# Lecture 22 — The Maxwell Distribution
# Chapter 7, Friday February 29th

- Final points from Ch. 6 – molecular hydrogen
- Maxwell-Boltzmann probability
- Density of states in *k*-space
- Single-particle density of states in energy
- Maxwell distribution of speeds in a classical gas

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| Reading: | All of chapter 7 (pages 144 – 157) |
| | Assigned problems, Ch. 6: 2, 4*, 6, 8, (+1) |
| | Homework 6 due today by 5pm |
| | Assigned problems, Ch. 7: 6, 8, 12, 14, 16 |
| | Homework 7 due next Friday |
| | Exam 2 on Wed. after spring break |

# Spin

*Fermions* : $\frac{1}{2}\hbar,\ \frac{3}{2}\hbar,\ \frac{5}{2}\hbar,\ldots.$

*Bosons* : $0,\ \hbar,\ 2\hbar,\ 3\hbar,\ldots.$

$$\Psi_{12} = \psi_{space}\chi_{spin}$$

$$\chi_1 = \left|\uparrow\uparrow\right\rangle$$

$$\chi_2 = \left(\left|\uparrow\downarrow\right\rangle + \left|\downarrow\uparrow\right\rangle\right)$$

$$\chi_3 = \left|\downarrow\downarrow\right\rangle$$

} Symmetric

$$\chi_4 = \left(\left|\uparrow\downarrow\right\rangle - \left|\downarrow\uparrow\right\rangle\right)$$ Antisymmetric

$$\Psi_{12} = \left\{\phi_i(x_1)\phi_j(x_2) - \phi_j(x_1)\phi_i(x_2)\right\}\left(\left|\uparrow\downarrow\right\rangle + \left|\downarrow\uparrow\right\rangle\right)$$

$$\Psi_{12} = \left\{\phi_i(x_1)\phi_j(x_2) + \phi_j(x_1)\phi_i(x_2)\right\}\left(\left|\uparrow\downarrow\right\rangle - \left|\downarrow\uparrow\right\rangle\right)$$

# Diatomic molecules: ortho and para $^1H_2$