

8. Concepts relating to heat

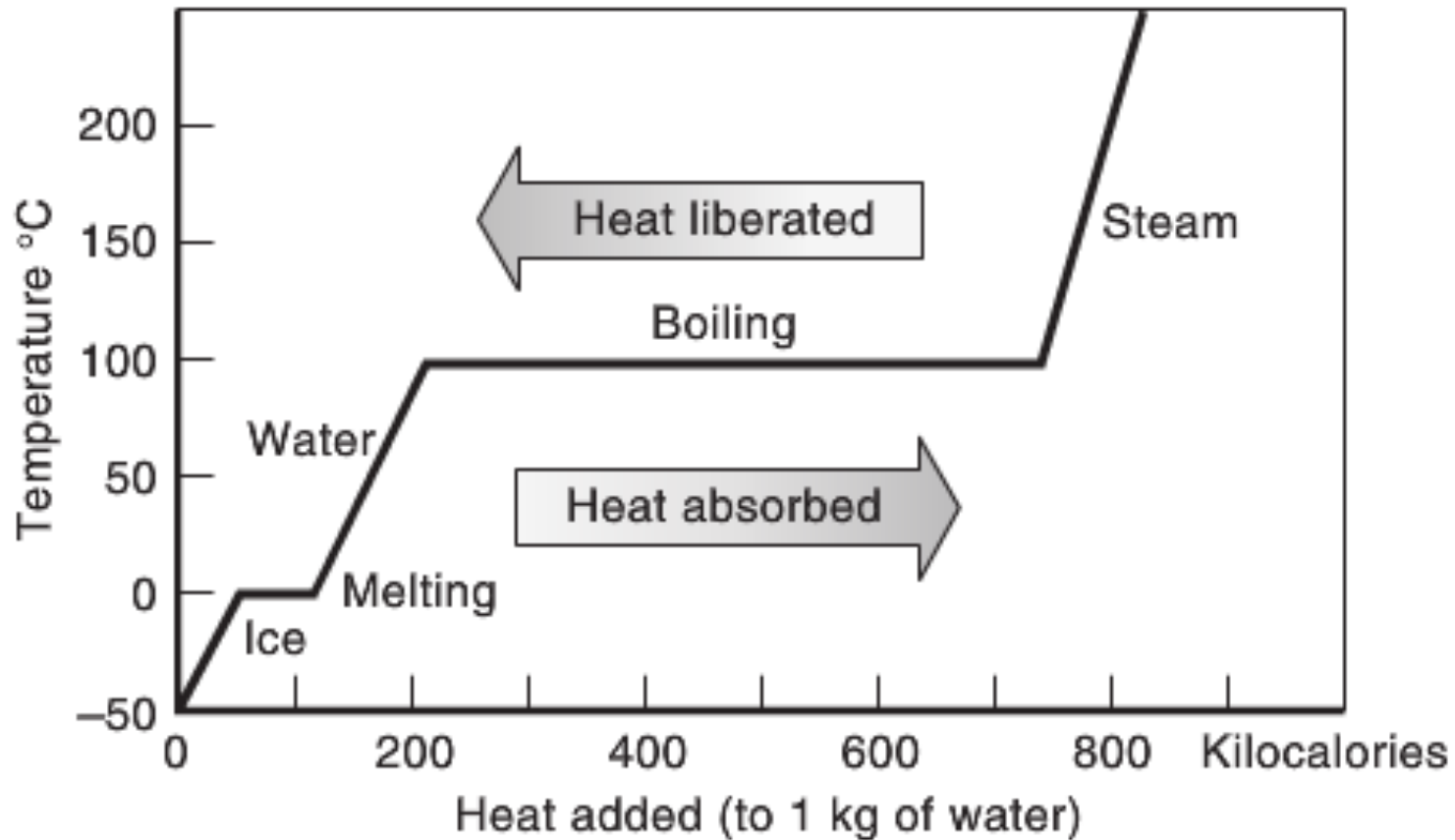
II. Heat energy transfer

Prepared for EGY 105

Energy in our World

