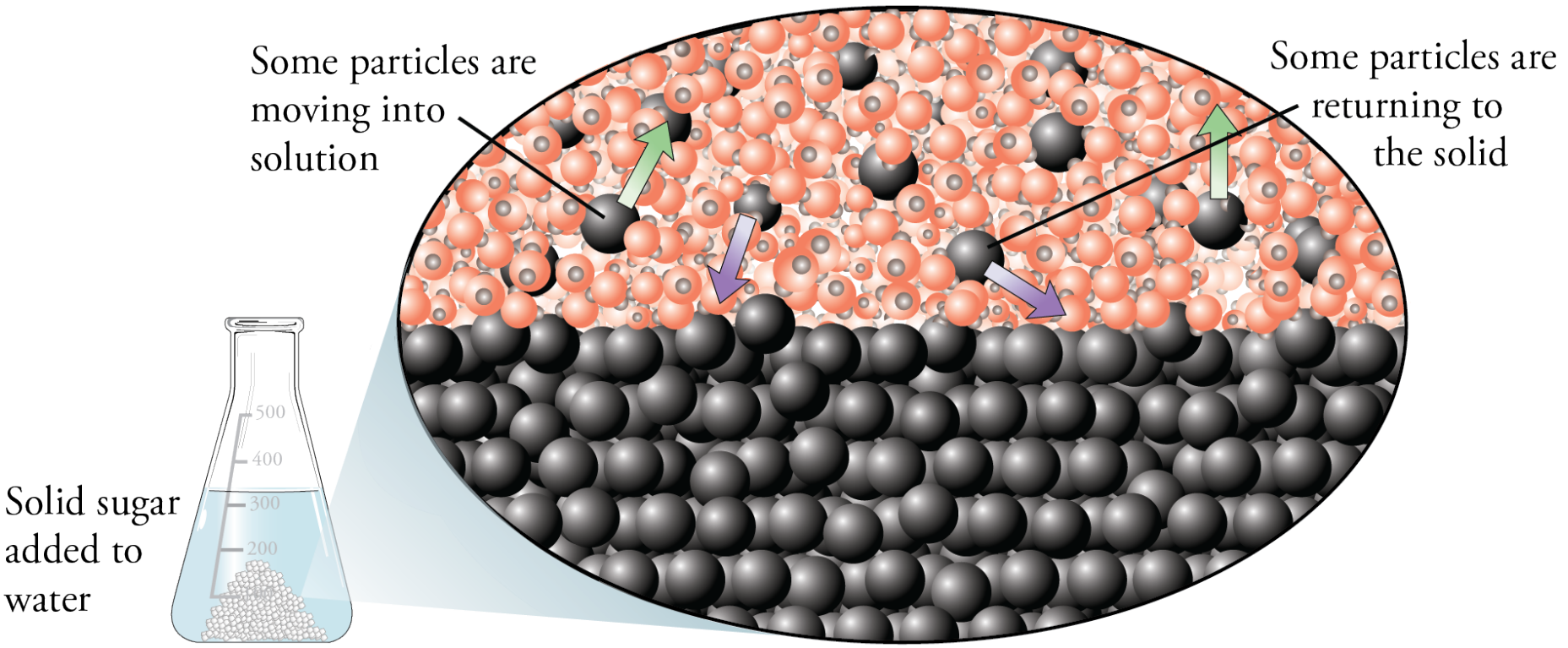
Questions to Answer

- What's happening at the molecular level as a solid dissolves in a liquid?
- Why is there a limit to the amount of solid that will dissolve in a given amount of solvent?
- What's going on when a mixture reaches the solubility limit?
- Why does powdered solid dissolve faster than solid with larger particles?
- How does agitation or stirring affect the process?
- How does temperature affect the process?
- Do particle size, agitation, or temperature change the solubility limit?

