

- **Today's Topics:** Conduction & Specific Heat
- **Cartoon:** Don Wimmer & Pat Brady
Rose is Rose



In the 1-D equation for diffusion ($\langle x^2 \rangle = 2Dt$) where is the thickness of material being diffused across?

- A. In the $\langle x^2 \rangle$
- B. In the D
- C. In the t
- D. Something else



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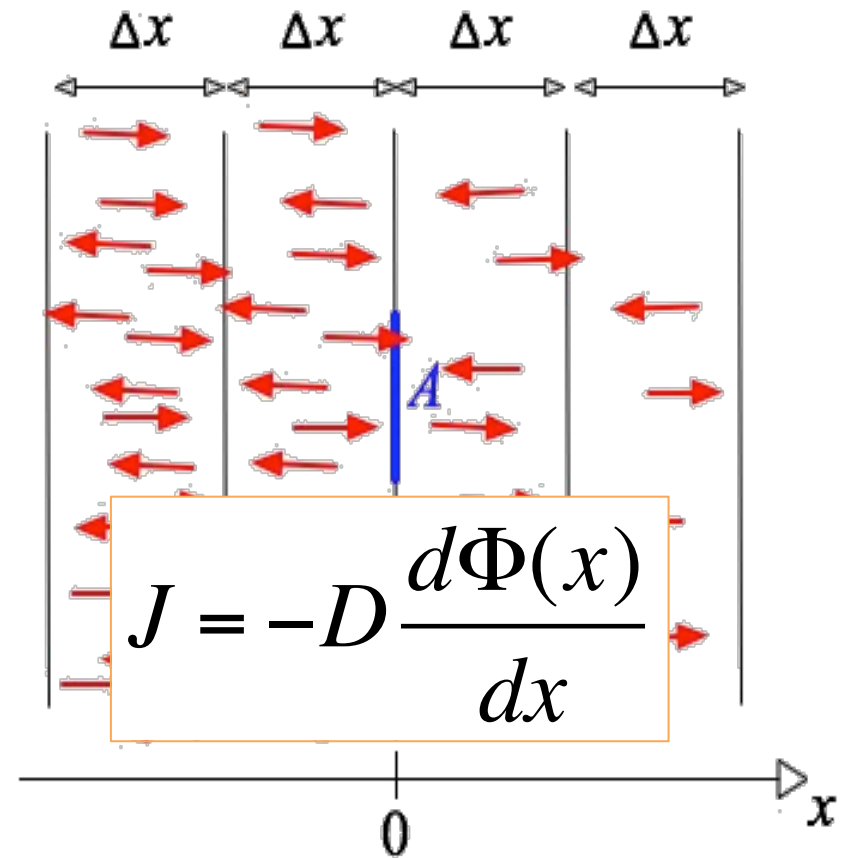
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The $\langle x^2 \rangle$ is talking about the average distance a molecule travels in a diffusive process. So the thickness of the material traveling across is in the $\langle x^2 \rangle$.



Fick's law: a simplified model of diffusion

- The red molecules do a random walk (as a result of collisions with fluid molecules)
- Assume
 - Uniform density in each bin
 - Ignore up/down motions
 - Move with uniform (average) velocity
 - Choose bin width to be average distance red molecule travels before colliding.
 - Ask net amount going through a surface of area A in a time



In Fick's Law what does the $d\Phi / dx$ tell us?



- A. The flow of particles depends on the concentration
- B. The flow of particles depends on the differences in concentration in time
- C. The flow of particles depends on the differences in concentration in space
- D. Something else

$$J = -D \frac{d\Phi(x)}{dx}$$

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$$J = -D \frac{d\Phi(x)}{dx}$$

The $d\Phi/dx$ is showing that what matters is the change in concentration as we move along the tube in space. So if you imagine walking along the tube when you encounter more stuff in one place and less stuff in another place.



We introduce ammonia (NH_3) and Hydrogen chloride (HCl) into a tube. We introduce one at each end, and they diffuse toward each other. NH_3 has a molar mass of 17 grams, while HCl has a molar mass of 36.5 grams.

Where does the gas meet?

