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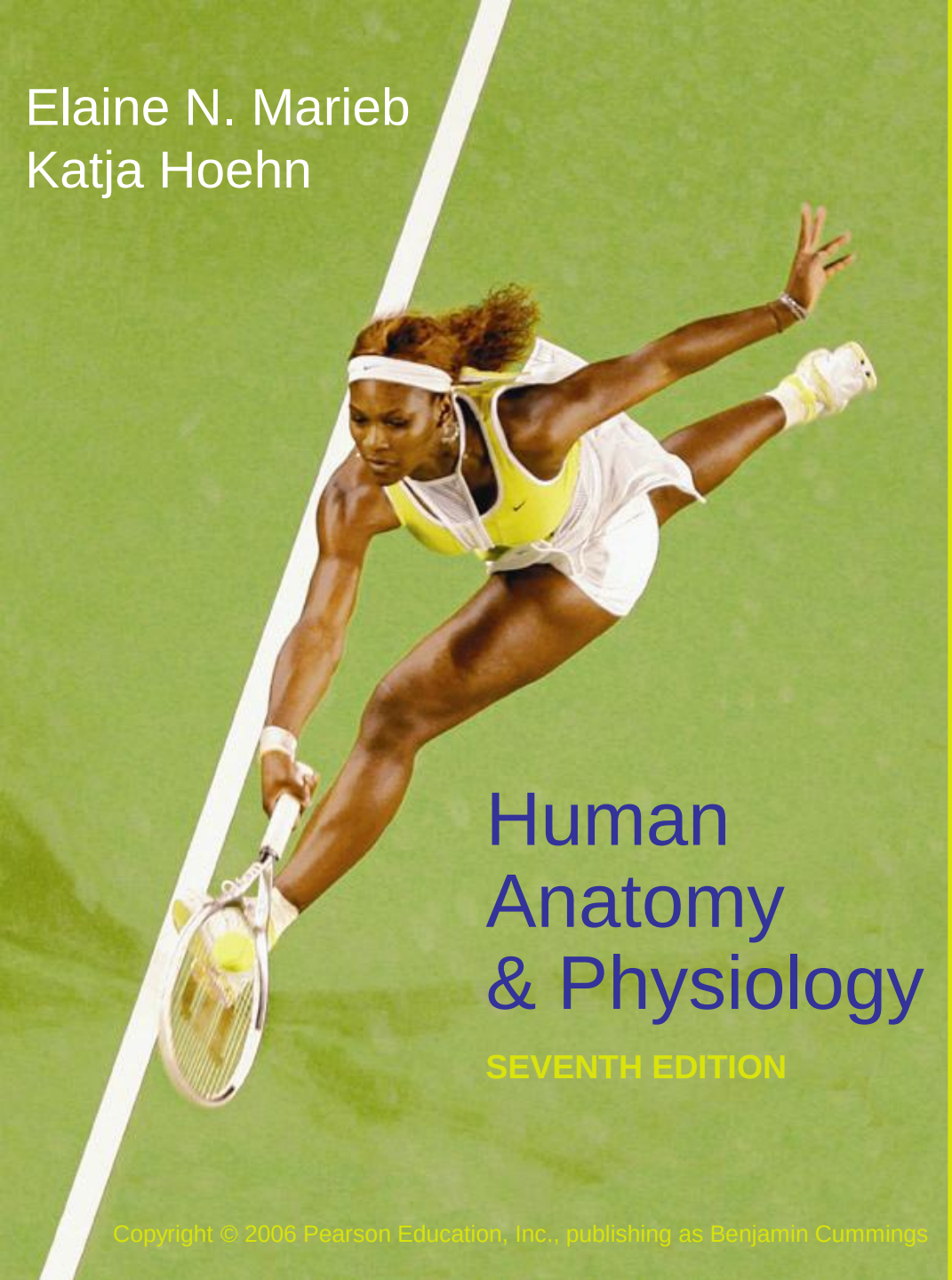


Human Anatomy & Physiology

SEVENTH EDITION

PowerPoint® Lecture Slides
prepared by Vince Austin,
Bluegrass Technical
and Community College

CHAPTER 1 PART A

The Human Body: An Orientation

Overview of Anatomy and Physiology

- Anatomy – the study of the structure of body parts and their relationships to one another
  - **Gross or macroscopic** (the study of large body structures visible to the naked eye i.e. heart, lung etc.)
  - **Microscopic** (structures that are too small to be seen with naked eye, i.e. thin slices of body tissues)
  - **Developmental** (traces structural changes that occur in the body throughout the life span)
- Physiology – the study of the function of the body's structural machinery

Gross Anatomy

- Regional – all structures in one part of the body (such as the abdomen or leg)
- Systemic – gross anatomy of the body studied system by system
- Surface – study of internal structures as they relate to the overlying skin

Microscopic Anatomy

- Cytology – study of the cell
- Histology – study of tissues

Developmental Anatomy

- Traces structural changes throughout life
- Embryology – study of developmental changes of the body before birth

Specialized Branches of Anatomy

- Pathological anatomy – study of structural changes caused by disease
- Radiographic anatomy – study of internal structures visualized by specialized scanning procedures such as X-ray, MRI, and CT scans
- Molecular biology – study of anatomical structures at a subcellular level

Physiology

- Considers the operation of specific organ systems (talks about the function of the organs)
  - Renal – kidney function
  - Neurophysiology – workings of the nervous system
  - Cardiovascular – operation of the heart and blood vessels
- Focuses on the functions of the body, often at the cellular or molecular level

Physiology

- Understanding physiology also requires a knowledge of physics, which explains
  - electrical currents
  - blood pressure
  - the way muscle uses bone for movement

Principle of Complementarity

- Function always reflects structure
- What a structure can do depends on its specific form
- Physiology and anatomy are related to each other and they are inseparable.

Levels of Structural Organization

- Chemical – atoms combined to form molecules
- Cellular – cells are made of molecules
- Tissue – consists of similar types of cells
- Organ – made up of different types of tissues
- Organ system – consists of different organs that work closely together
- Organismal – made up of the organ systems

