Physics A410: Thermal Physics

Problem Set 2

Assigned 2004 January 20
Due 2004 January 27

Show your work on all problems! Be sure to give credit to any collaborators, or outside sources used in solving the problems.

1 Kinetic Pressure

In a rainstorm, 100 raindrops strike a 1 m × 1 m square window every second, falling at an angle of 30° to the vertical. Each raindrop has a mass of 1 g and a speed of 20 m/s. The raindrops collide *inelastically* with the window, sliding down the surface of the pane after they hit. What is the average pressure exerted on the window due to the raindrops hitting it? How does this compare with the pressure of the atmosphere?

2 Work and Power

If a microwave oven can heat a 300 ml cup of water from 20°C to boiling temperature in three minutes, what is the power of the microwave, in watts? Explain why the transfer of energy into the water is not heat.

3 Schroeder 1.31

4 Schroeder 1.37

Note that "air" is primarily made up of the diatomic gases nitrogen and oxygen.