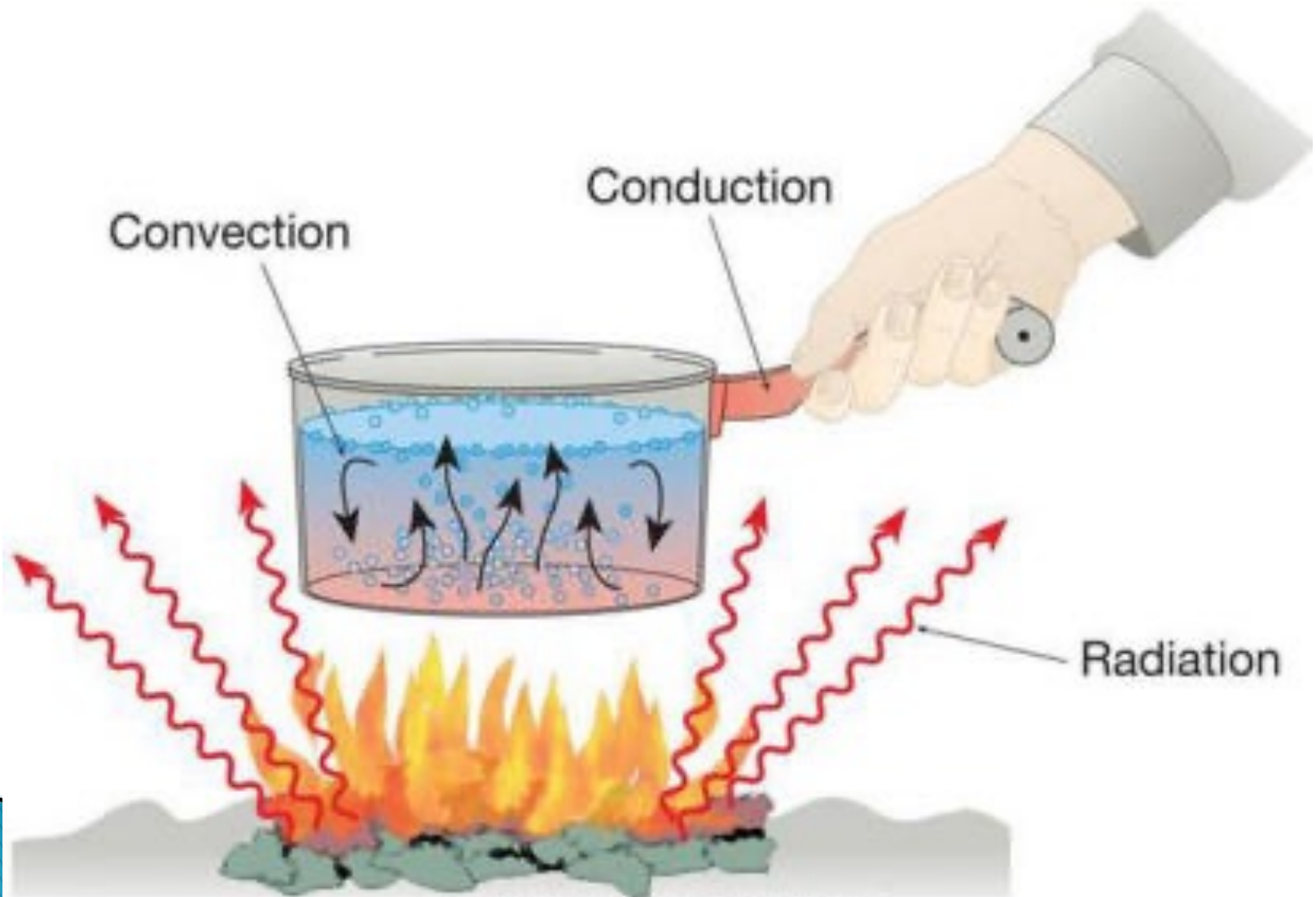
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Temperature as a function of heat in water