Levels of Structural Organization

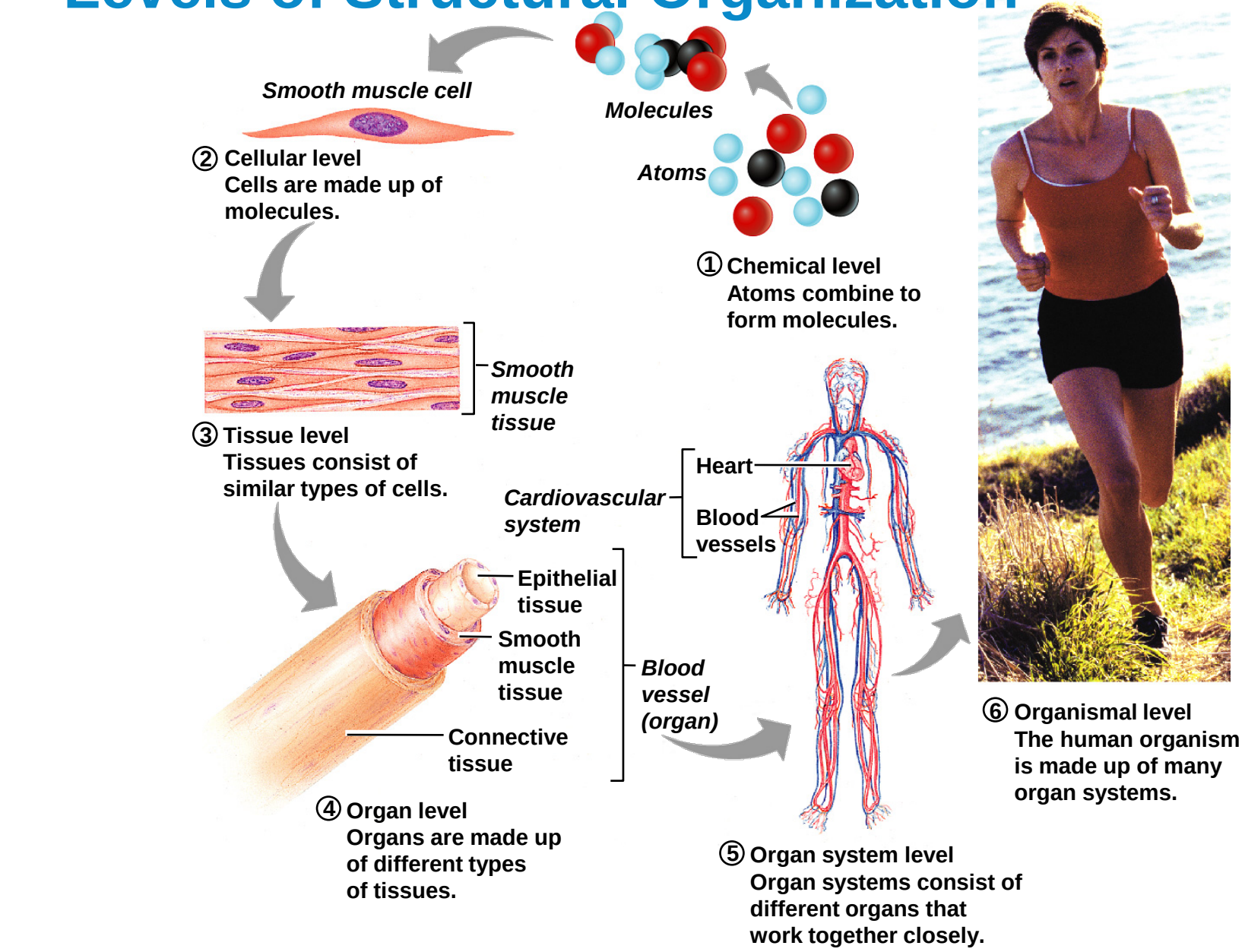
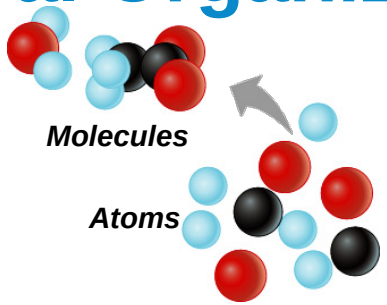


Figure 1.1

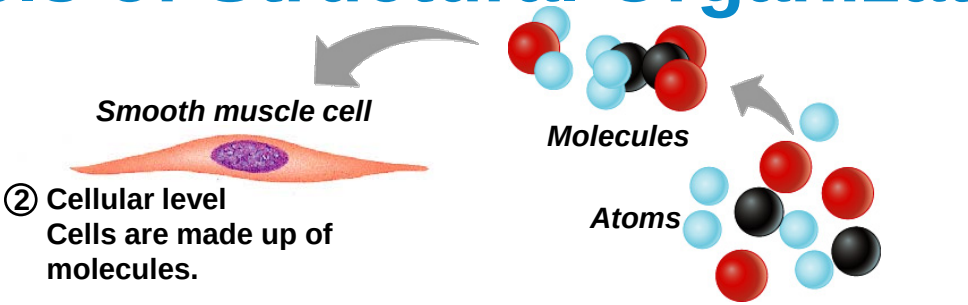
Levels of Structural Organization



① **Chemical level**
Atoms combine to form molecules.

Figure 1.1

Levels of Structural Organization

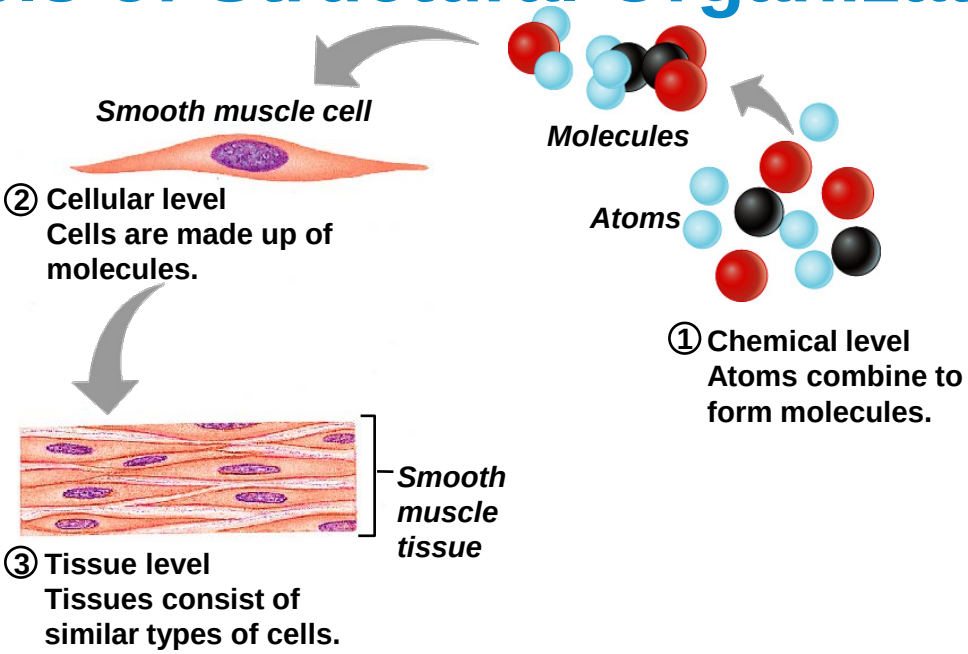


② Cellular level
Cells are made up of molecules.

① Chemical level
Atoms combine to form molecules.

Figure 1.1

Levels of Structural Organization



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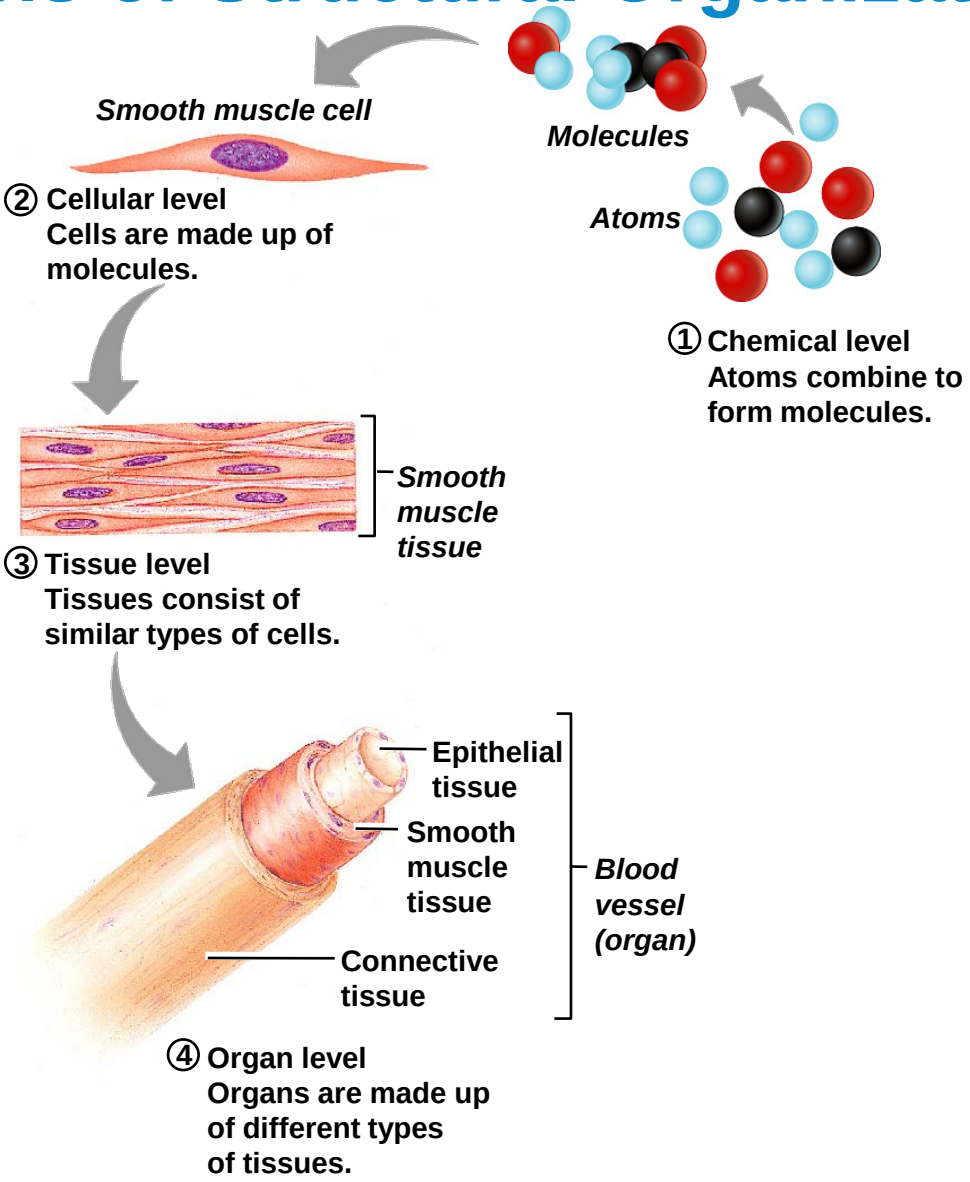