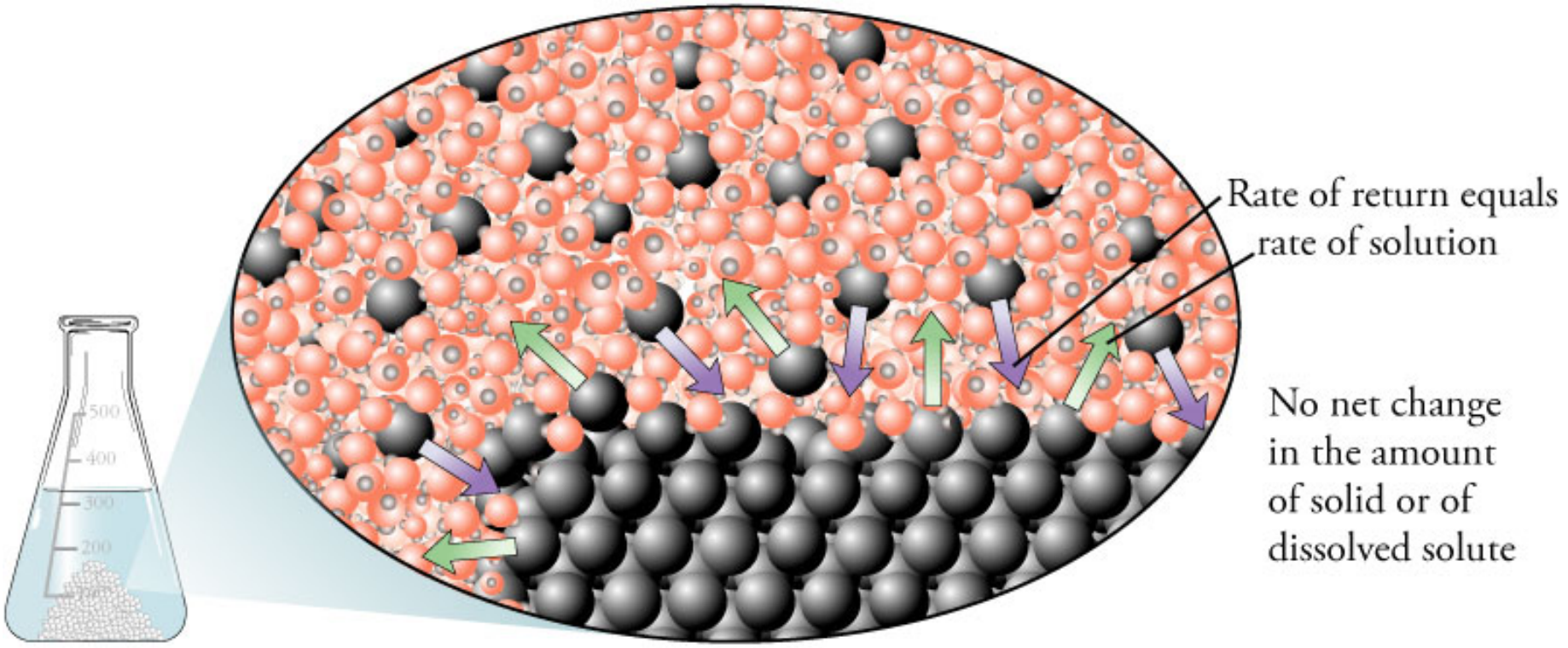
Particles into Solution



Particles Return to Solid



Dynamic Equilibrium in a Saturated Solution



Dynamic Equilibrium and Saturated Solutions

Addition of a large amount of solid to a liquid

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Initially, rate of solution is greater than the rate of return

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Net increase in number and concentration of particles in solution

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Increased rate of collision between dissolved particles and solid

↓

Increased rate of return...

↓

...Until rate of return equals rate of solution

↓

Constant changes from solid to dissolved solute and back,
but no net change in amounts of solid and dissolved solute

