

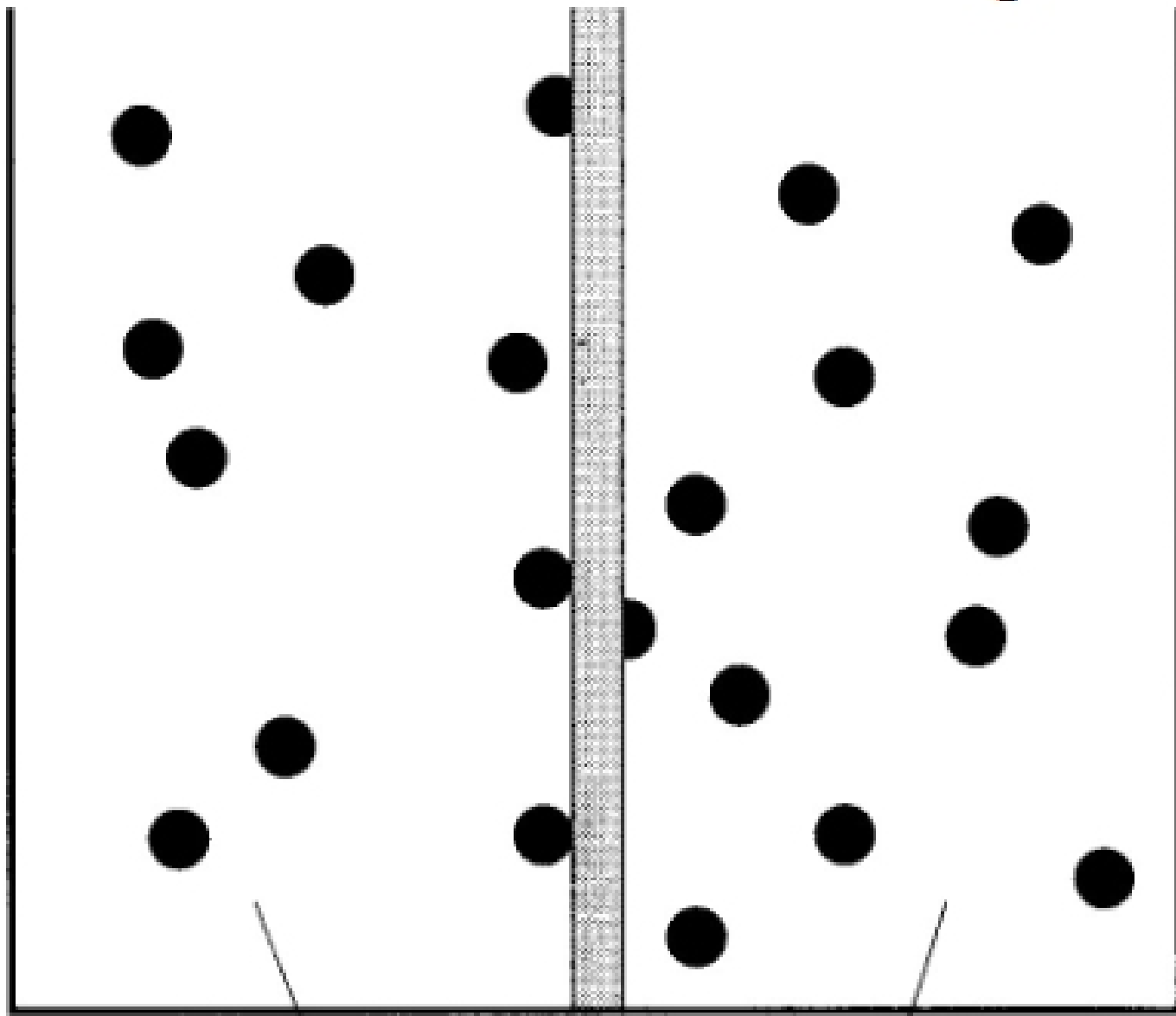
# Lecture 32—Grand canonical ensemble

## Chapter 9, Wednesday April 2<sup>nd</sup>

- Systems with variable particle number
- Conditions for equilibrium
- Revised 1st and 2nd laws
- Chemical and Gibbs potentials
- Calculating the chemical potential
- Examples