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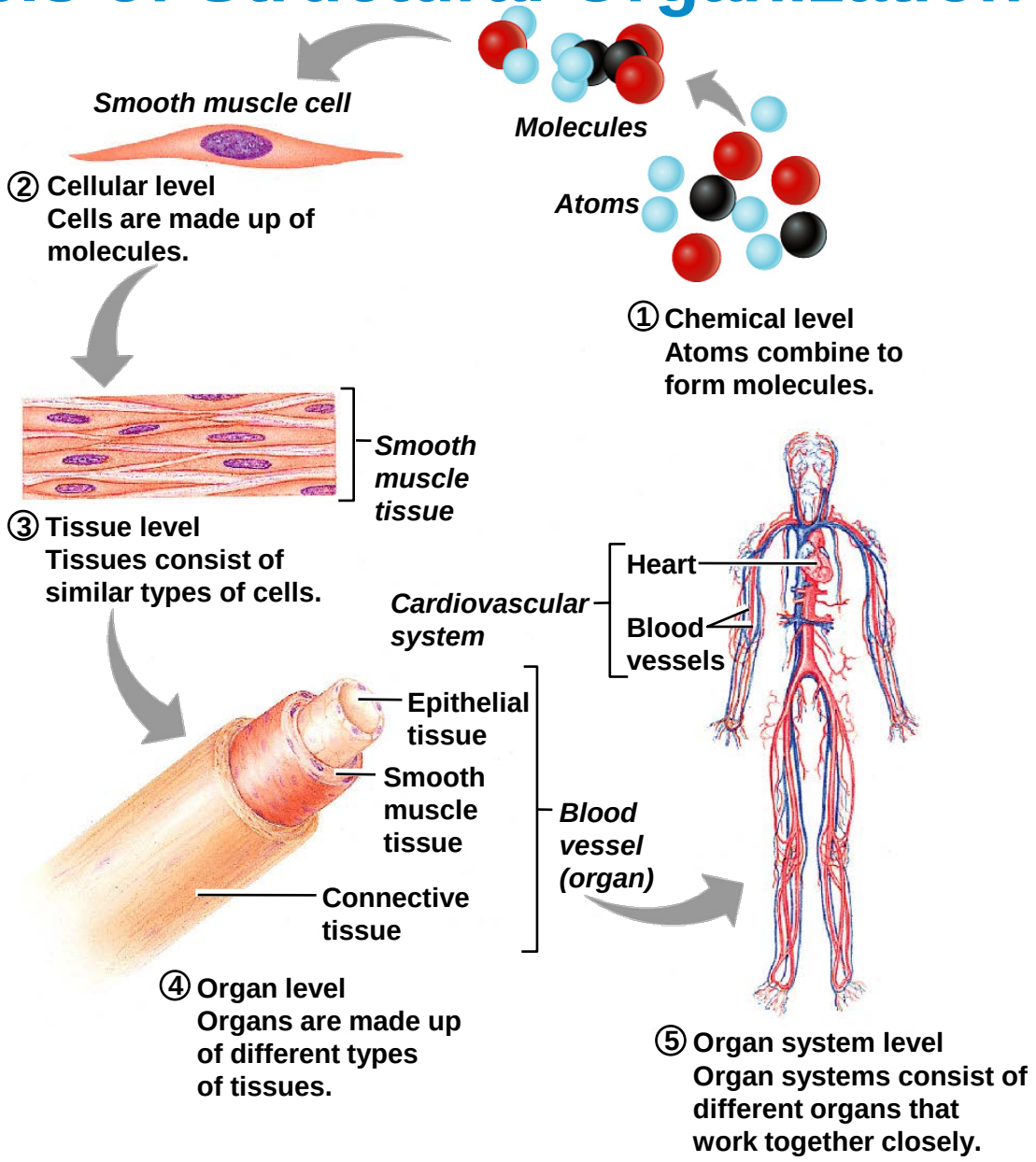

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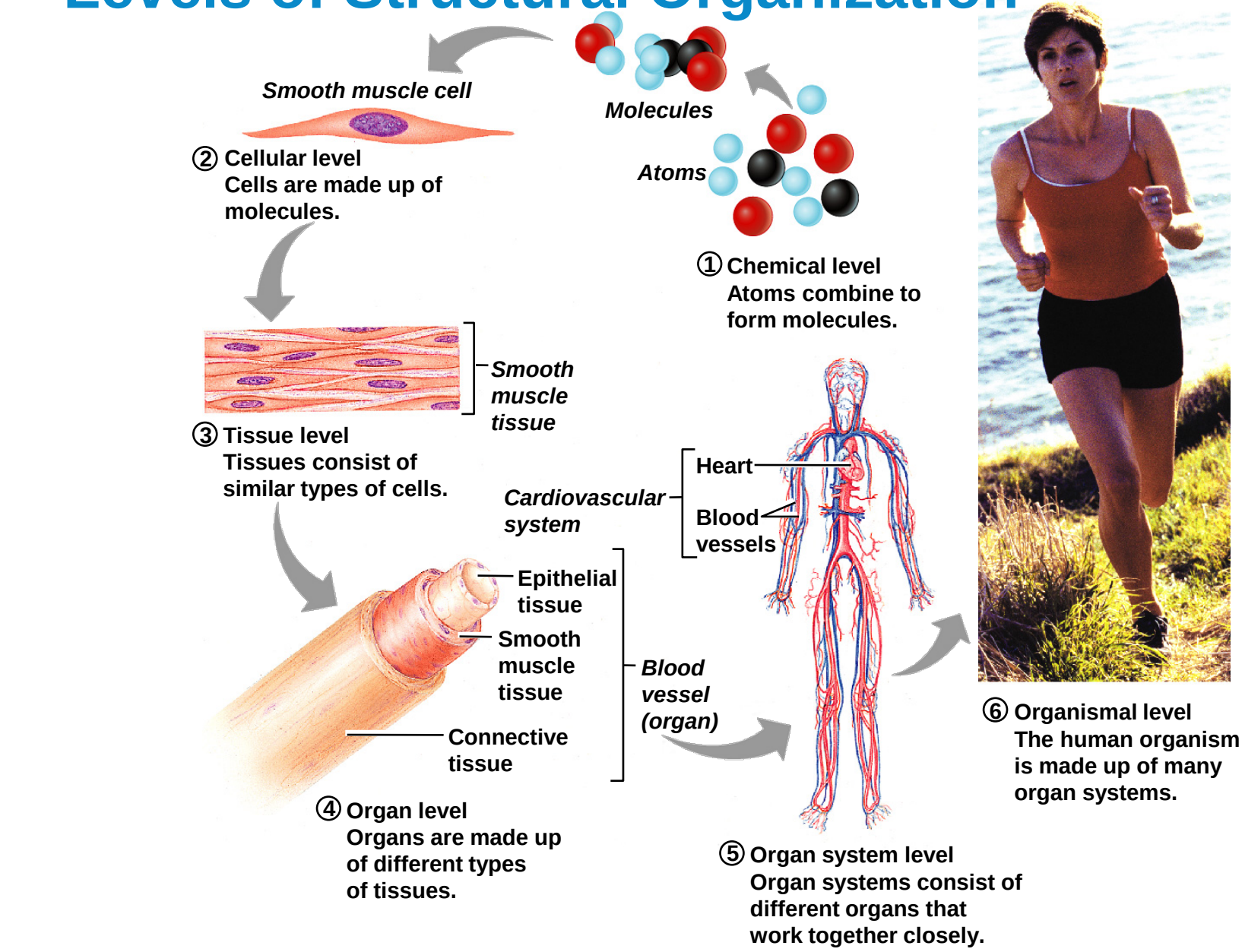


