Physics 121 – November 14, 2017

Announcements:

No labs or recitations next week (Thanksgiving)

Assignments:

This week:

- Read Chapter 15.
- Complete ETA Problem Set #12 by Monday, Nov 20.
- End-of-chapter problems: Ch 15: 26, 36, 38, 50, 51, 52. Due by 4 pm, Nov 20.
- Recitation: Quiz (statics and torque). Practice problems on harmonic motion.

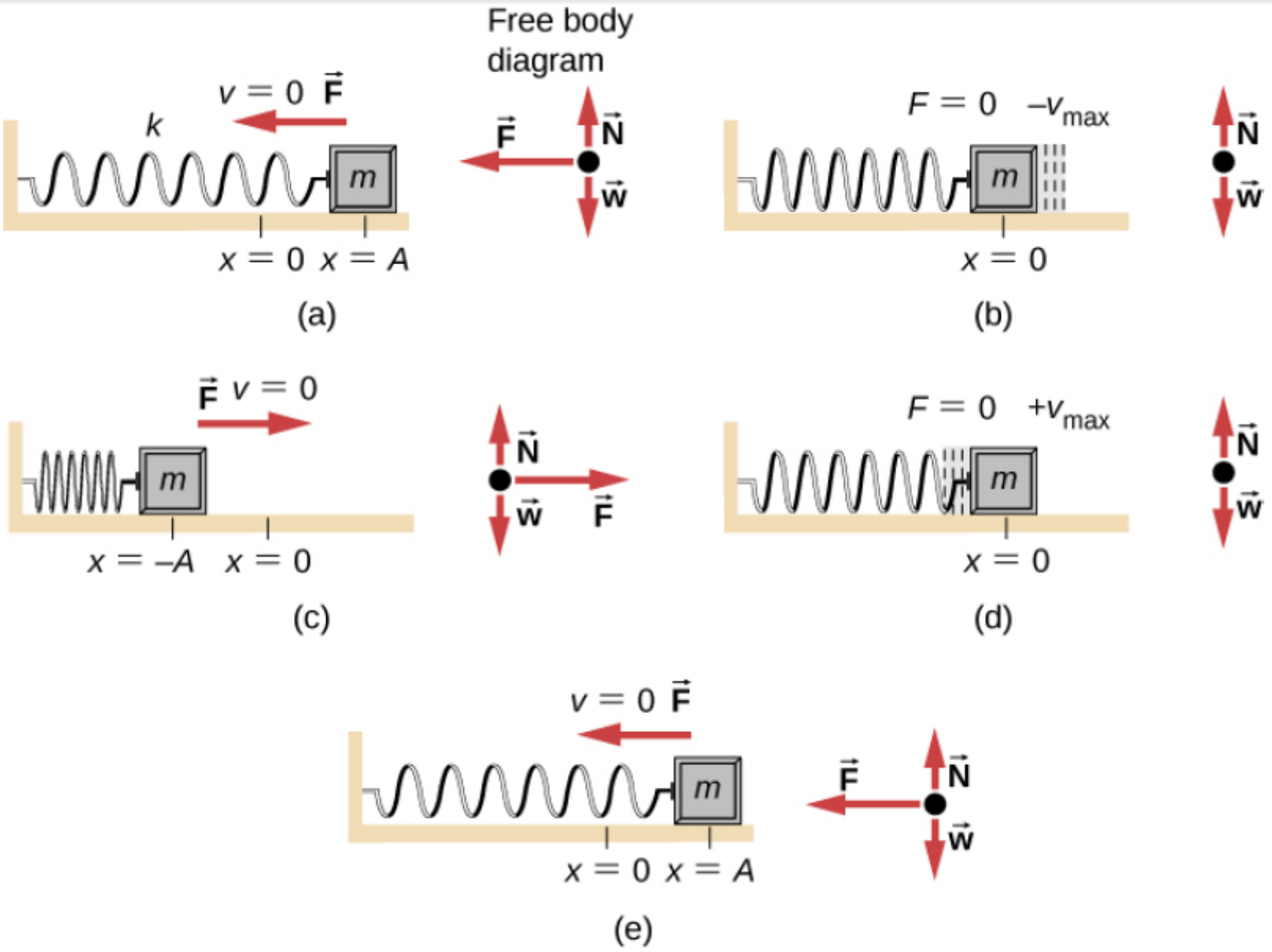


Figure 15-3 from L&S

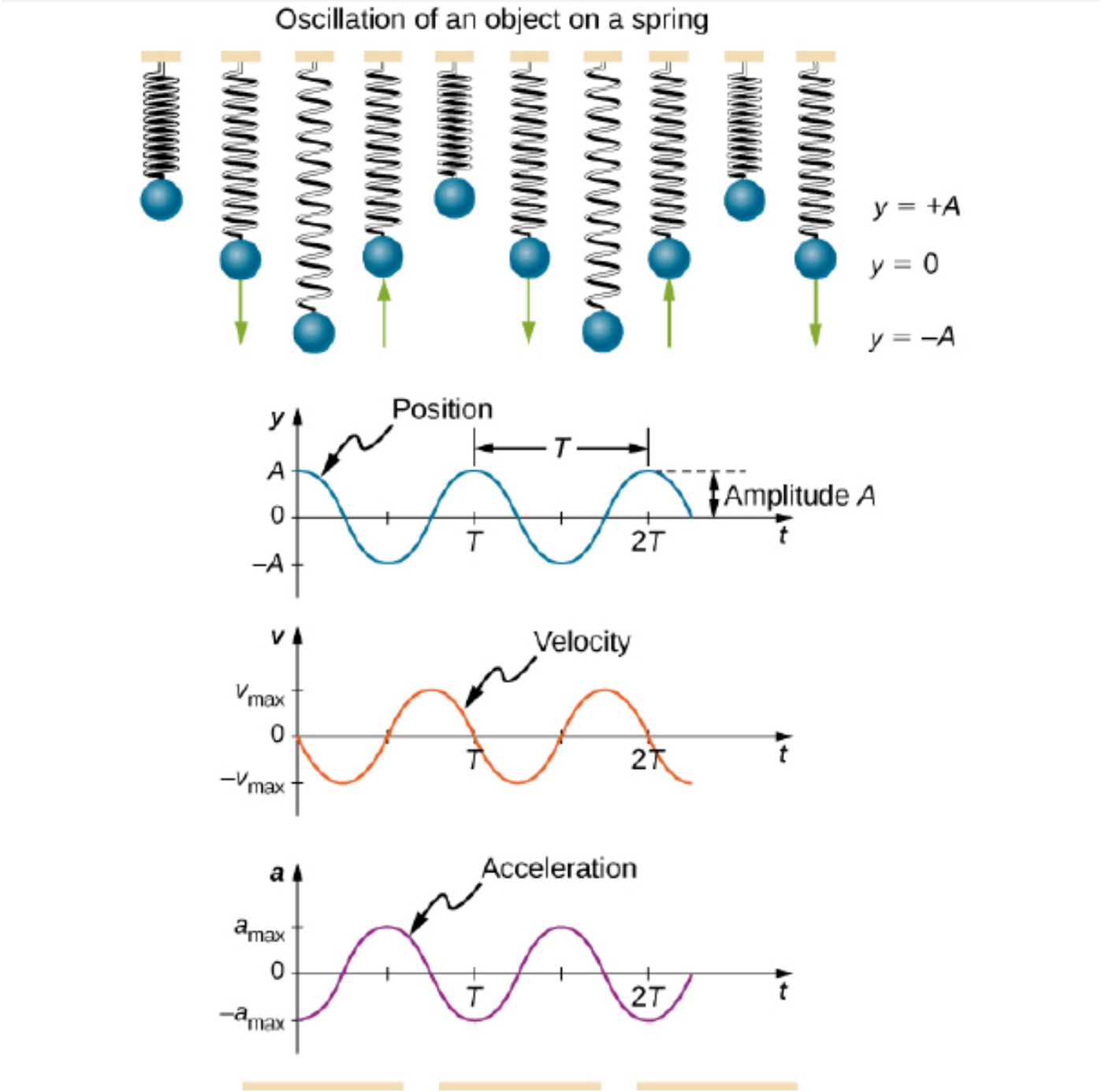
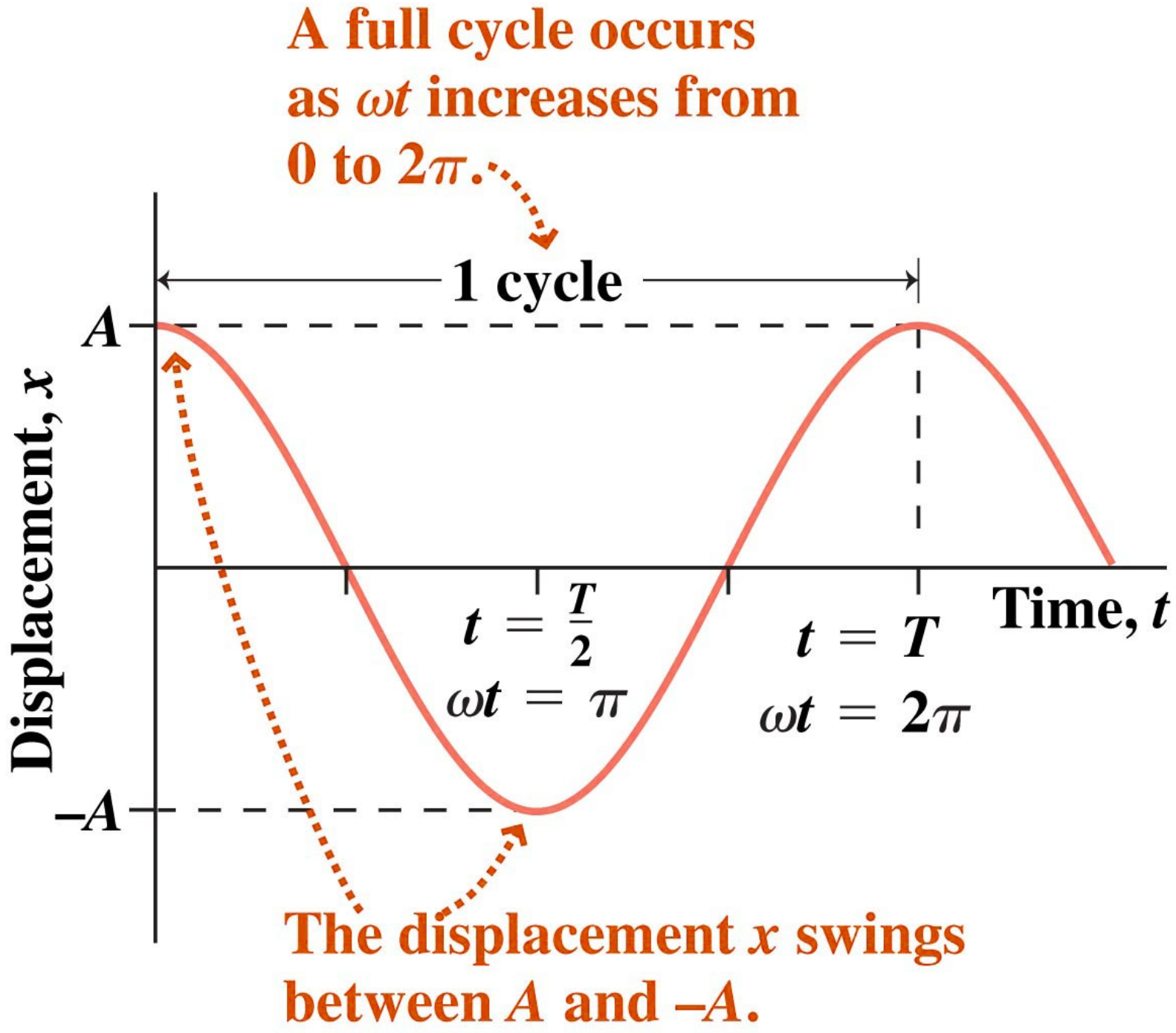


