

# Unit 6: Dynamic Planet: Plate Tectonics

## Lecture 2

### Objectives:

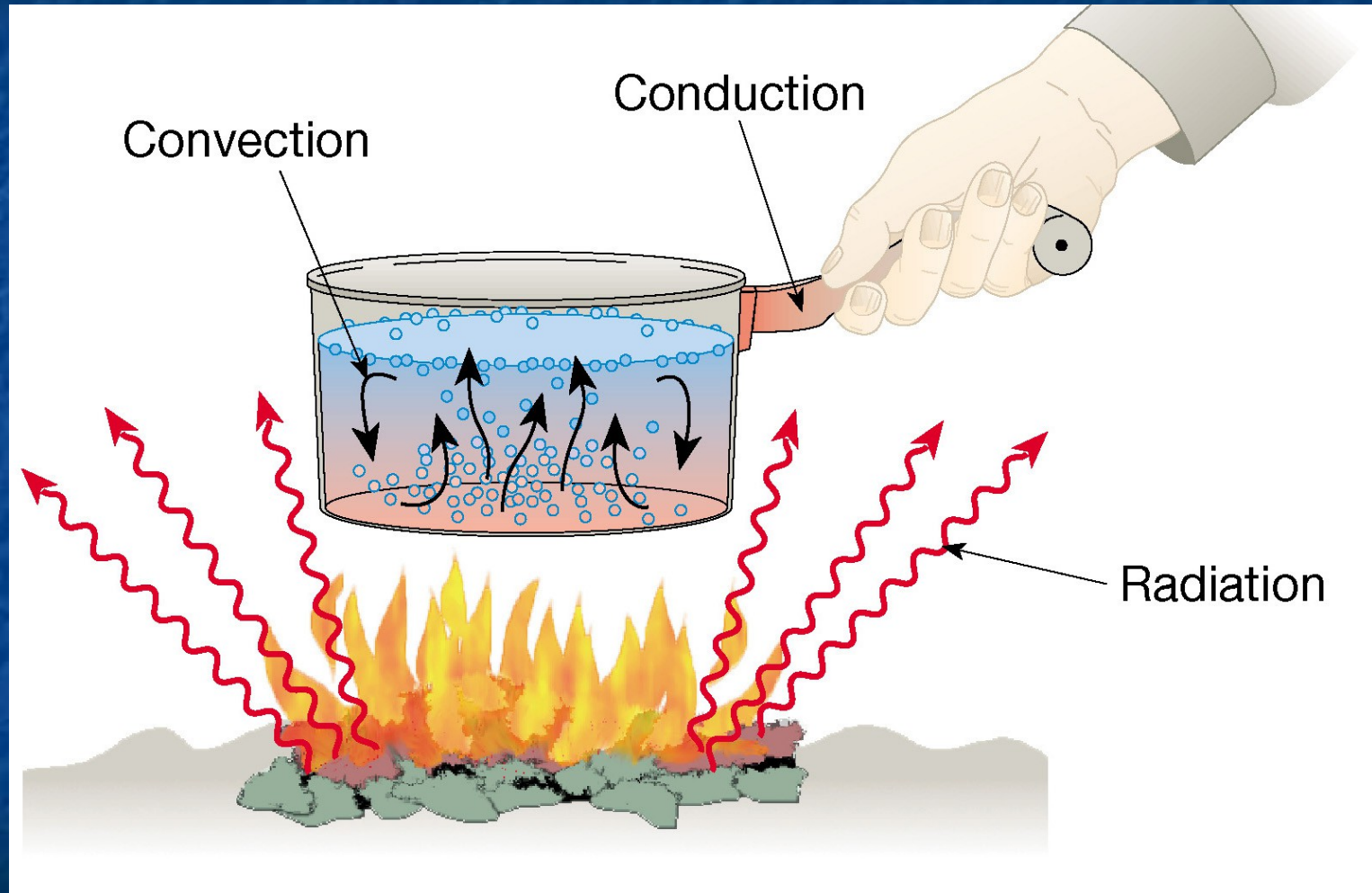
E2.2C - Describe natural processes in which heat transfer in the Earth occurs by conduction, convection, radiation.