Figure 1.1

Organ Systems Interrelationships

- The integumentary system protects the body from the external environment
- Digestive and respiratory systems, in contact with the external environment, take in nutrients and oxygen

Organ Systems Interrelationships

- Nutrients and oxygen are distributed by the blood
- Metabolic wastes are eliminated by the urinary and respiratory systems

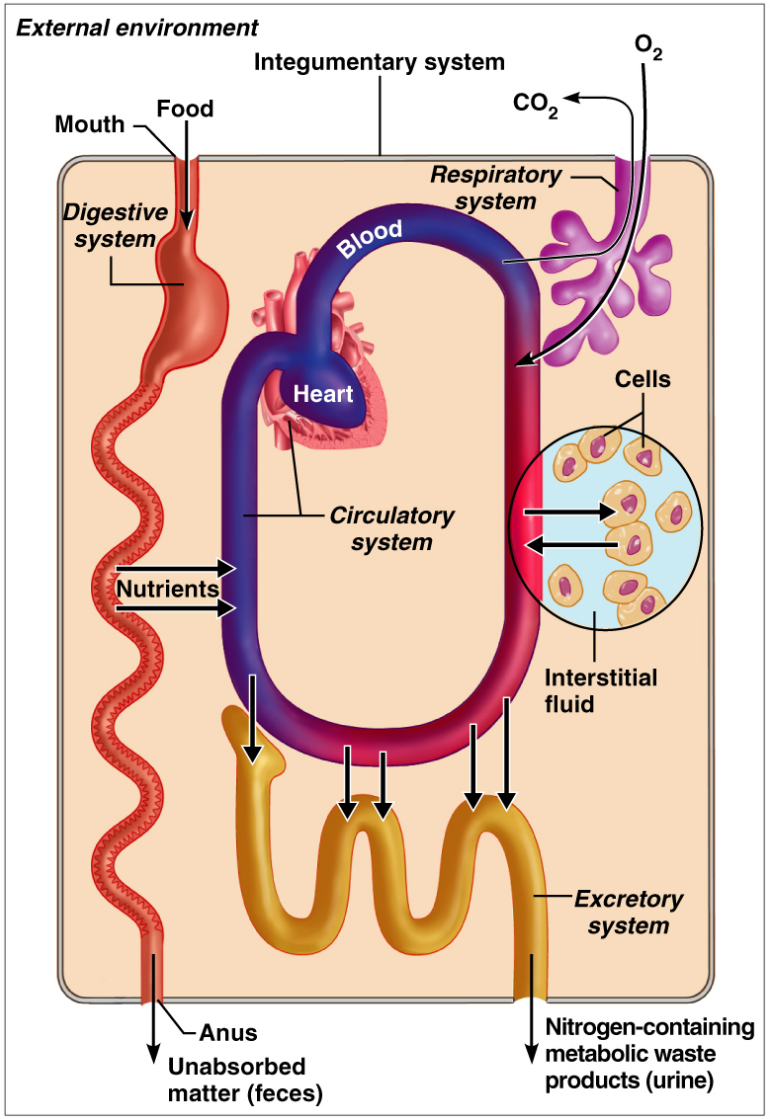


Figure 1.2

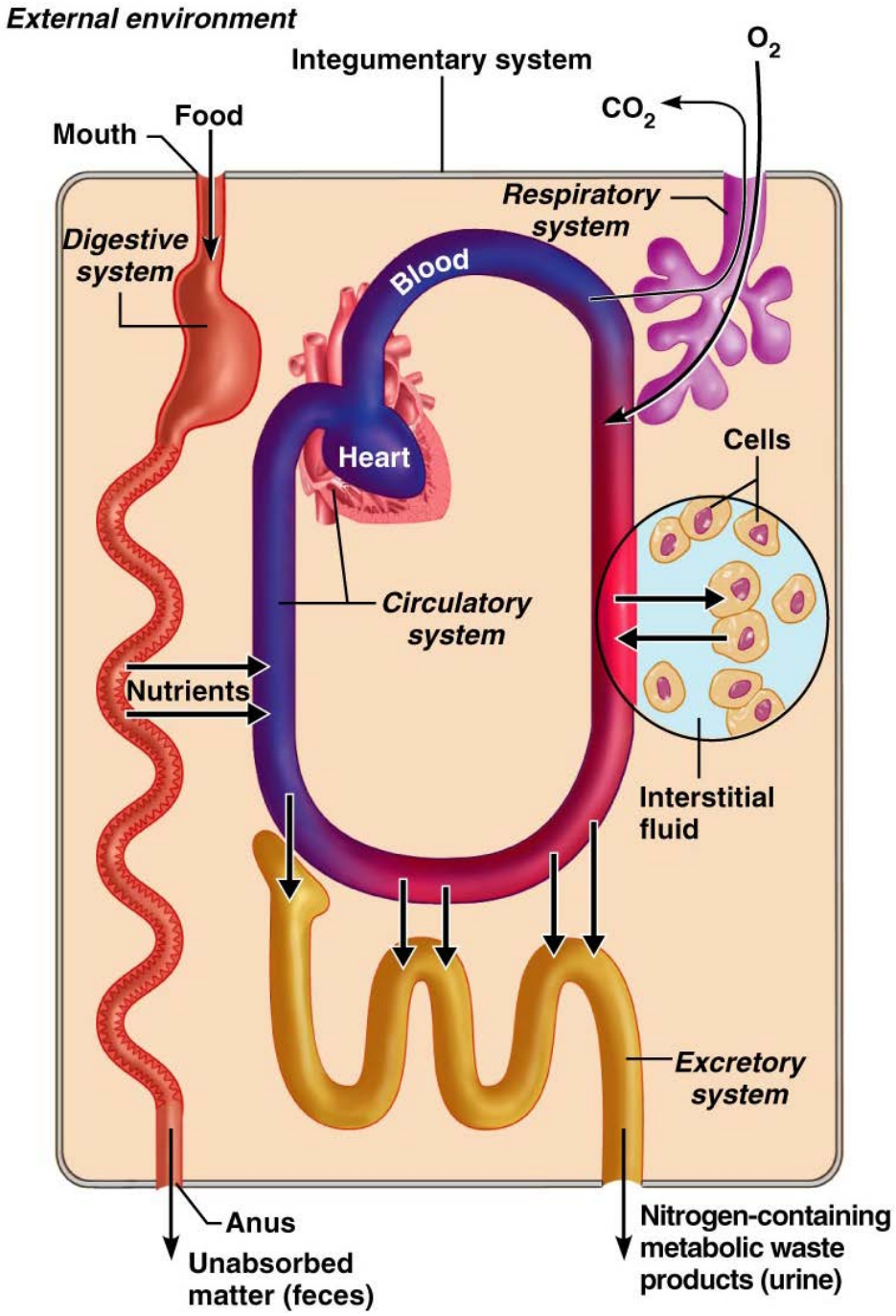


Figure 1.2

Necessary Life Functions

- Maintaining boundaries – the internal environment remains distinct from the external environment
  - Cellular level – accomplished by plasma membranes
  - Organismal level – accomplished by the skin
- Movement – locomotion, propulsion (peristalsis), and contractility