Figure 15-10 from L&S



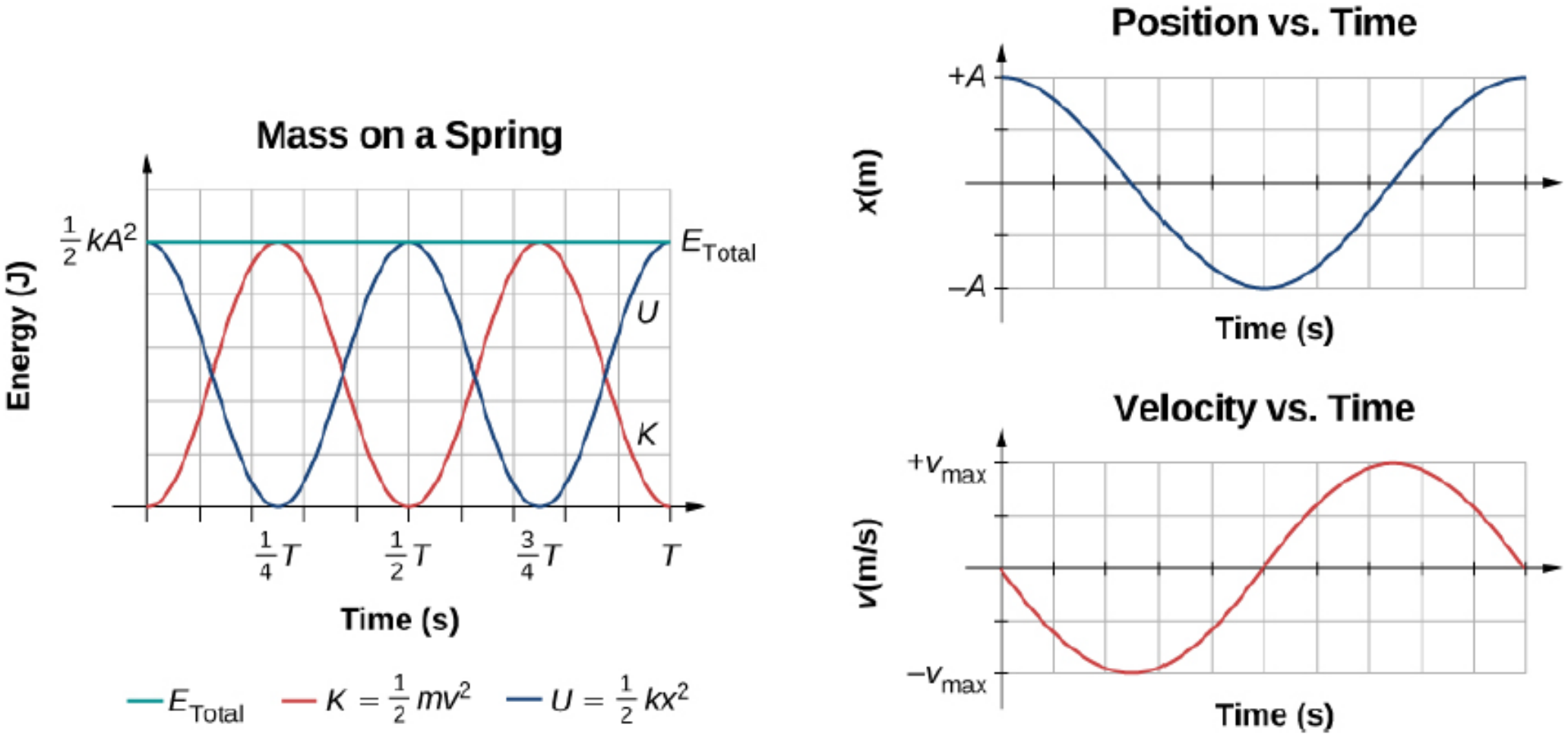