↓

Saturated solution due to dynamic equilibrium

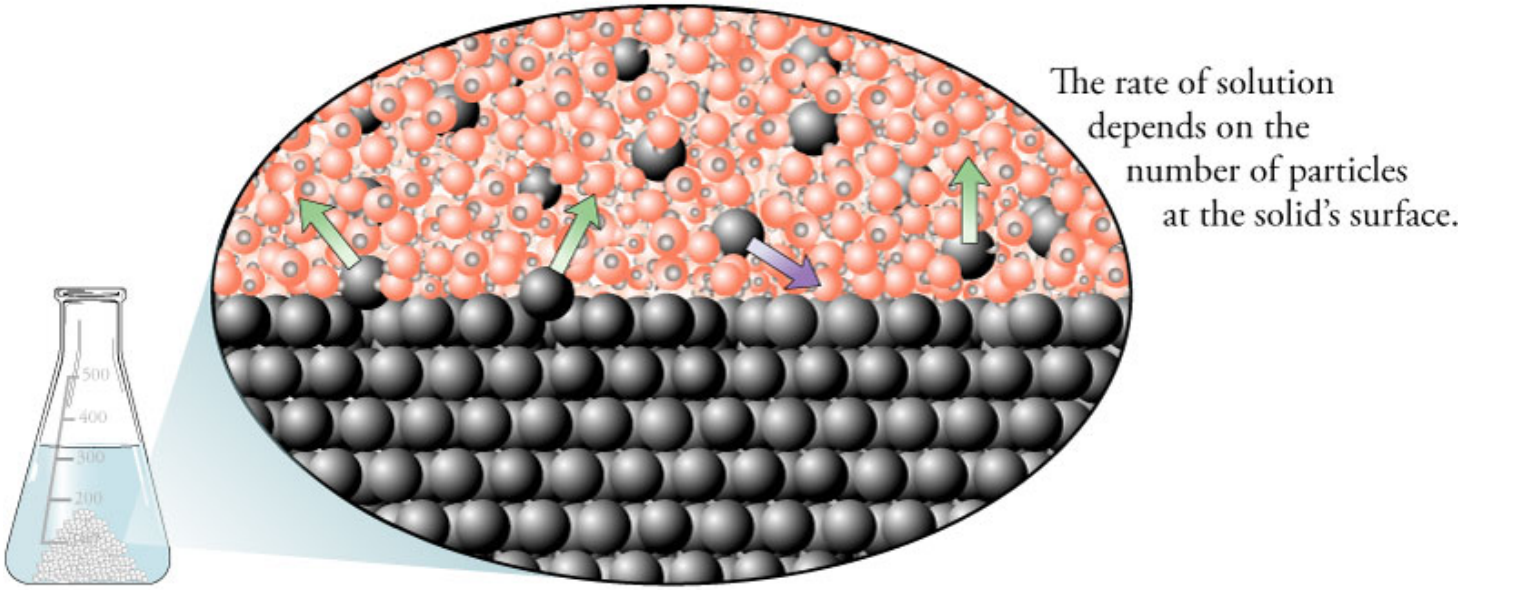
Saturated and Unsaturated Solutions

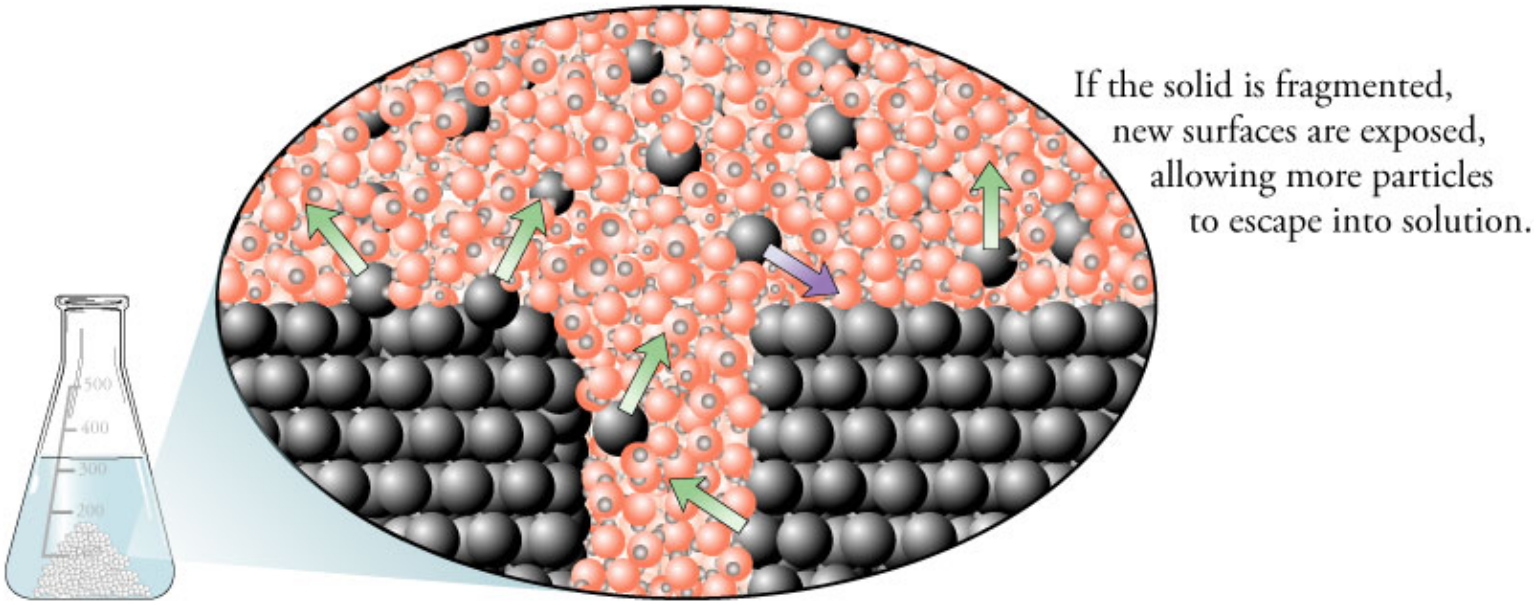
- A **saturated solution** is a solution that is at the solubility limit, either because
  - it contains an excess of solid with a dynamic equilibrium between the rate of solution and the rate of return
  - or it has reached the dynamic equilibrium and the excess solid has been filtered out.
- An **unsaturated solution** is a solution that has less solute than the solubility limit, either because
  - all the solid dissolves before the dynamic equilibrium is reached
  - or there just has not been enough time for the dynamic equilibrium to be reached.