Necessary Life Functions

- Responsiveness – ability to sense changes in the environment and respond to them
- Digestion – breakdown of ingested foodstuffs
- Metabolism – all the chemical reactions that occur in the body
- Excretion – removal of wastes from the body

Necessary Life Functions

- Reproduction – cellular and organismal levels
  - Cellular – an original cell divides and produces two identical daughter cells
  - Organismal – sperm and egg unite to make a whole new person
- Growth – increase in size of a body part or of the organism

Survival Needs

- Nutrients – needed for energy and cell building
- Oxygen – necessary for metabolic reactions
- Water – provides the necessary environment for chemical reactions
- Normal body temperature – necessary for chemical reactions to occur at life-sustaining rates
- Atmospheric pressure – required for proper breathing and gas exchange in the lungs

Homeostasis

- Homeostasis – ability to maintain a relatively stable internal environment in an ever-changing outside world
- The internal environment of the body is in a dynamic state of equilibrium
- Chemical, thermal, and neural factors interact to maintain homeostasis

Homeostatic Control Mechanisms

- Variables produce a change in the body
- The three interdependent components of control mechanisms:
  - Receptor – monitors the environments and responds to changes (stimuli)
  - Control center – determines the set point at which the variable is maintained
  - Effector – provides the means to respond to stimuli

Homeostatic Control Mechanisms

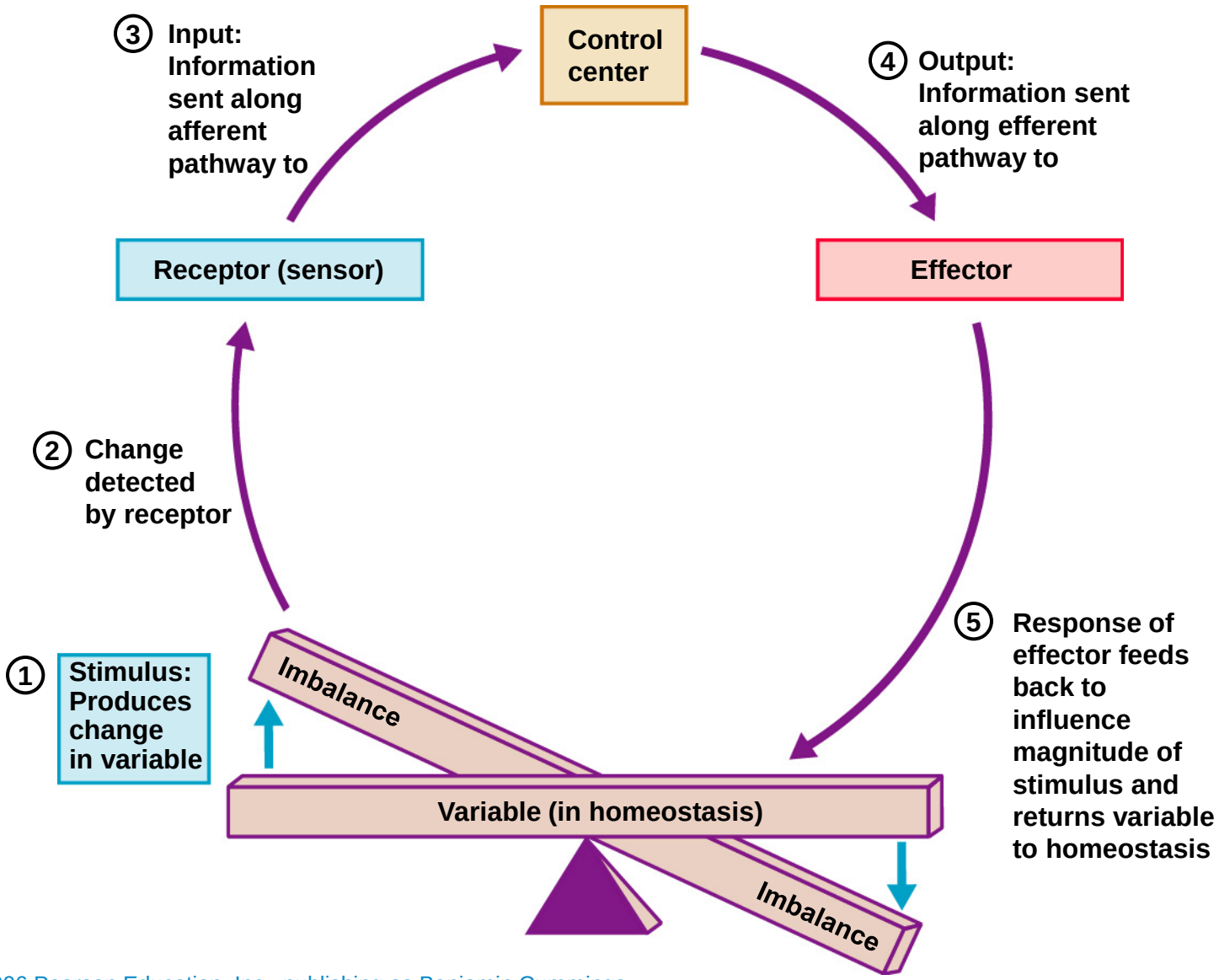


Figure 1.4

Negative Feedback

- In negative feedback systems, the output shuts off the original stimulus
- Example: Regulation of room temperature

