

Solution to Problem 1.2

TEMPERATURE :

AS TEMPERATURE OF THE FLUID INCREASES, THE WATER MOLECULES MOVE ABOUT MORE VIGOROUSLY. THE COLLISION OF WATER MOLECULES WITH MOLECULES OF THE DIFFUSING SPECIES CAUSES THE SPECIES MOLECULES TO MOVE ABOUT AS WELL. AS THE STRENGTH + NUMBER OF COLLISIONS INCREASES WITH TEMPERATURE, THE MEAN DISTANCE (Δx) MOVED PER TIME (Δt) INCREASES. THEREFORE, BASED ON THE RANDOM WALK MODEL, WE EXPECT D TO INCREASE WITH TEMPERATURE. $D \sim \Delta x^2 / \Delta t$

MOLECULE SIZE :

BIGGER MOLECULES WILL BE LESS EASILY MOVED BY COLLISIONS FROM SURROUNDING WATER MOLECULES, ESPECIALLY IF SPECIES MOLECULE IS MUCH BIGGER THAN WATER MOLECULE, AND \therefore WILL EXPERIENCE MULTIPLE, SIMUL UNCOORDINATED COLLISION. THUS, THE MEAN STEP SIZE, Δ PER TIME IS SMALLER FOR BIGGER MOLECULES. AND WE EXPECT $D \sim \Delta x^2 / \Delta t$ TO BE SMALLER T