Rate of Solution Dependent on:

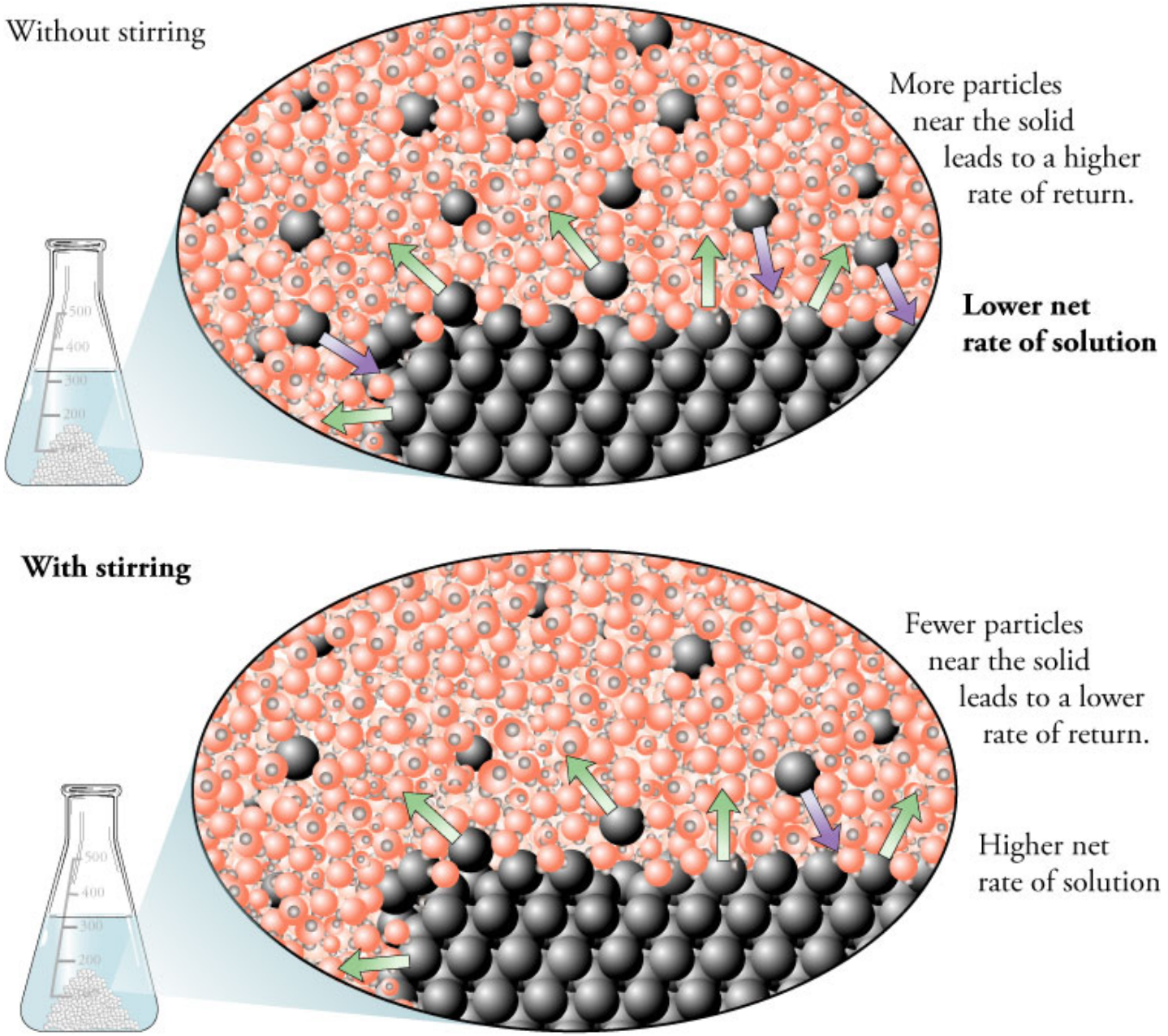
- Surface area of the solute
- Degree of agitation or stirring
- Temperature