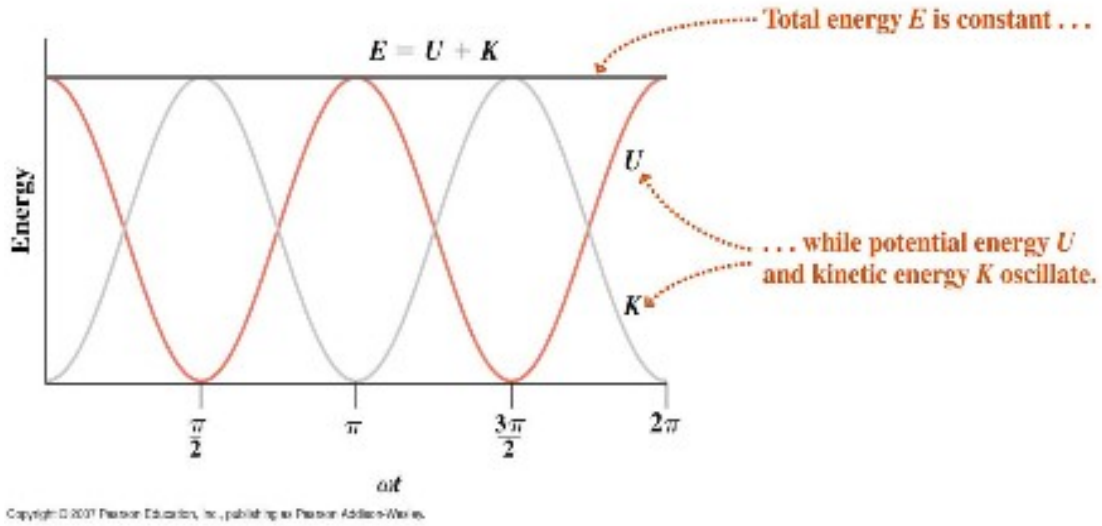
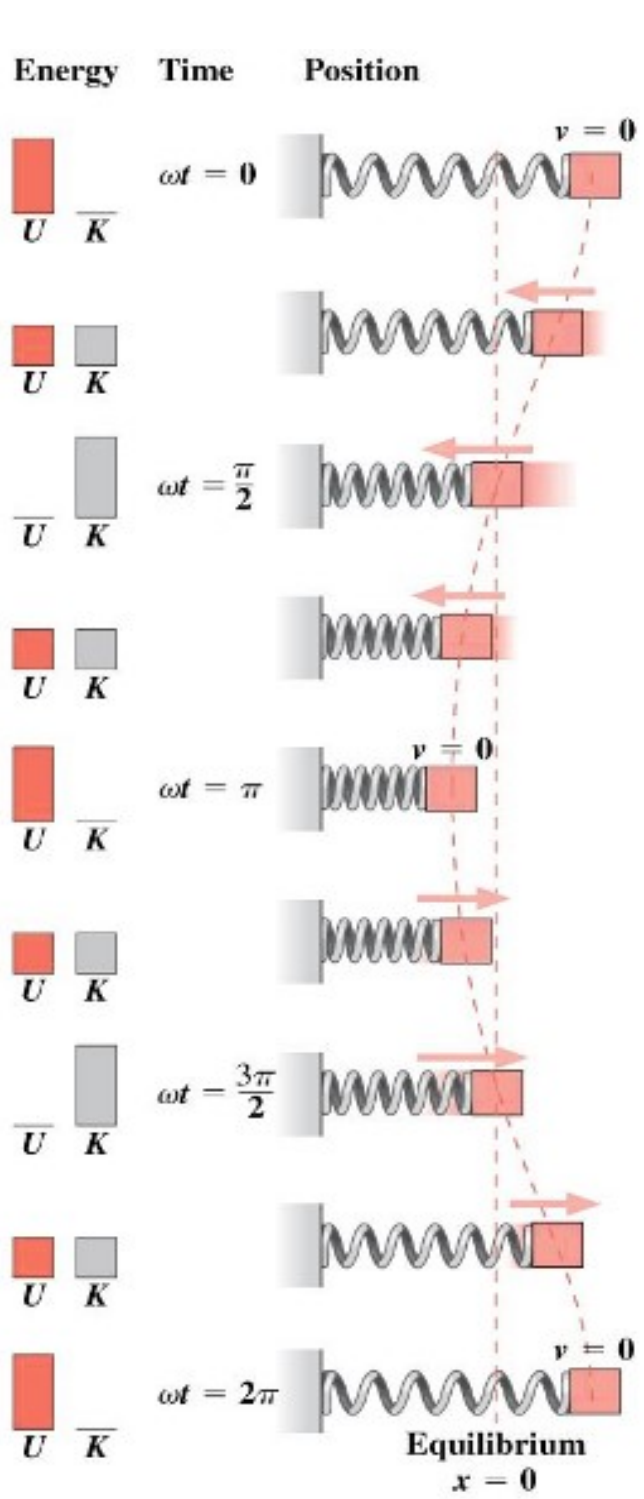


