CONCEPT: ANIMAL METABOLISM

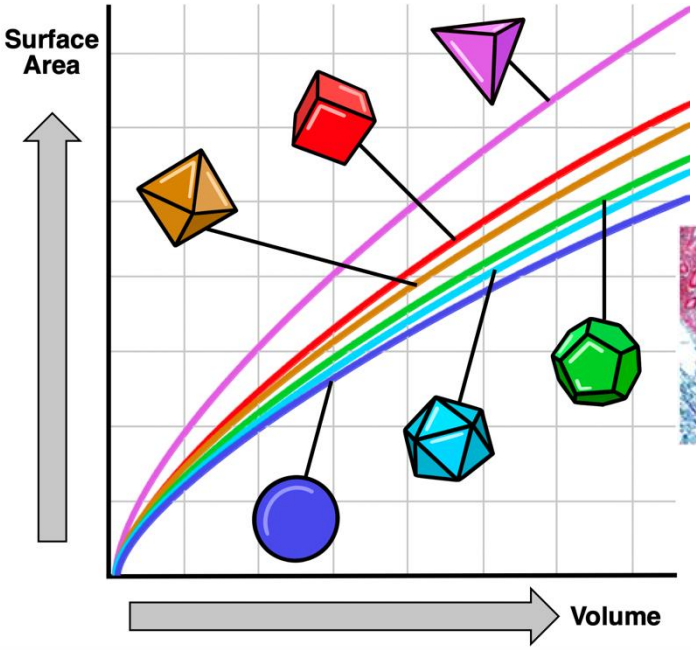
● Body size and functions are constrained by physics, larger animals require thicker skeletons and bigger muscles

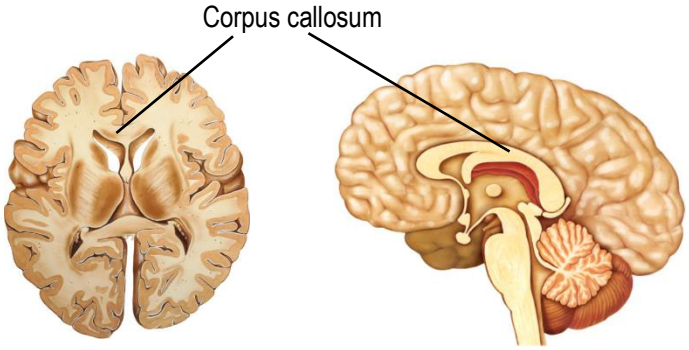
EXAMPLE:

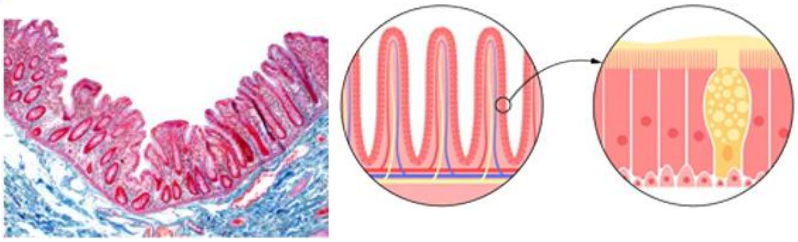
● ***Surface area to volume ratio*** (SA:V) determines the physiology of an animal and its cells

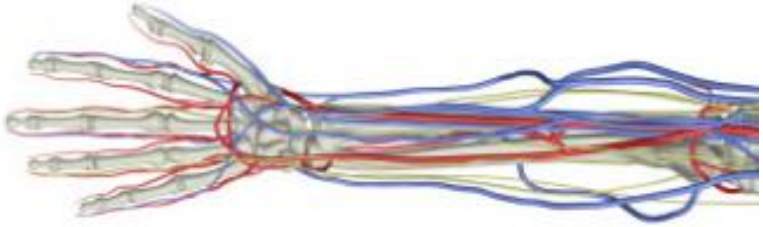
- □ As cells and organisms get bigger, SA:V decreases
- □ Molecular diffusion related to surface area
- □ Nutrient use and heat lost related to volume
- □ Flattening, folding, and branching increase surface area

EXAMPLE:





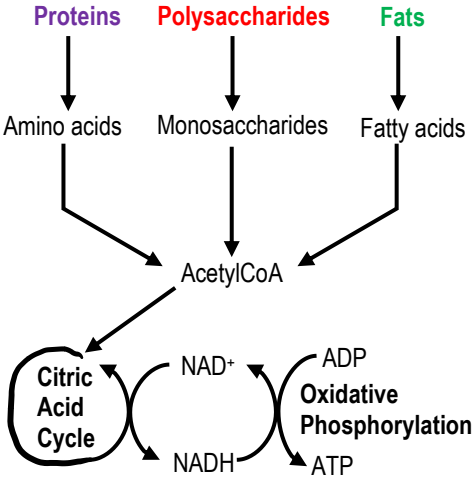


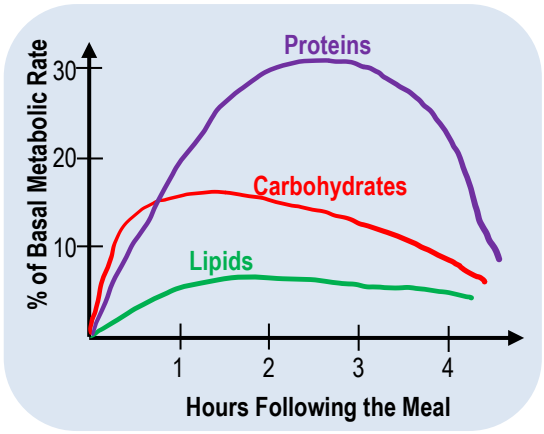


CONCEPT: ANIMAL METABOLISM

- Bioenergetics – energy flow through living systems, related to animal's size and metabolism
- ***Metabolism*** – chemical processes of an organism that sustain life

EXAMPLE:



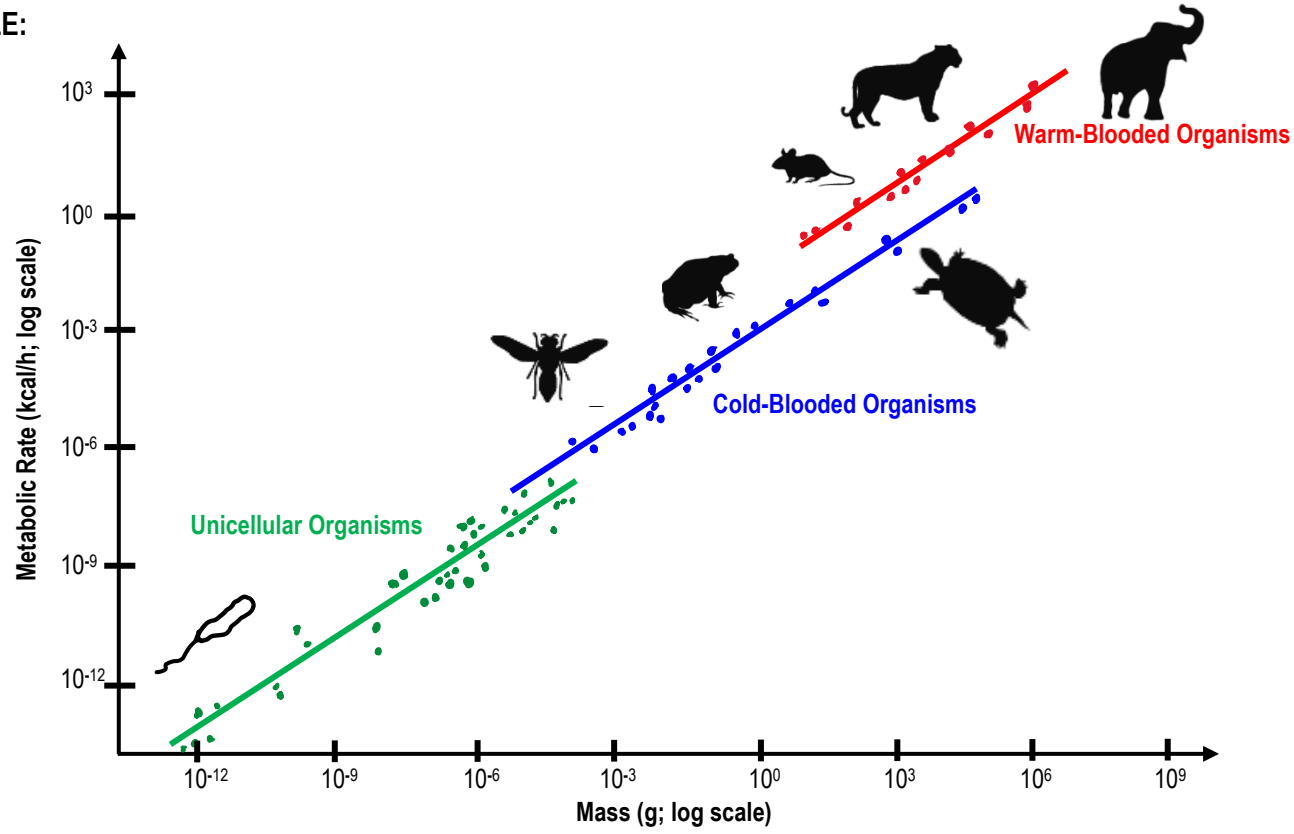


□ ***Metabolic rate*** – rate of energy consumption of an organism

- ***Basal metabolic rate*** – minimum rate of energy consumption of an endotherm at rest
- ***Standard metabolic rate*** – minimum rate of energy consumption of an ectotherm at rest

□ Smaller animals have larger relative metabolic rates than larger animals

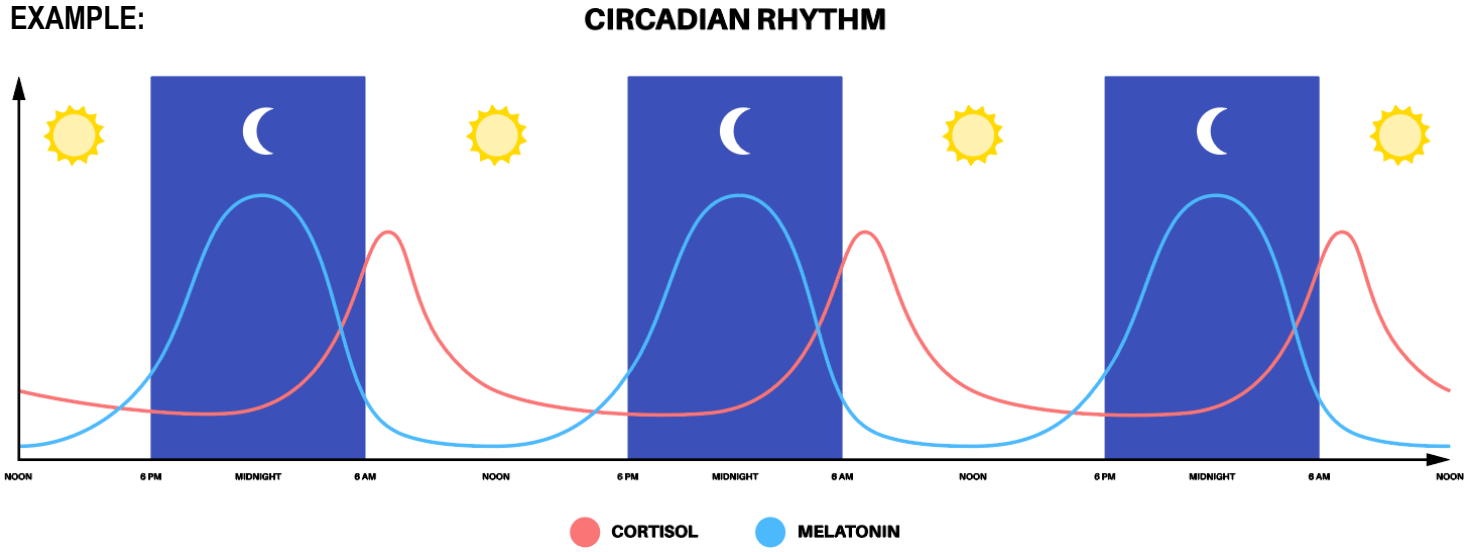
EXAMPLE:



CONCEPT: ANIMAL METABOLISM AND HOMEOSTASIS

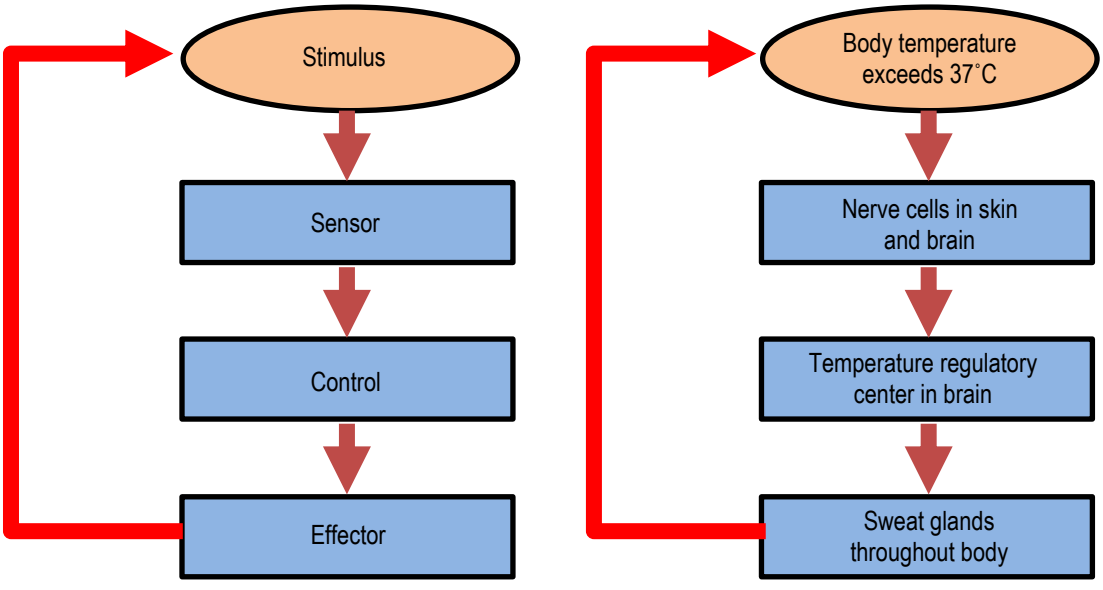
- ***Circadian rhythm*** – daily cycles that result in regular physiological and metabolic fluctuations
- ***Torpor*** – short-term state of decreased physiological activity and metabolic rate
- ***Hibernation*** – a state of inactivity and depressed metabolism in endotherms, to conserve energy when food is scarce

EXAMPLE:



- ***Homeostasis*** – regulation of a physiological property to maintain a near-constant state
  - □ Enzymes function best in in specific physiological conditions, and can cease functioning outside a certain range
  - □ ***Conformation*** – conformers do not actively regulate, instead will conform to their environmental conditions
  - □ ***Regulation*** – regulators actively control their internal environment in the face of fluctuations in external conditions
  - □ ***Set point*** – target range for a homeostatic system
  - □ ***Sensor*** – detects stimuli related to a property of a homeostatic system
  - □ ***Integrator*** – evaluates sensory information to determine a response
  - □ ***Effector*** – generates a response to restore homeostatic system to ideal conditions

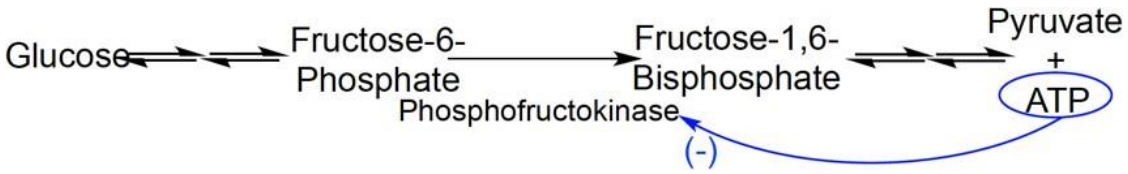
EXAMPLE:



CONCEPT: FEEDBACK REGULATION

- ***Negative feedback*** – regulation in which the output of a system has the effect of reducing the system's output
- ***Positive feedback*** – regulation in which the output of a system has the effect of increasing the system's output

EXAMPLE:



- ***Nervous system*** – transmits information throughout the body, and receives information from the body and environment
- ***Endocrine system*** – hormone secreting glands that send and receive signals throughout the body
- ***Hypothalamus*** – structure in the forebrain that coordinates the autonomic nervous system and pituitary gland
  - □ Links the nervous system and endocrine system, and plays essential role in homeostasis

EXAMPLE: