

PC1221 Fundamentals of Physics 1

Semester-1, AY10/11

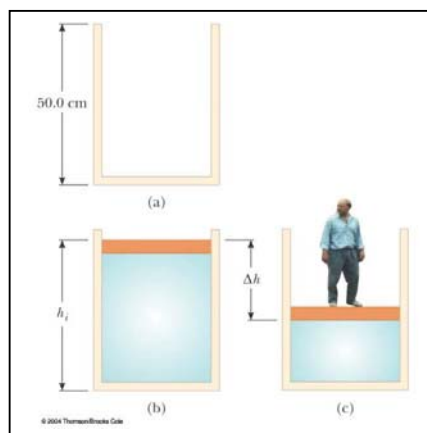
Tutorial 6 (Mass Tutorial)

Tutorial 6 will be conducted in LT25 on 13 Nov 2010 at 9am.

1. Why must we use absolute temperature in the ideal gas law ($PV = NkT$)? Explain how using the Celsius scale would give nonsensical results.

2. A metal bar stand on a wooden deck feels colder than the wood around. Is the metal bar necessarily colder? Explain.

3. A cylinder that has a 40.0-cm radius and is 50.0 cm deep is filled with air at 20.0°C and 1.00 atm (Fig. a). A 20.0-kg piston is now lowered into the cylinder, compressing the air trapped inside (Fig. b). Finally, a 75.0-kg man stands on the piston, further compressing the air, which remains at 20°C (Fig. c). (a) How far down (Δh) does the piston move when the man steps onto it? (b) To what temperature should the gas be heated to raise the piston and man back to h_i ?



4. On a cold day, you rub your hands together to warm them up. You press your hands together with a force of 5.0 N. Each time you rub them back and forth they move a distance of 16 cm with a coefficient of kinetic friction of 0.45. Assuming 20% of your work done flow to the surroundings, after you have rubbed your hands back and forth eight times, by how much has the internal energy of your hands increased?

5. A water heater is operated by solar power. If the solar collector has an area of 6.00 m², and the intensity delivered by sunlight is 550 W/m², how long does it take to increase the temperature of 1.00 m³ of water from 20.0°C to 60.0°C?

6. A sample of an ideal gas goes through the process shown in figure. From A to B, the process is adiabatic; from B to C, it is isobaric with 100 kJ of energy entering the system by heat. From C to D, the process is isothermal; from D to A, it is isobaric with 150 kJ of energy leaving the system by heat. Determine the difference in internal energy $E_{int,B} - E_{int,A}$.

