BI 103 - Objectives

To define homeostasis.

To distinguish positive and negative feedback mechanisms for maintaining homeostasis.

To contrast homeotherms and poikilotherms.

To compare hyperthermia and hypothermia.

To identify the levels of organization of the body and the four tissue types.

Essential Life Processes

- Capturing energy and essential materials from the environment
- Exchanging gases
- Maintaining
  - body of a particular shape
  - fluid composition
  - temperature
- Remove wastes

Homeostasis:

The <u>maintenance</u> of a relatively constant environment required for optimal functioning despite changes.

Can apply to:

Cells
Organs
Organisms
Populations.

Goal – Efficient functioning

How is Homeostasis Achieved?

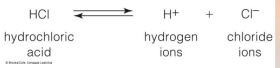
Negative Feedback loops:

Response to a change is to counteract the change. e.g. body temperature

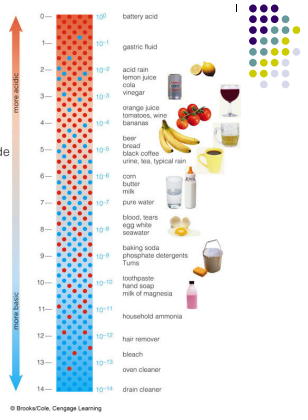
Positive Feedback loops:

Response to a change that intensifies the original change. E.g. oxytocin > childbirth

pH



Neutral – 7.0
Acidic - less than 7.0
Basic - greater than 7.0



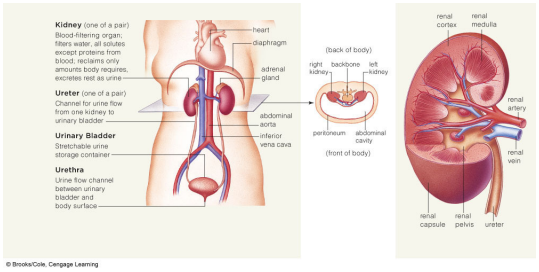
Maintaining Fluid Balance

- All animals constantly acquire and lose water and solutes, and produce metabolic wastes
- Excretory organs keep the volume and the composition of their internal environment – the extracellular fluid – stable

How animals regulate fluids

- Vertebrates have a **urinary system** that filters water, metabolic wastes and toxins out of the blood, and reclaims water and certain solutes
- All vertebrates have paired **kidneys** – excretory organs that filter blood and adjust the level of solutes

Systems based approach



Normal pH of extracellular fluid is 7.35 to 7.45

Kidneys, buffering systems, and respiratory system work together to maintain the **acid-base balance** (H^+ concentration) within a tight range

Kidneys are the only organs that can selectively rid the body of H^+ ions

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Temperature

Maintaining Body Temperature

Homeotherm	**Poikilotherm**
Animals that maintain constant body temp.	Animals that show variable body temp.
Homeo = same	Poikilo = various
Therm = heat	Therm = heat
e.g. Mammals	e.g. Reptiles
Birds	Fish

Hyperthermia

- Elevated body temps.
- Increases metabolic rate
- Skin becomes hot and dry.
- Organ damage may occur.
- Heat stroke – can be fatal.

Run away positive feedback

Hypothermia

- Low body temps.
- Vital signs decrease e.g BP, heart rate, resp. rate
- Drowsiness
- Shivering (stops at body core temp of 87-90 F)
- Frostbite on extremities
- Can lead to coma and death.

Failure of negative feedback

Organization of the body

Cells – The smallest unit of life, has an outer membrane that contains watery medium, organic molecules, organelles and genetic material.

Tissues - Group of cells of similar structure performing a common function.

The composition of organisms

Organs - A unit composed of two or more tissues that perform a certain function.

Organ System - Two or more interrelated organs that work together, serving a common function.