

Problem Set 6

Physics, summer 2020/21

- 1) **(2p.)** In a system undergoing adiabatic compression, what are the values of internal energy and heat if work done on the system is 500 J?
- 2) **(2p.)** What is the change in internal energy of a system when a total of 150.00 J of heat transfer occurs out of (from) the system and 159.00 J of work is done on the system?
- 3) **(3p.)** A coal-fired power station is a huge heat engine. It uses heat transfer from burning coal to do work to turn turbines, which are used to generate electricity. In a single day, a large coal power station has 2.50×10^{14} J of heat transfer from coal and 1.48×10^{14} J of heat transfer into the environment.
 - a) What is the work done by the power station?
 - b) What is the efficiency of the power station?
- 4) **(2p)** What is the heat energy required to completely vaporize 10 g of water beginning at 0°C? (The heat capacity of water is 4.2 J/g·K and the $\Delta H_{\text{vaporization}}$ of water is 2260 kJ/kg)
- 5) **(1p.)** The temperature at the bottom of a high waterfall is higher than that at the top because:
 - a) by itself the heat flows from higher to lower temperature.
 - b) the difference in height causes the difference in pressure.
 - c) thermal energy transforms into chemical energy.
 - d) mechanical energy transforms into thermal energy.

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