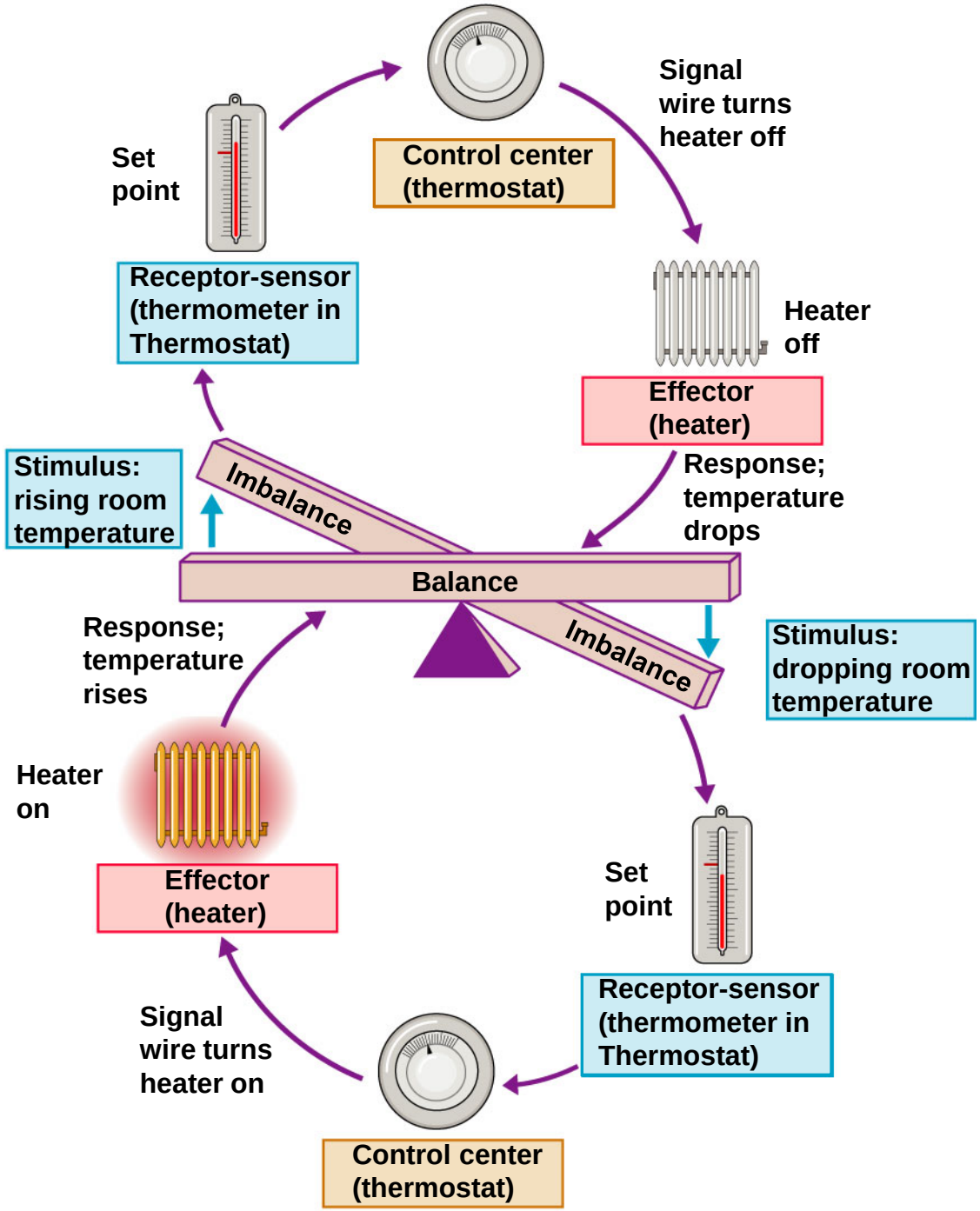

Set point
Control center (thermostat)
Signal wire turns heater off
Receptor-sensor (thermometer in Thermostat)
Heater off
Effector (heater)
Stimulus: rising room temperature
Imbalance
Response; temperature drops
Balance
Response; temperature rises
Imbalance
Stimulus: dropping room temperature
Heater on
Effector (heater)
Set point
Receptor-sensor (thermometer in Thermostat)
Signal wire turns heater on
Control center (thermostat)

Figure 1.5

Positive Feedback

- In positive feedback systems, the output enhances or exaggerates the original stimulus
- Example: Regulation of blood clotting

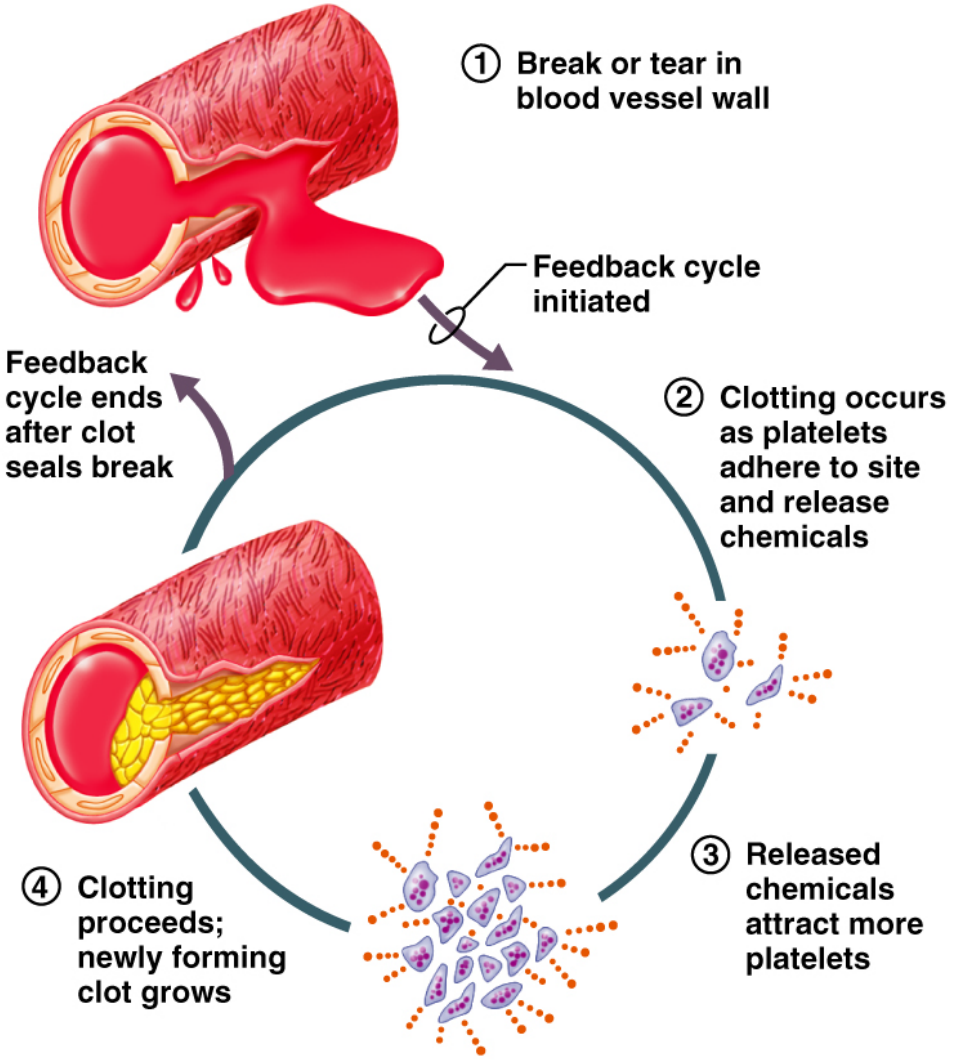
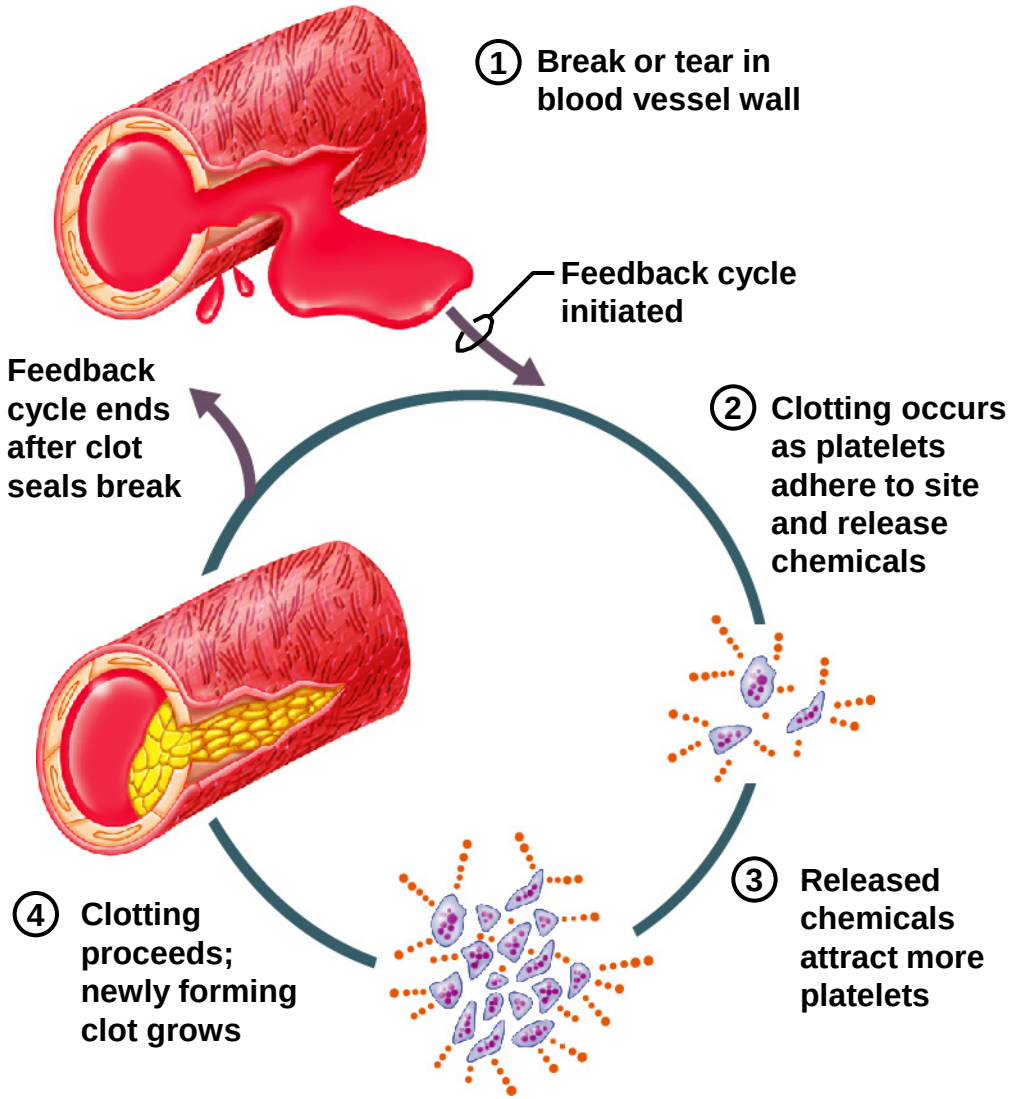