E3.3B - Explain why tectonic plates move using the concept of heat flowing through mantle convection, coupled with the cooling and sinking of aging ocean plates that result from their increased density.

# *Heat Transfer \**

- ❖ Heat is always transferred from warmer to cooler objects
- ❖ Mechanisms of heat transfer
  - Conduction through molecular activity
  - Convection
    - Mass movement within a substance
    - Usually vertical motions
  - Radiation (electromagnetic radiation)
    - Velocity: 300,000 kilometers (186,000 miles) per second in a vacuum

# *Mechanisms of heat transfer*



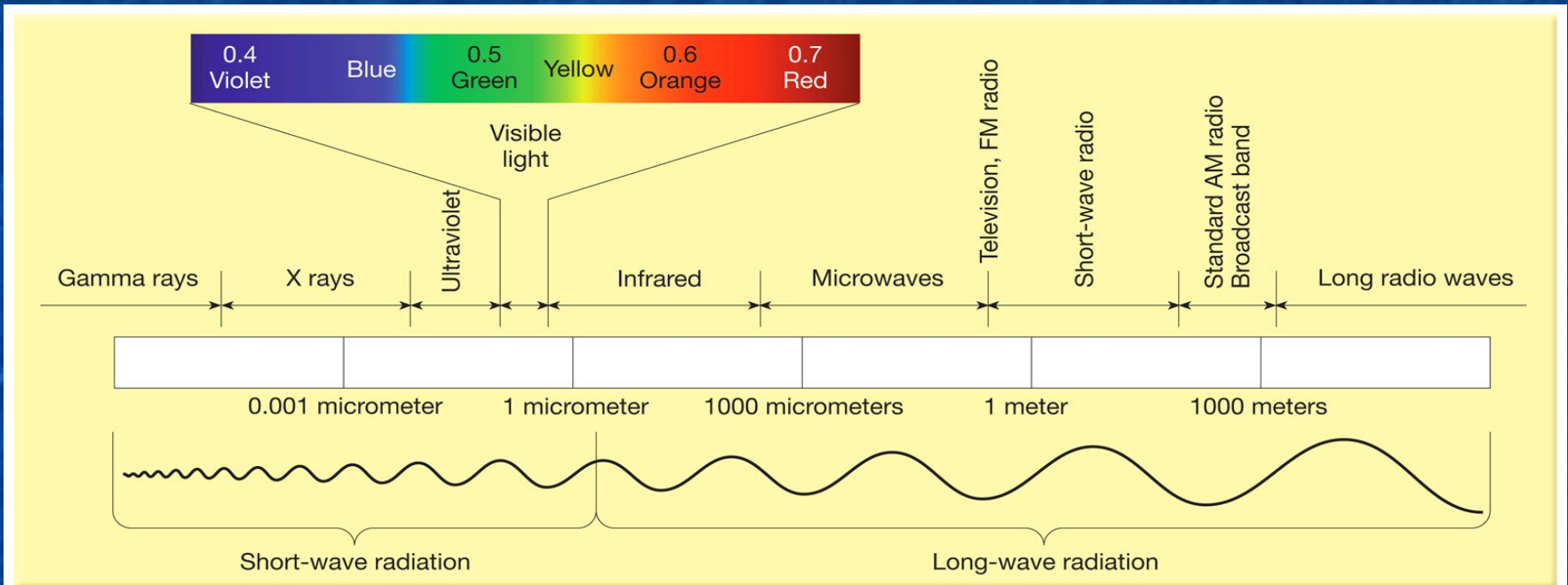


# Mechanisms of heat transfer

## Radiation (electromagnetic radiation)

- Consists of different wavelengths
  - Gamma (very short waves)
  - X-rays
  - Ultraviolet (UV)
  - Visible
  - Infrared
  - Microwaves and radio waves
  - Example: Uranium decay in Mantle Rx's

