

Study Guide for Chapter 3

1) Second law of thermodynamics

2) Carnot cycle (engine)

Q, W, ΔU in each step; which step absorbs/releases heat?

$$\oint \frac{dQ_{rev}}{T} = 0; \oint \frac{dQ_{irr}}{T} < 0$$

3) Entropy: $dS = \frac{dQ_{rev}}{T}$

4) $\int_A^B \frac{dQ_{irr}}{T} = 0$ for **adiabatic** process

$\Delta S > 0$ for irreversible process

5) Calculate ΔS for phase changes

6) Calculate ΔS for ideal gas T, V changes

7) Calculate ΔS for mixing gases, solutions

$$\Delta S = -R (x_1 \ln x_1 + x_2 \ln x_2)$$

8) Third law of thermodynamics

9) Equilibrium conditions, what thermodynamic quantities characterize (determine) equilibrium under which conditions?

10) Direction of spontaneous process, when do the following conditions apply?

$$\Delta S > 0, \Delta G < 0, \Delta A < 0$$