

The **Diffusion** simulation allows students to explore how two gases mix. Experiment with concentration, temperature, mass, and radius to determine how these factors affect the rate of diffusion. Use the Center of Mass and Particle Flow Rate representations to determine when the system reaches equilibrium.

The screenshot shows the PhET Diffusion simulation interface. A central window displays a dark space with blue and orange particles. A vertical green line separates the two sides. Above the window is a 'Data' panel showing particle counts (81 blue, 15 orange on the left; 19 blue, 85 orange on the right) and average temperatures (307 K and 293 K). To the right is a control panel with sliders for Number of Particles, Mass (AMU), Radius (pm), and Initial Temperature (K). Below these are checkboxes for 'Center of Mass', 'Particle Flow Rate', 'Scale', and 'Stopwatch'. At the bottom, there are play/pause buttons, a speed selector (Normal/Slow), and a reset button. Callout boxes provide the following information:

- TRACK** the number of particles and temperature on each side
- EXPERIMENT** with number, mass, radius, and initial temperature.
- EXPLORE** the effects of mean free path by changing radius
- MEASURE** diffusion rate
- VISUALIZE** the flow of particles between sides

## Insights into Student Use

- Students may take some time to discover that they can quickly change values by holding down the arrow buttons.

## Model Simplifications

- The particle-particle collisions are modeled as hard sphere collisions. All inter-molecular forces are ignored. A detailed description of the model can be found [here](#).
- The Particle Flow Rate arrows are proportional to the number of particles that have crossed the midline and is time-averaged over 300 ps.

## Suggestions for Use

### Sample Challenge Prompts

- Explain how two gases mix.
- Describe what the Particle Flow Rate arrows represent.
- Design an experiment to determine the factors which affect the rate of diffusion.

## Customization Options

Query parameters allow for customization of the simulation, and can be added by appending a '?' to the sim URL, and separating each query parameter with an '&'. The general URL pattern is:

```
...html?queryParameter1&queryParameter2&queryParameter3
```

For example, in Diffusion, if you want to turn on projector mode (`colorProfile=projector`), with links disabled (`allowLinks=false`) use:

```
https://phet.colorado.edu/sims/html/diffusion/latest/diffusion_all.html?colorProfile=projector&allowLinks=false
```

To run this in Spanish (`locale=es`), the URL would become:

```
https://phet.colorado.edu/sims/html/diffusion/latest/diffusion_all.html?locale=es&colorProfile=projector&allowLinks=false
```

Query Parameter and Description	Example Links
<code>locale</code> - specify the language of the simulation using <a href="#">ISO 639-1</a> codes. Available locales can be found on the simulation page on the <a href="#">Translations tab</a> . Note: this only works if the simulation URL ends in “_all.html”.	<code>locale=es</code> (Spanish) <code>locale=fr</code> (French)
<code>colorProfile</code> - changes simulation colors for easier projection.	<code>colorProfile=projector</code>
<code>allowLinks</code> - when <code>false</code> , disables links that take students to an external URL. Default is <code>true</code> .	<code>allowLinks=false</code>

See all published activities for Diffusion [here](#).

For more tips on using PhET sims with your students, see [Tips for Using PhET](#).