Figure 1.6



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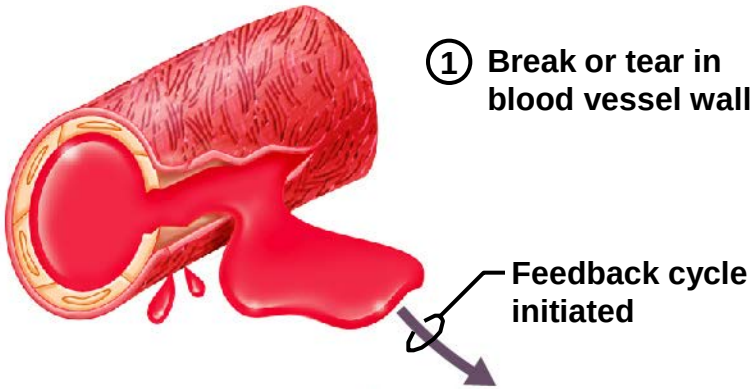

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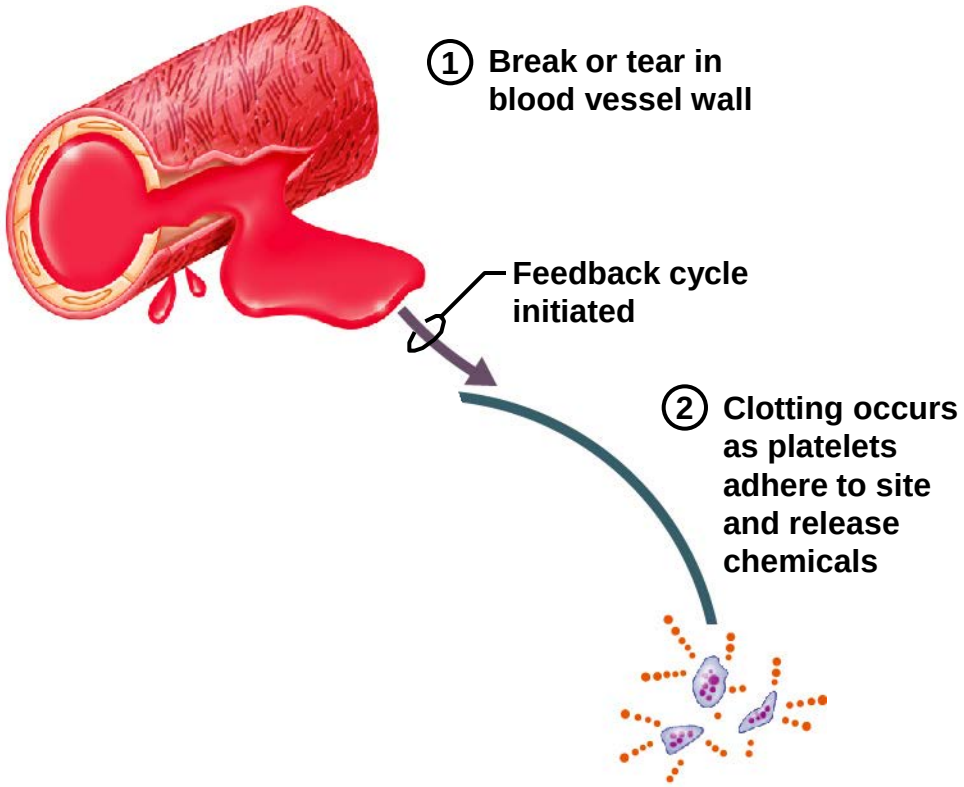

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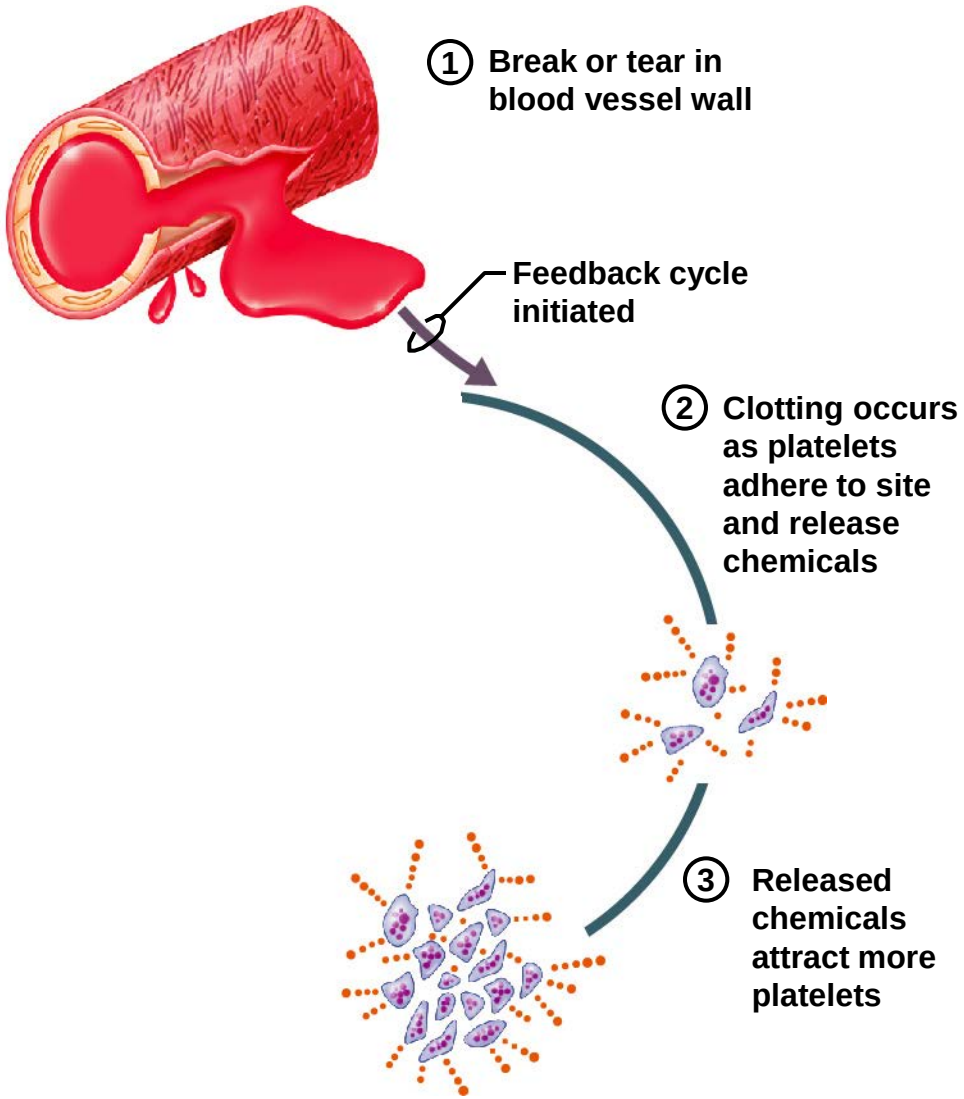