Figure 15.12 Graph of the kinetic energy, potential energy, and total energy of a block oscillating on a spring in SHM. Also shown are the graphs of position versus time and velocity versus time. The total energy remains constant, but the energy oscillates between kinetic energy and potential energy. When the kinetic energy is maximum, the potential energy is zero. This occurs when the velocity is maximum and the mass is at the equilibrium position. The potential energy is maximum when the speed is zero. The total energy is the sum of the kinetic energy plus the potential energy and it is constant.

Energy in SHM:

$$E = K + U$$
$$= \tfrac{1}{2}mv^2 + \tfrac{1}{2}kx^2$$
$$= \tfrac{1}{2}kA^2\sin^2(\omega t) + \tfrac{1}{2}kA^2\cos^2(\omega t)$$



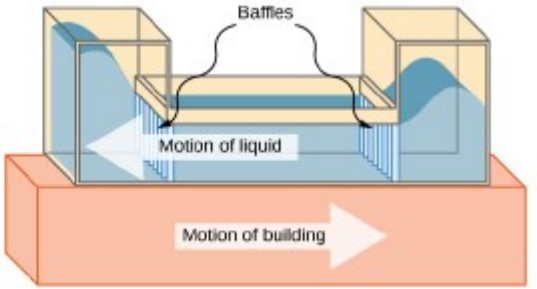


Here are some interesting things involving approximations that use simple harmonic motion

Diatomic molecules, internuclear separation (see next slide)

More complicated molecules
http://www2.ess.ucla.edu/~schauble/molecular_vibrations.htm

Damping for tall buildings



Stringed instruments (real or fake video?)

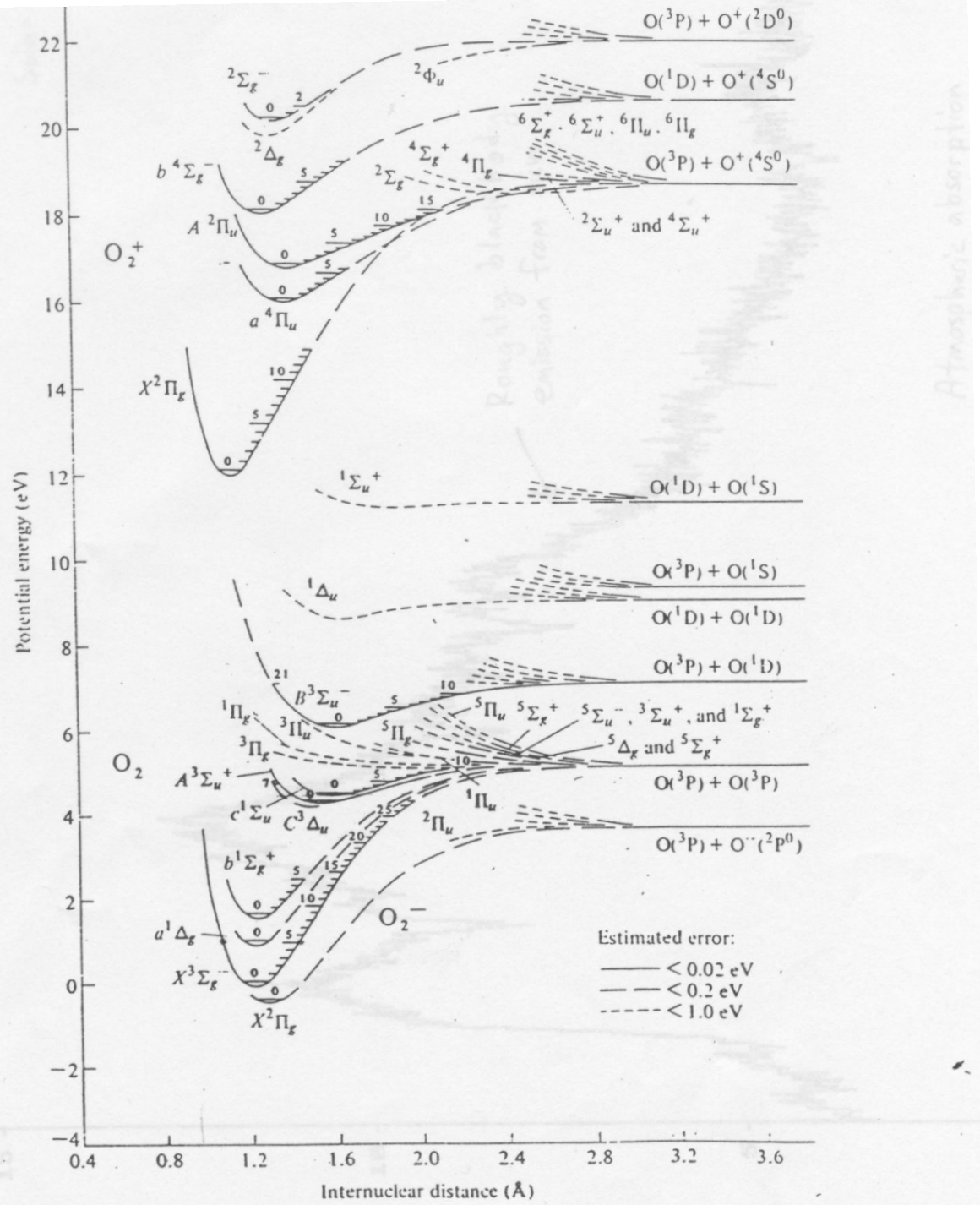
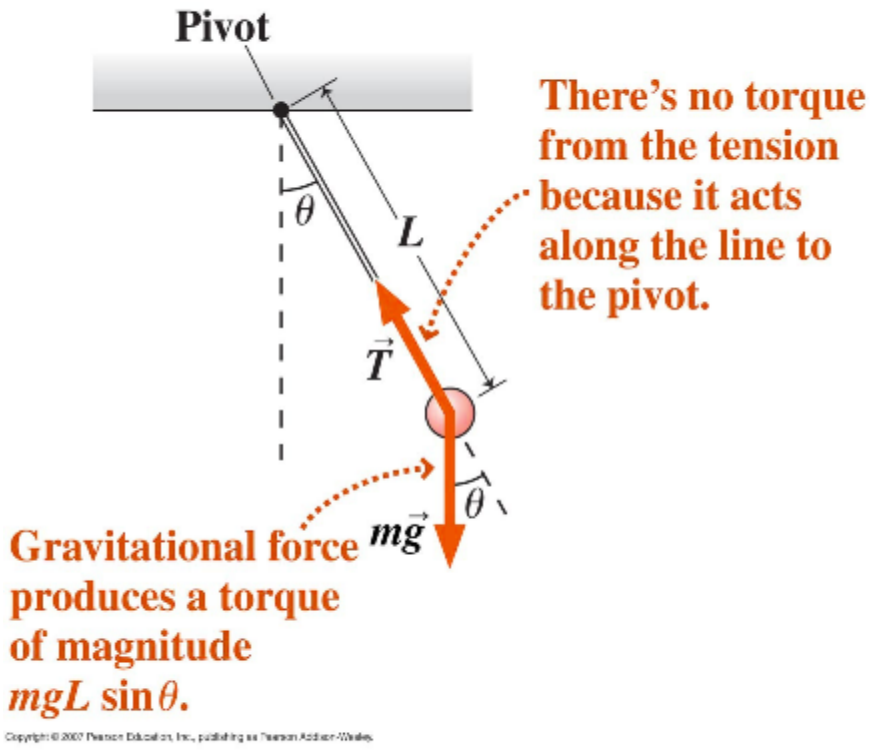