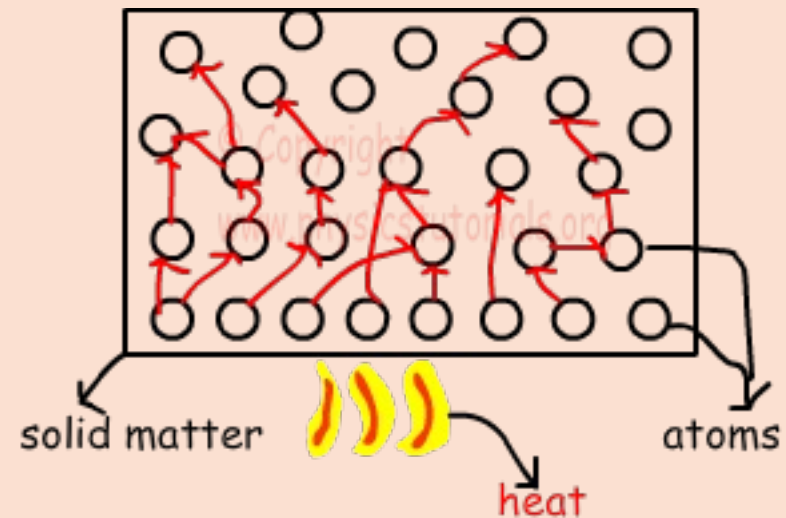
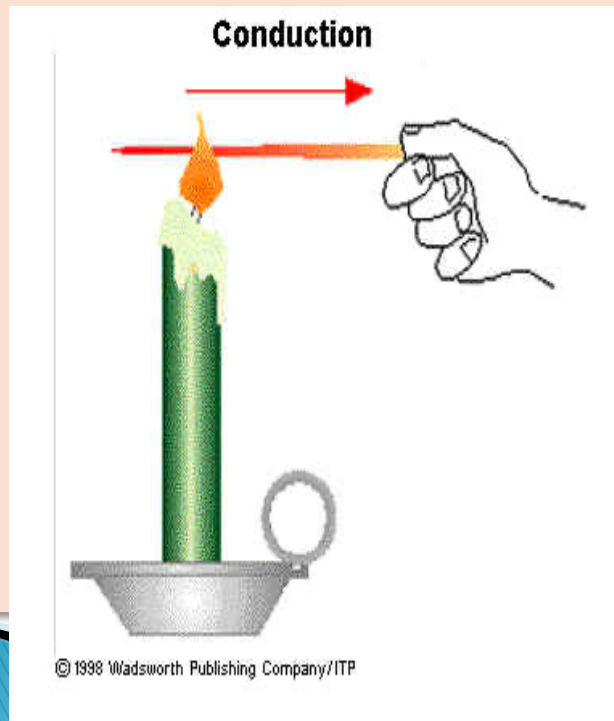
See Figure 5.6 on p. 101 of your text.

Forms of heat transfer



Conduction

- ▶ Energy of molecules directly transferred to adjoining molecules
 - Causes them to gain heat