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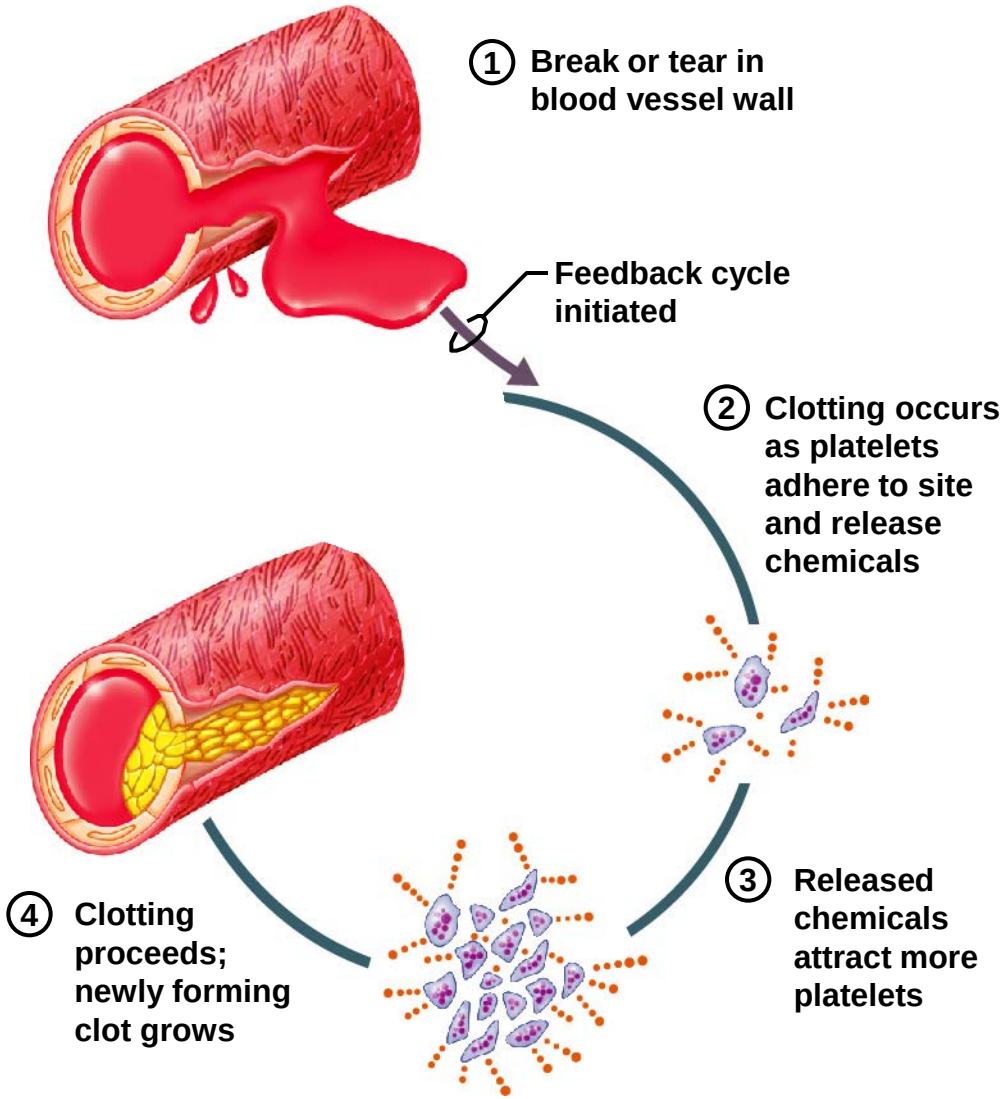

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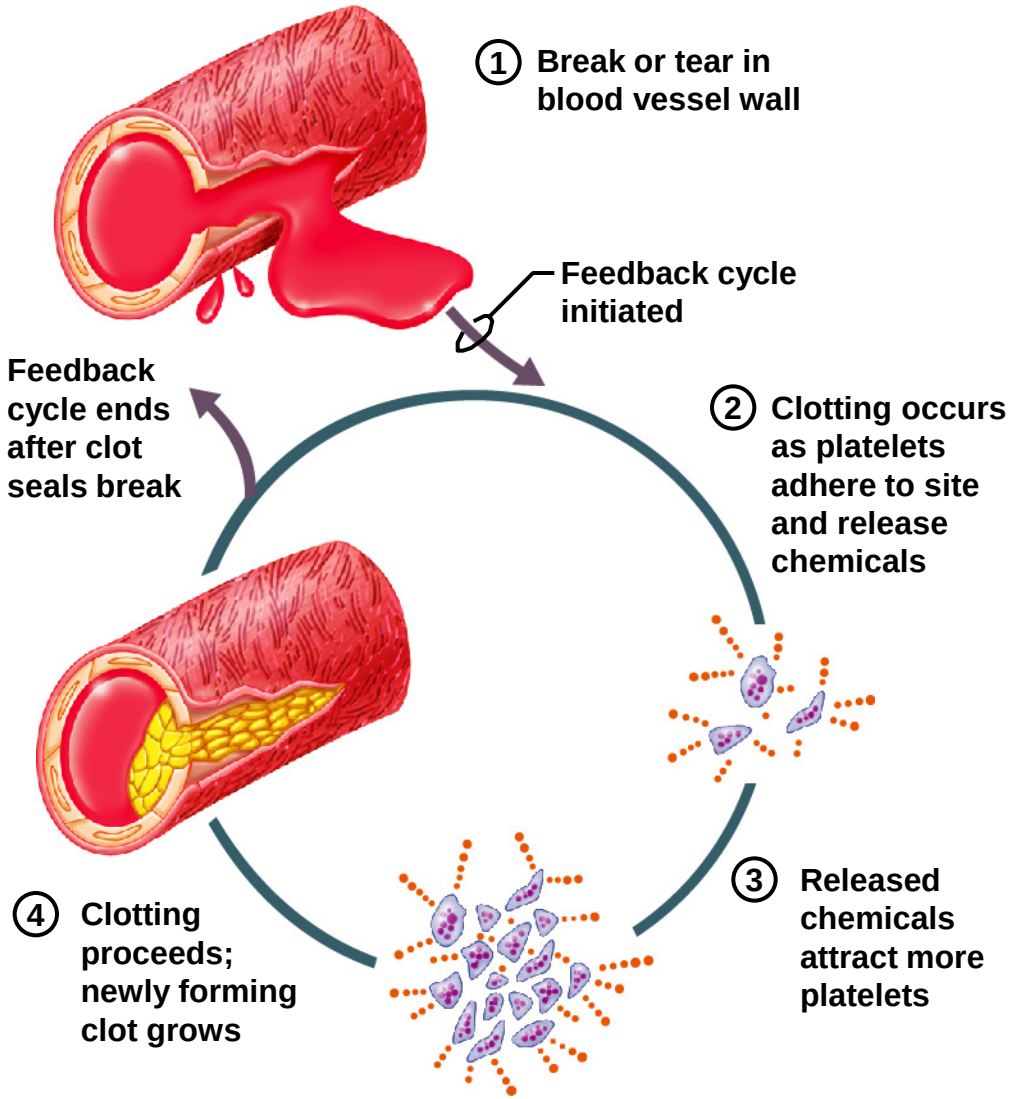

Figure 1.6

Homeostatic Imbalance

- Disturbance of homeostasis or the body's normal equilibrium
- Overwhelming the usual negative feedback mechanisms allows destructive positive feedback mechanisms to take over