

Problem Set 3: Kinetic Theory of Gases

Due Sept 4, 2008

This problem set is shorter than usual to give you an opportunity to review the calculus covered in Problem Set 2. Since your ability to understand and complete future problem sets requires a good working knowledge of derivatives, including partial derivatives, please make sure that you are comfortable with all the material in Problem Set 2.

As with Problem Sets 1 and 2, groups of four or fewer students can hand in a problem set together. Your group **MUST** choose a different person to write the final answers than you used for Problem Sets 1 or 2.

1. Problem 2.49 (p. 35):
Apply the kinetic theory of gases to explain:
 - (a) Boyle's law,
 - (b) Charles' law (use alternate form on p. 13 of $P \propto T$),
 - (c) Dalton's law
2. Problem 2.50 (p. 35):
Is temperature a microscopic or macroscopic concept? Explain.
3. Problem 2.53 (p. 35):
A square box contains He (helium) at 25°C. If the atoms are colliding with the walls perpendicularly (at 90°) at the rate of 4.0×10^{22} times per second, calculate the force (in Newtons) and the pressure (in atms) exerted on the wall given that the area of the wall is 100 cm² and the speed of the atoms is 600 m s⁻¹.