<http://www.physicstutorials.org/>

Conductivity differs among materials



High in
metals



Intermediate in
brick



Low in
styrofoam



These make
good insulators

Conductive heat transfer through a material

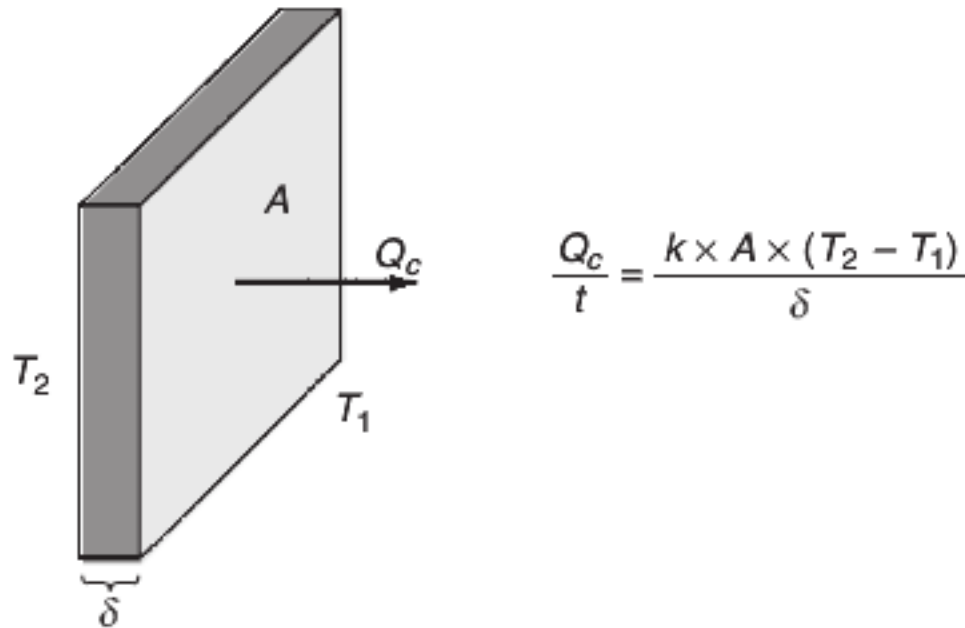
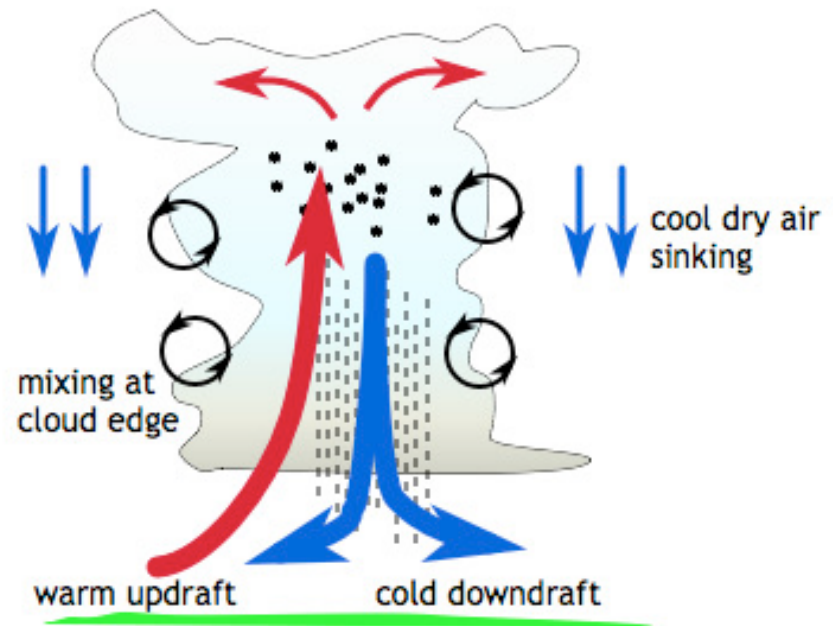
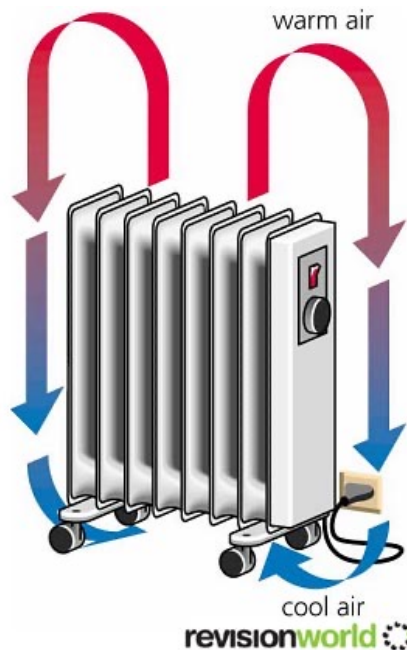


Figure 4.9 Heat flow through a wall by conduction. The rate Q_c/t at which heat energy is transferred through the material depends on the temperatures on either side (T_1 and T_2), the wall's area A , its thickness δ , and its thermal conductivity k .

See discussion on p. 102-104

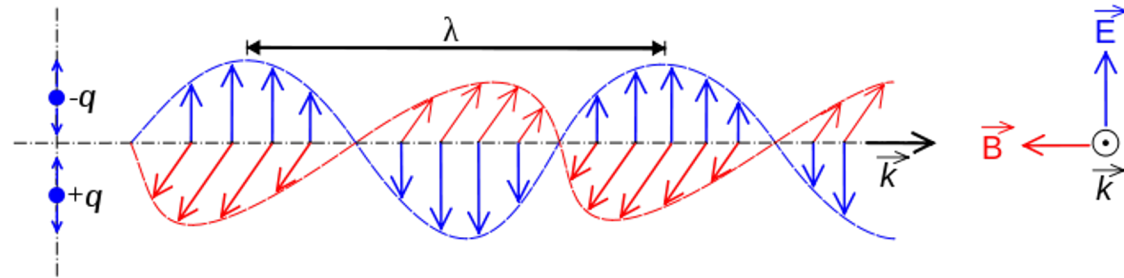
Convection (see pp. 104–106)

- ▶ Occurs in liquids and gases
- ▶ Warm liquid / gas becomes less dense and rises through medium
 - Creates eddy currents
 - Carries much energy



Radiation

(See pp. 106-110)