# The electromagnetic spectrum



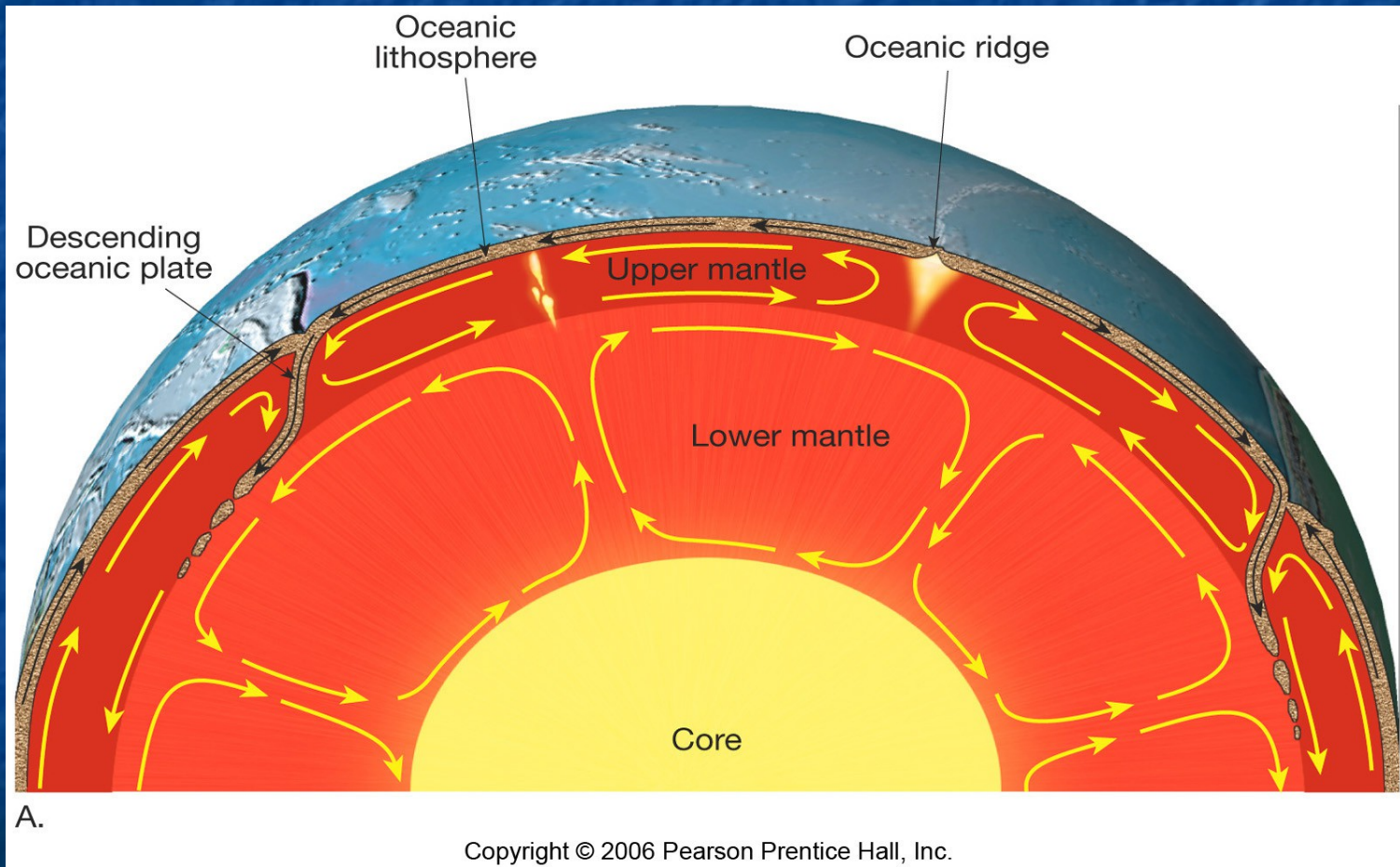
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# *What drives plate motion \**