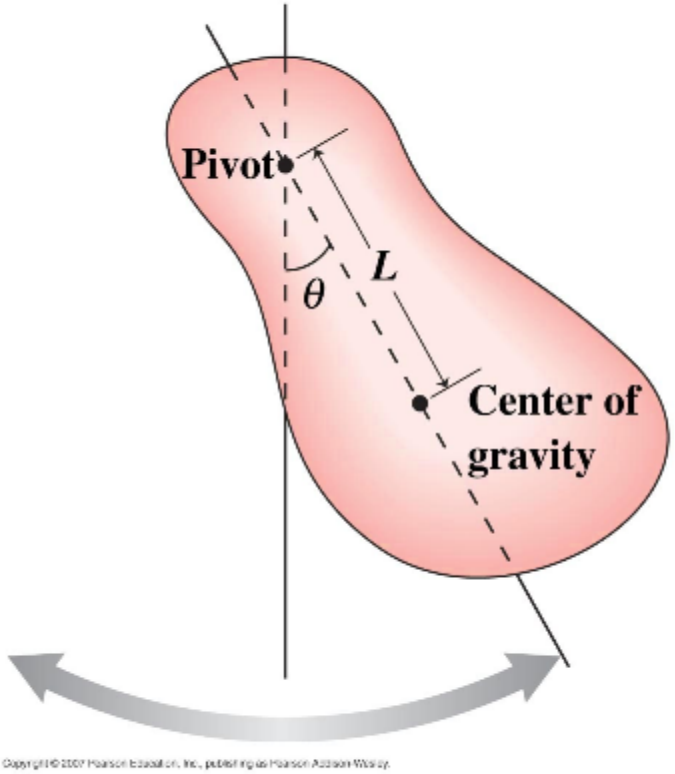
Figure 3.15
Potential energy diagram for O_2 compiled by F. R. Gilmore (reference 8). [Reproduced with the permission of F. R. Gilmore, The Rand Corporation.]

Simple Pendulum



Point mass suspended from a massless string

Physical Pendulum



Arbitrary shape that's free to swing.