Surface Area and Rate of Solution

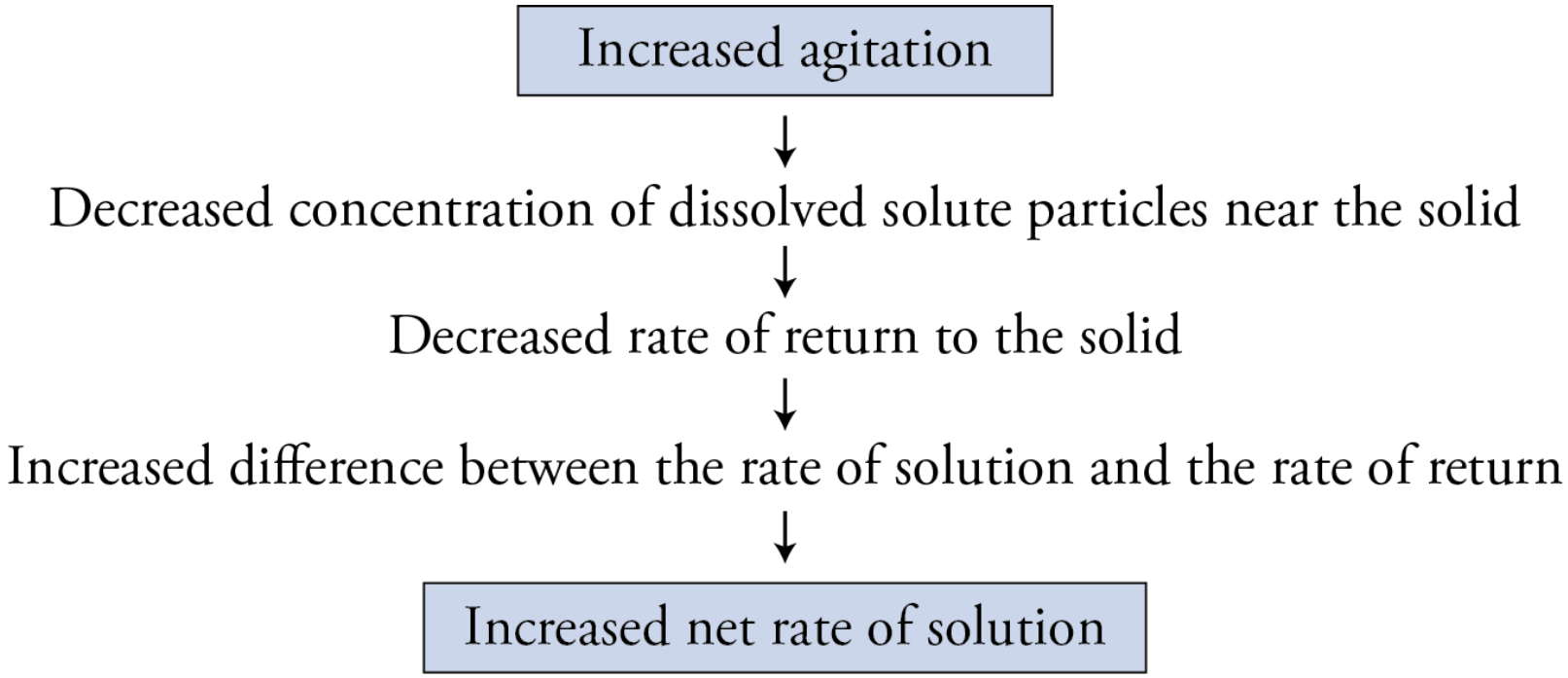




Agitation and Rate of Solution



Agitation and Rate of Solution



Temperature and Rate of Solution

Increased temperature

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Increased velocity of particles

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Particles in solution move away from the solid more rapidly

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Increased net rate of solution

Temperature and Increased Solubility Limit