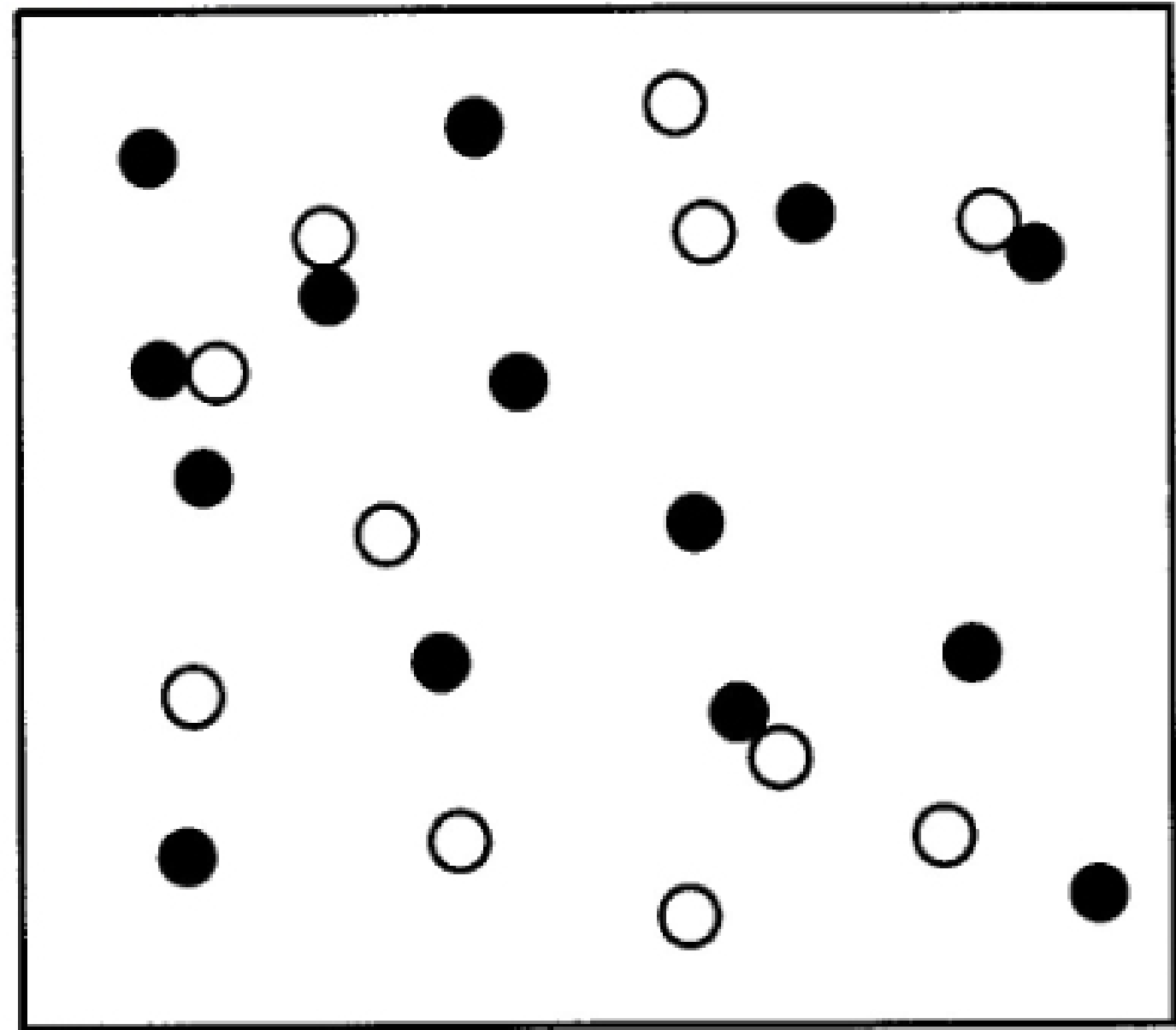
**Reading:** All of chapter 9 (pages 188 - 207)  
Homework 9 due Wed. Apr. 9th at 5pm  
Assigned problems, Ch. 9: 2, 4, 6, 8, 10

# Chapter 9: systems with variable #s of particles

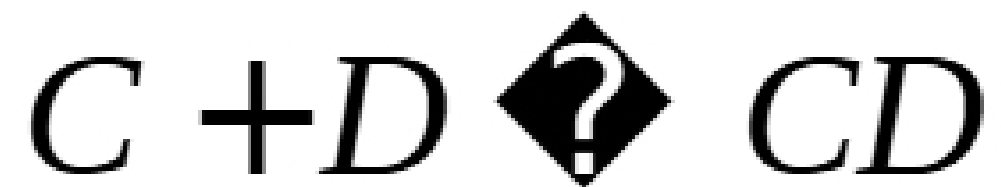


System A

System B



Chemical reaction:



$$\frac{dN_A}{dN_B} = -1$$

# London - van der Waals' interaction

Repulsion occurs when the negative electron clouds eventually come into contact. It is a very hard interaction, almost like the collision between two billiard balls, i.e.  $V$  increases very rapidly.