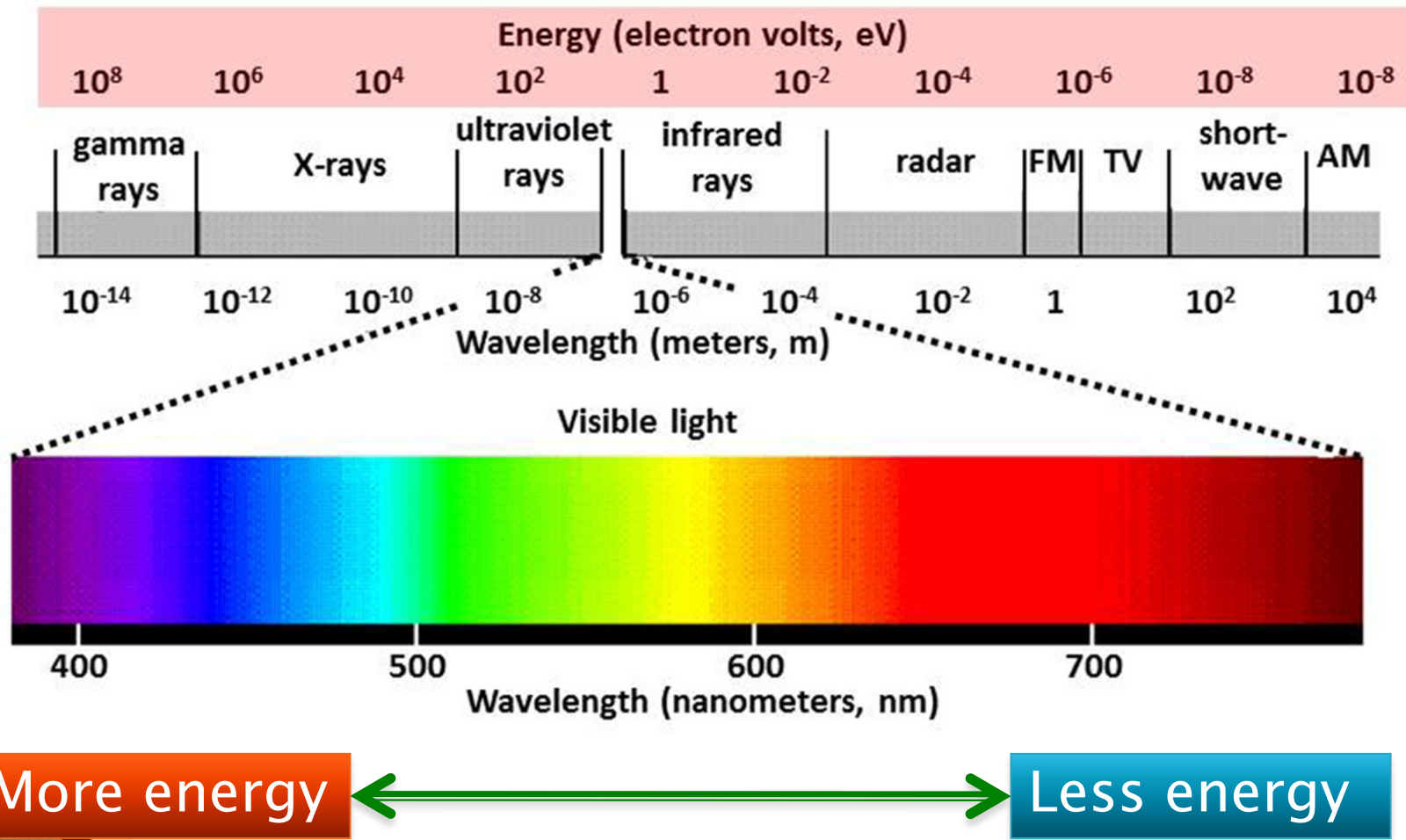


- ▶ Involves electromagnetic waves
- ▶ Produced by charged particles
- ▶ Travel at speed of light
- ▶ Wave components include:
 - Amplitude
 - Frequency
 - Wavelength
- ▶ Electric and magnetic waves are perpendicular to field of travel

Frequency and wavelength are inversely related

- ▶ Velocity (m/s) = wavelength (m) x frequency (#/second)
- ▶ As wavelength increases, frequency decreases

Radiation is classified by wavelength (and hence by frequency)



See p. 108 and assoc. text

Thought questions

- ▶ When radiation strikes a body, it causes that body to start radiating, itself.
 - Will the wavelengths of that energy likely to be longer or shorter than the energy striking it?
 - When sunlight hits the earth, will the re-radiated energy be more likely to be in the form of:
 - Ultraviolet, Visible, Infrared energy
 - When light strikes a chlorophyll solution, some of the energy is reradiated as visible light. What is the most likely color for that light?
 - Blue, Green, or Red