- A. Closer to the NH_3 end
- B. Closer to the HCl end
- C. Right in the middle of the tube
- D. Not enough information to determine



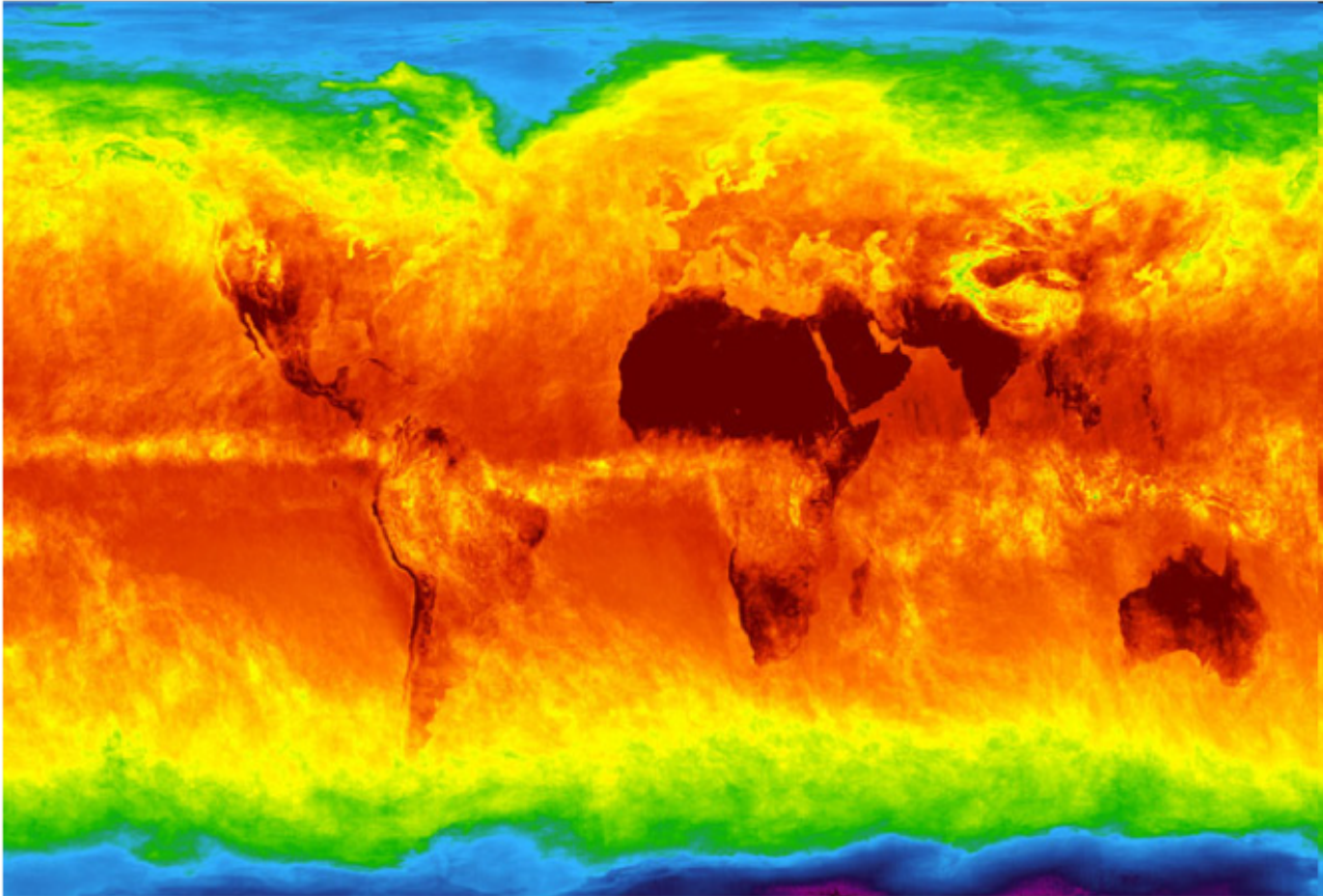
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Since the ammonia weighs less than the HCl , the speed of the individual ammonia molecules will have to be higher. As a result, the diffusion constant will be higher for HCl and thus the ammonia will diffuse faster than the HCl .

CH 15: Keeping Cool & Staying Warm



Tutorial

Would you expect the (formerly) boiling water to have a temperature greater than, equal to, or less than the air in the room?

- A. Greater than
- B. Less than
- C. Equal to



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Consider an empty plastic chair in this room. Does the metal and plastic parts have the same or different temperatures?

- A. Same
- B. Different – Metal is higher T
- C. Different – Metal is lower T



Consider an empty plastic chair in this room. Does the metal and plastic parts have the same or different temperatures?



A. Same

B. Different – Metal is higher T

C. Different – Metal is lower T

Click when you've got a prediction for the "metal" graph



Click when you've got a prediction for the "plastic" graph



Plastic

	T, C
Run #1	