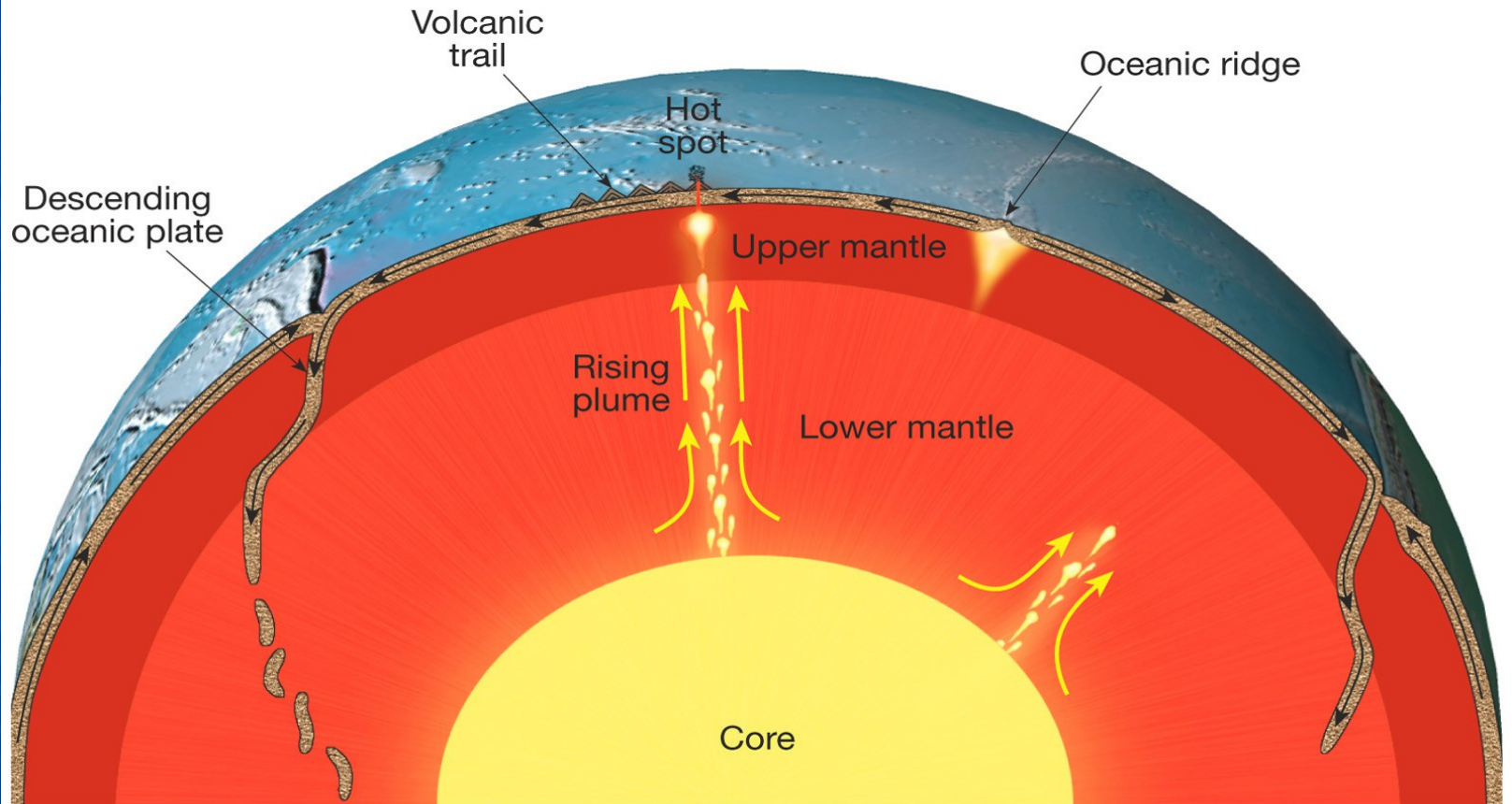
- ❖ Several models have been proposed
  - Plate-mantle convection
    - Mantle plumes extend from mantle-core boundary and cause convection within the mantle
  - Models
    - Layering at 660 kilometers
    - Whole-mantle convection
    - Deep-layer model



# Layering at 660 kilometers



# Whole-mantle convection



B.

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# *What drives plate motion* \*

- ❖ Driving mechanism of plate tectonics
  - No one model explains all facets of plate tectonics
  - Earth's heat is the driving force
  - Several models have been proposed
    - Slab-pull and slab-push model
      - Descending oceanic crust pulls the plate
      - Elevated ridge system pushes the plate

# Several mechanisms contribute to plate motion

