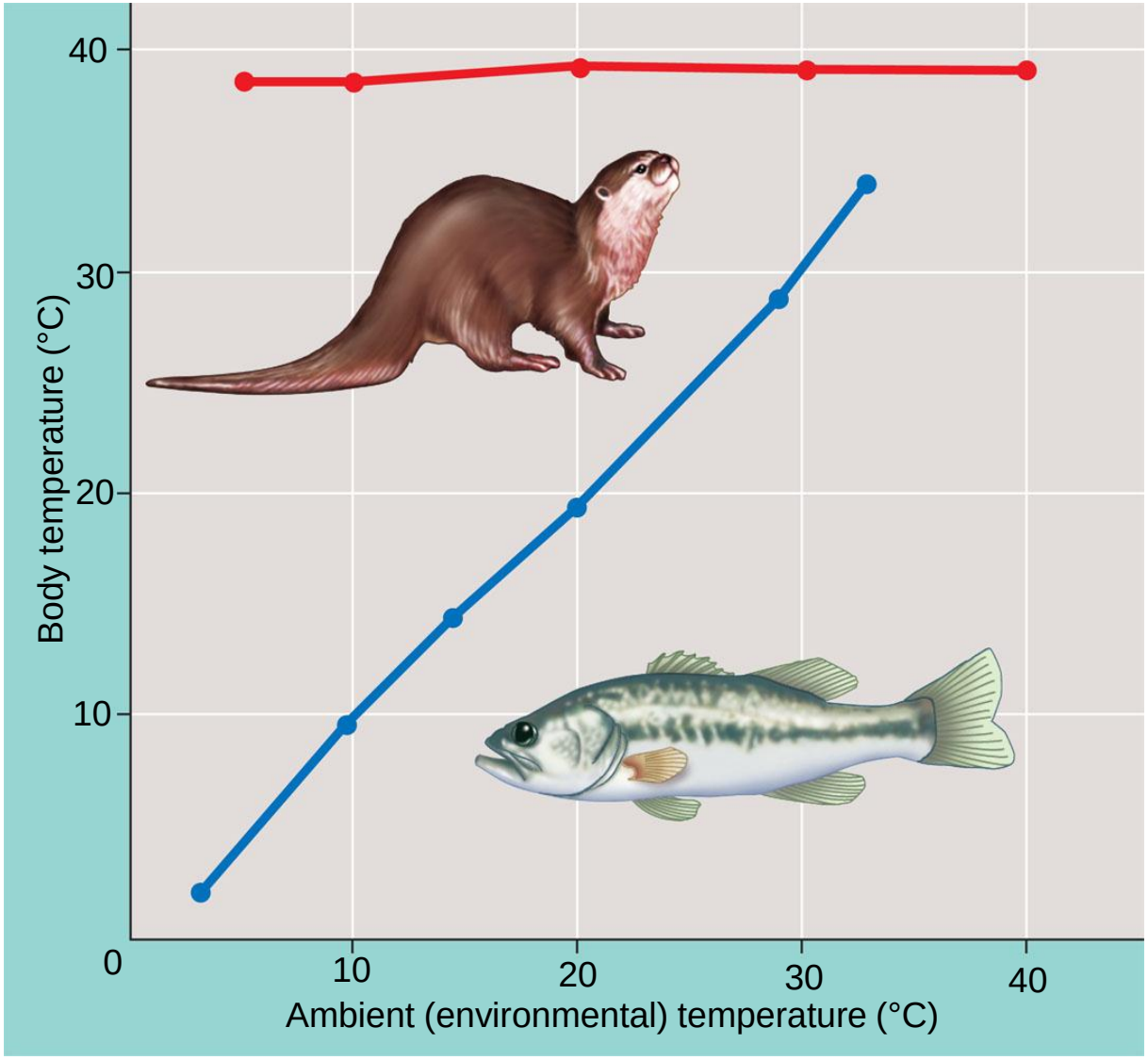
Homeostasis: *keeping the balance*

- temperature
- blood sugar levels
- energy production
- water balance
- nutrients
- ion balance
- cell growth

BILL:

1. What is considered to be normal body temperature in a human?
2. Why is temperature homeostasis important for an organism?

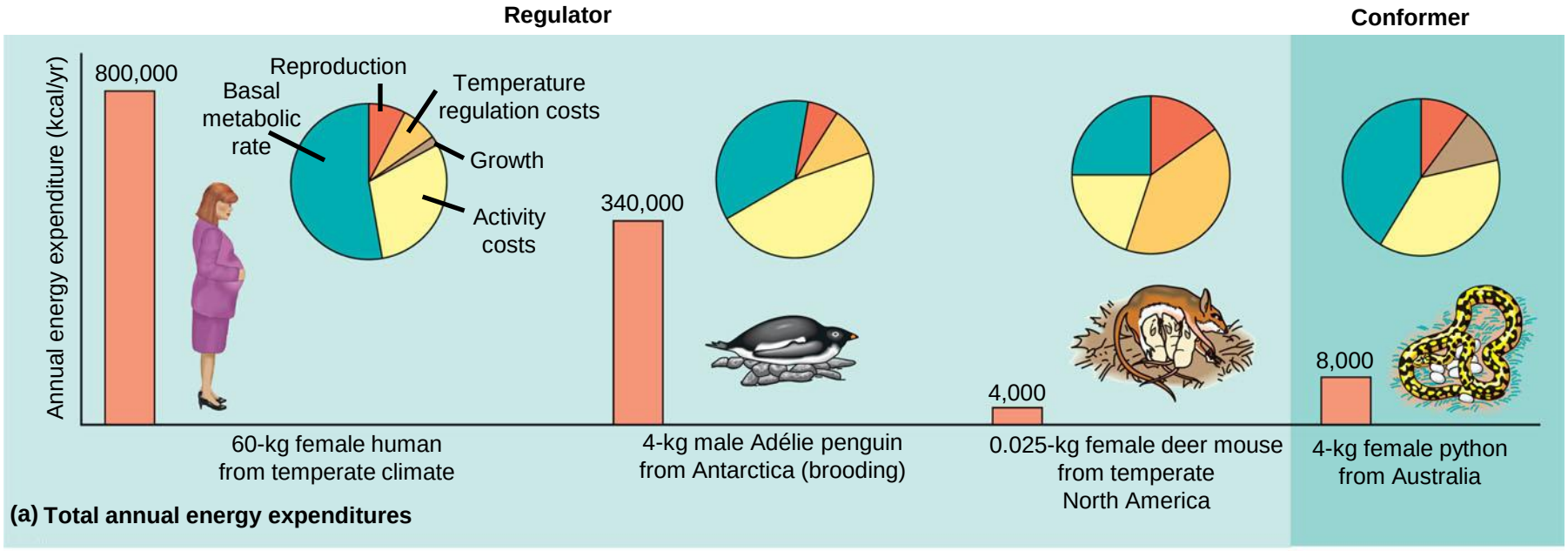
The relationship between body temperature and environmental temperature in two organisms

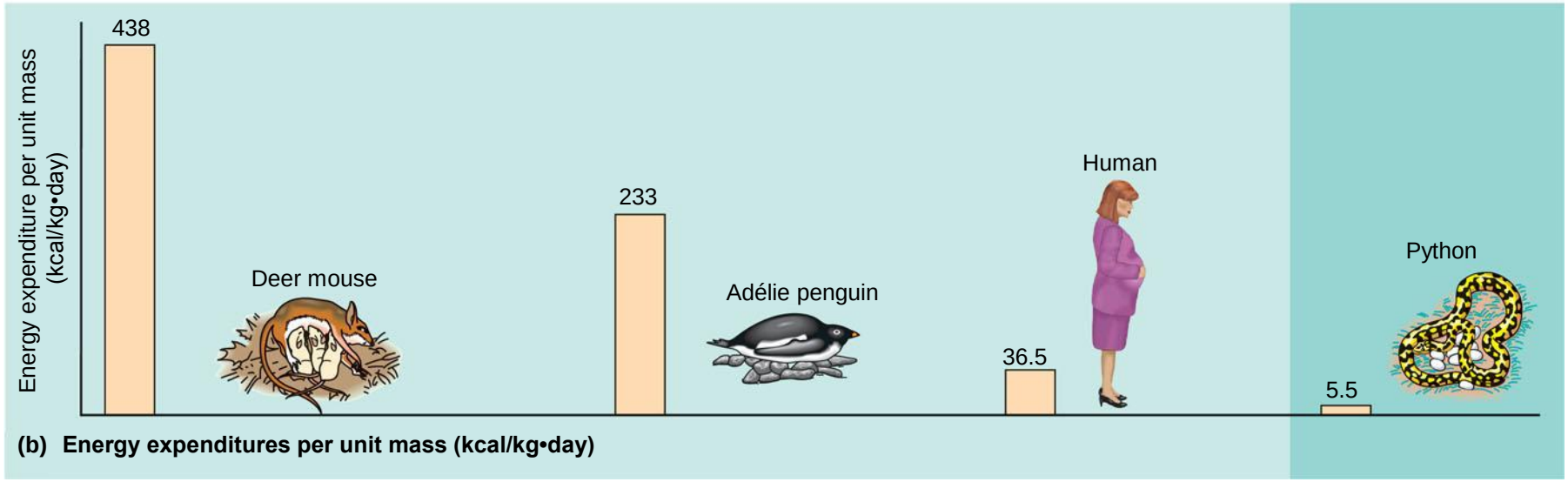


Conformers vs. Regulators

Regulate internal environment	Conform to external environment
Maintain relatively constant internal conditions	Allow internal conditions to fluctuate along with external changes
	

Energy budgets for four animals





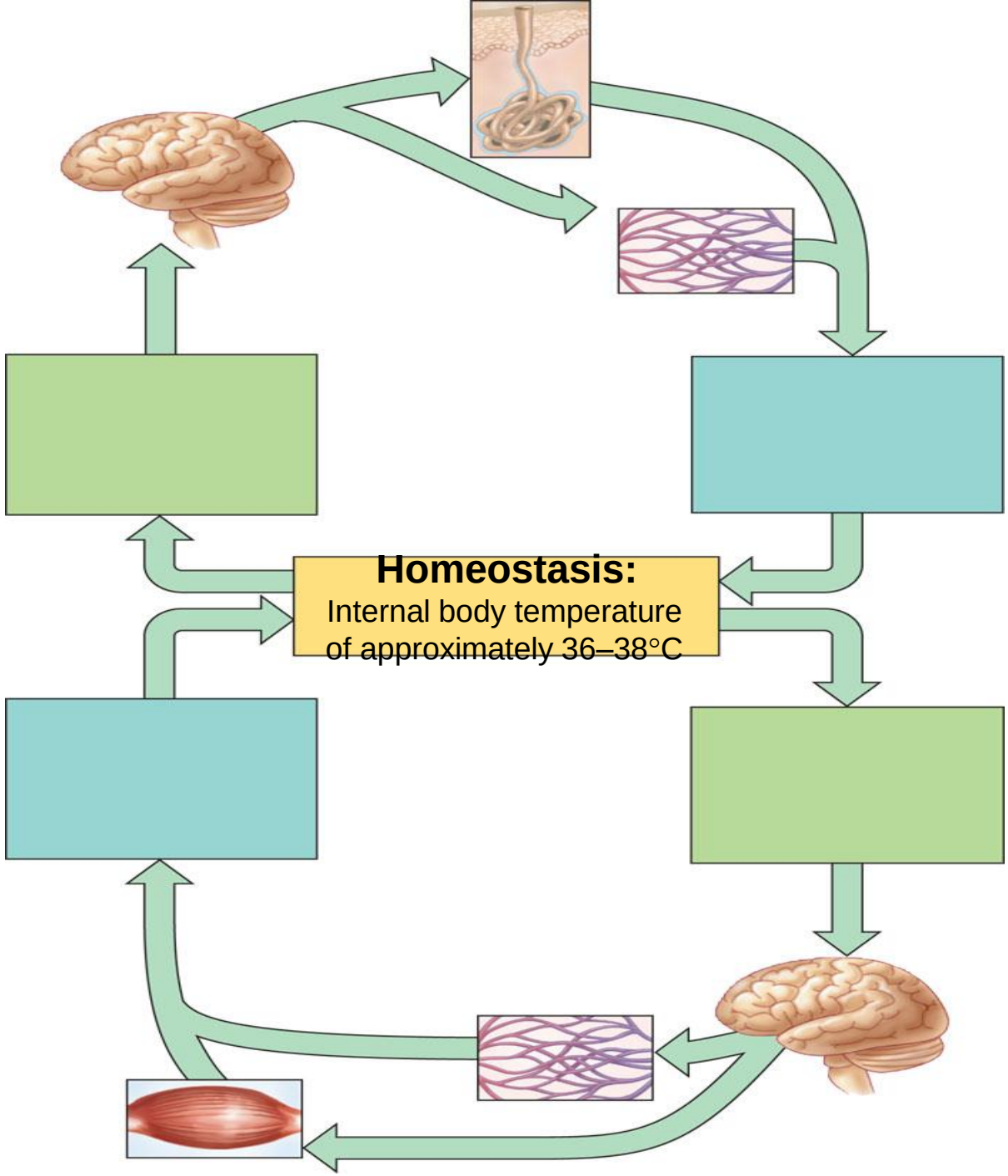
Take your forehead temperature

- Anonymously report using Active Votes
- View results

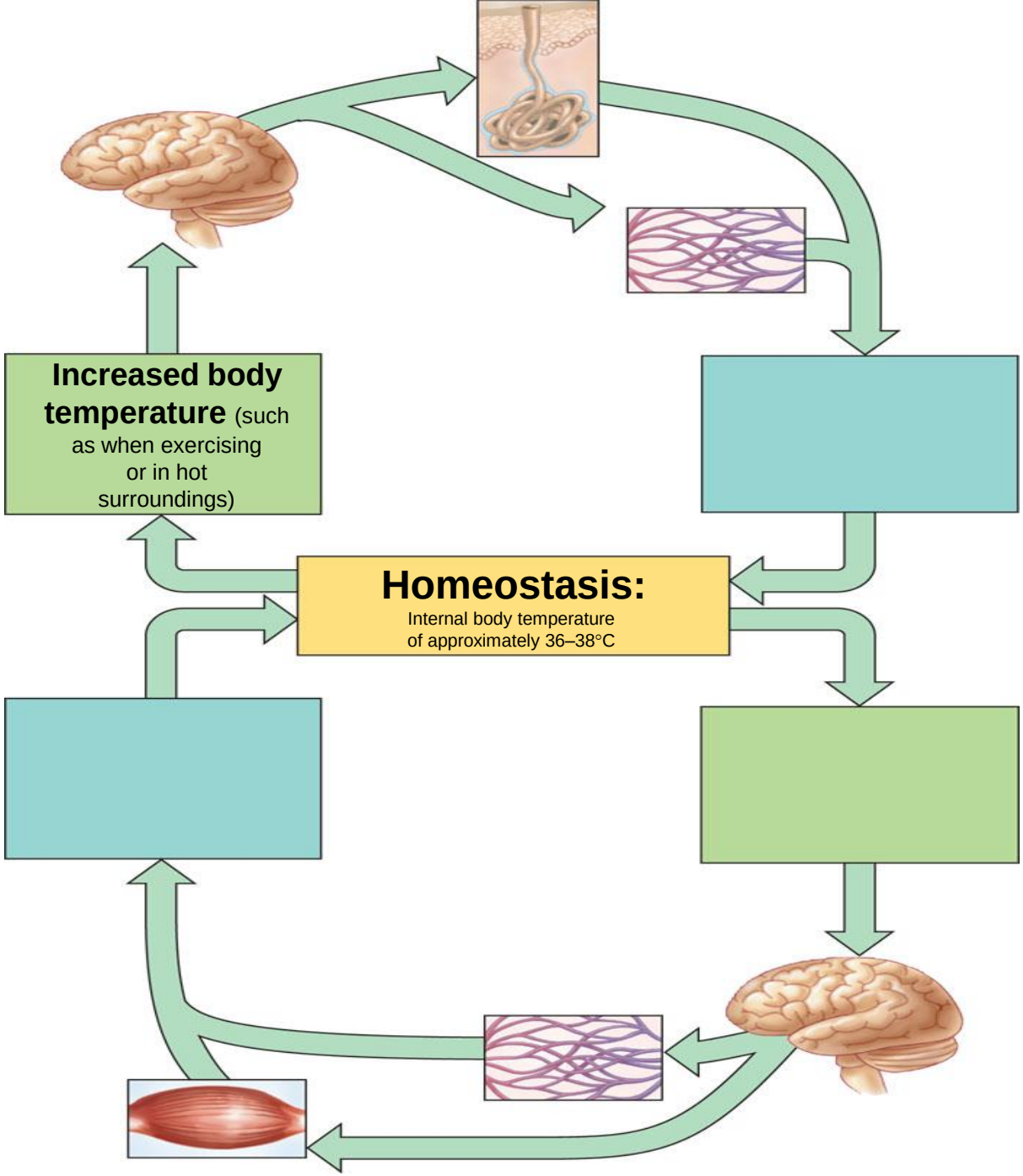
Take your forehead temperature

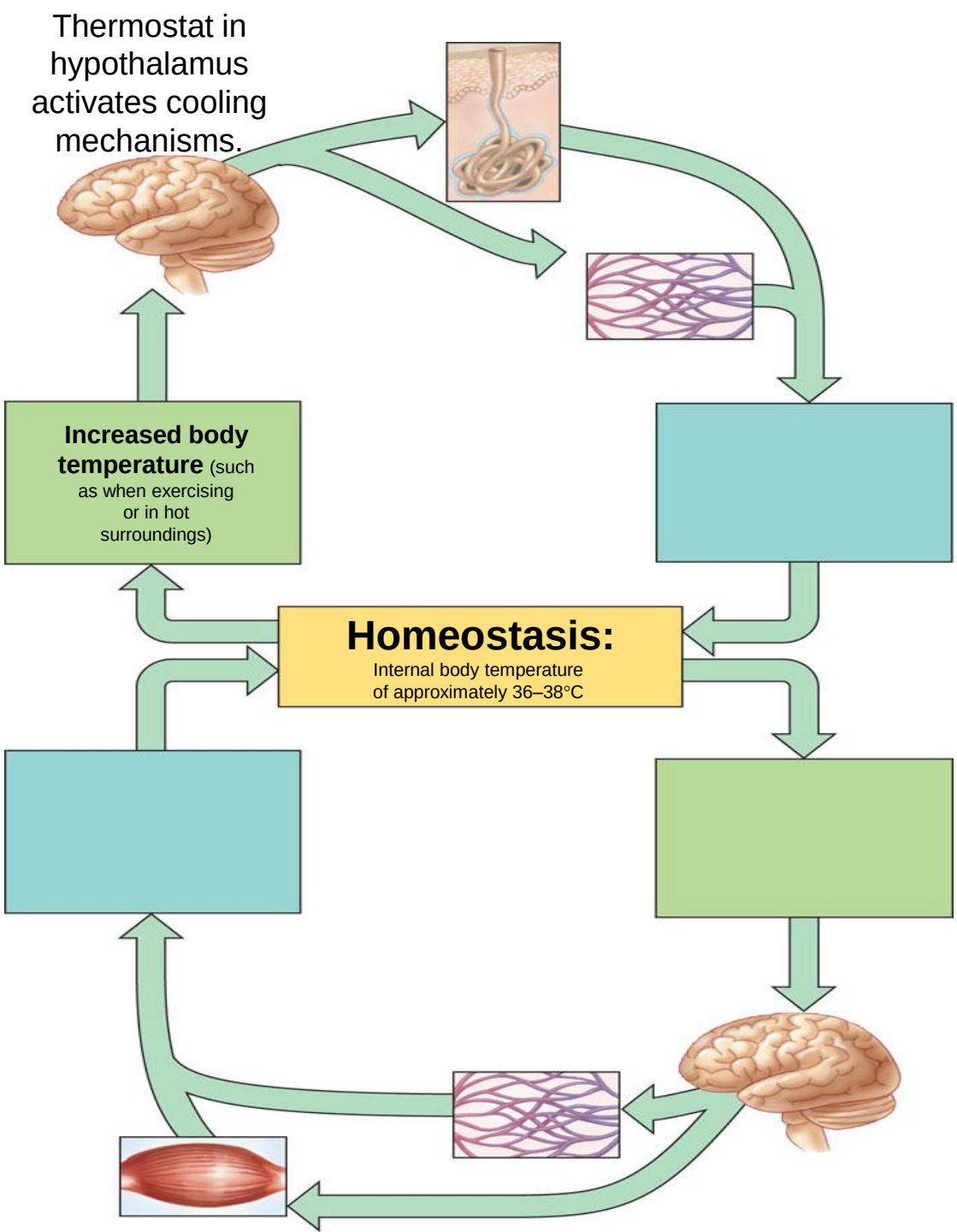
- Anonymously report using Active Votes
- View results

Why do you think there is so little difference in normal human body temperature while humans vary so much in other traits?


Homeostasis:
Internal body temperature
of approximately 36–38°C


MAC


Increased body temperature (such as when exercising or in hot surroundings)
Homeostasis:
Internal body temperature of approximately 36–38°C


Thermostat in hypothalamus activates cooling mechanisms.
Increased body temperature (such as when exercising or in hot surroundings)
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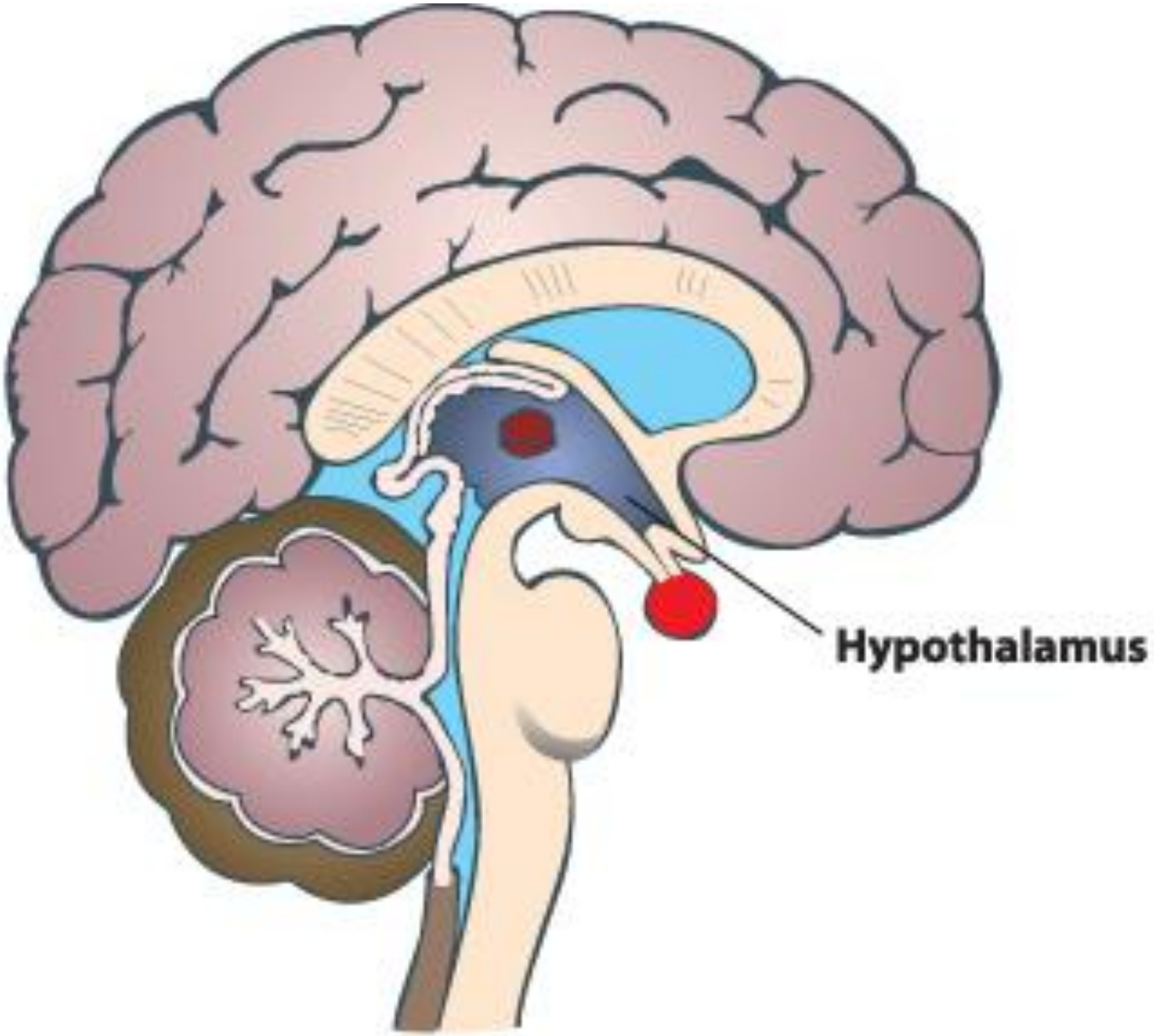
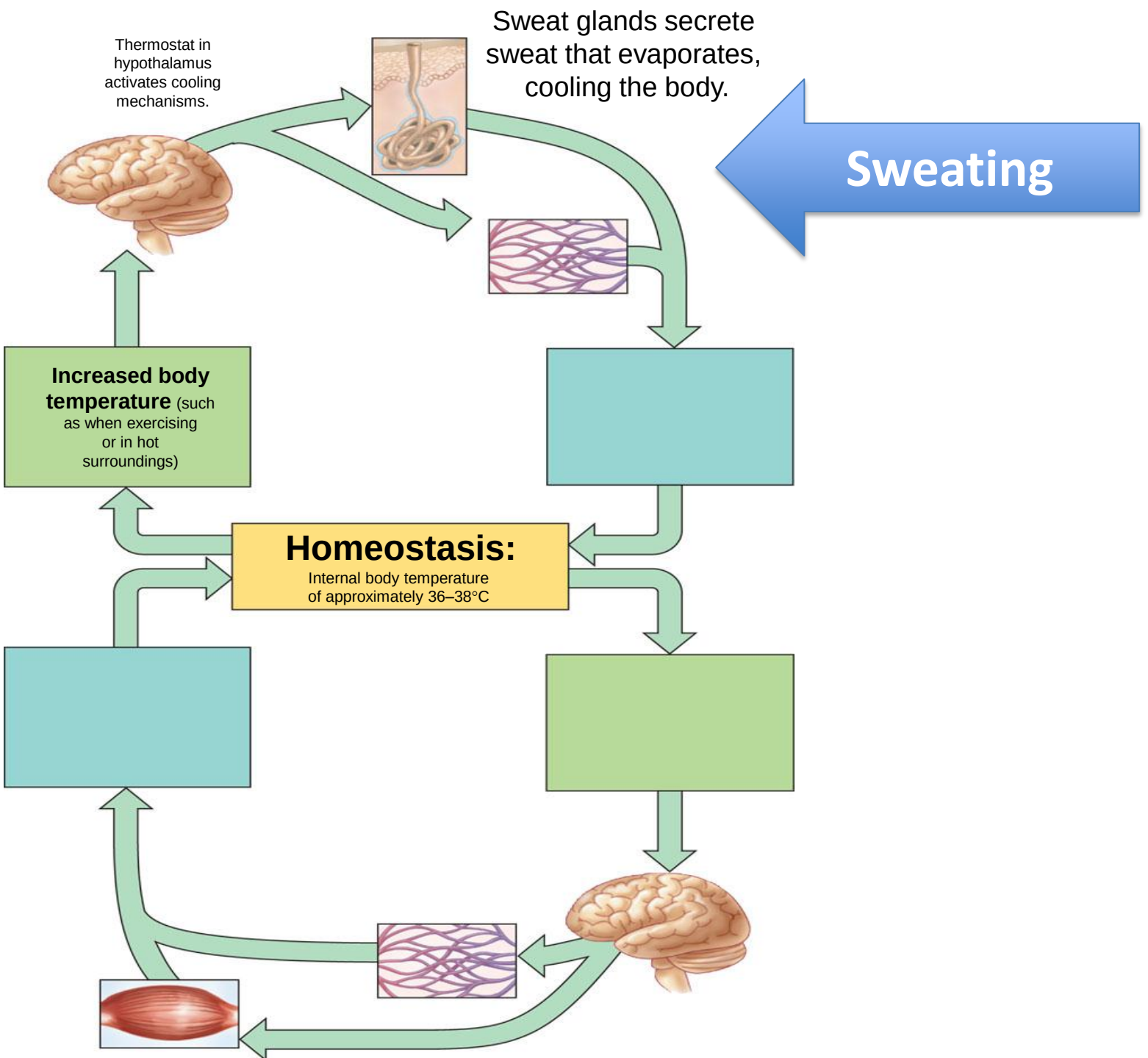

Hypothalamus

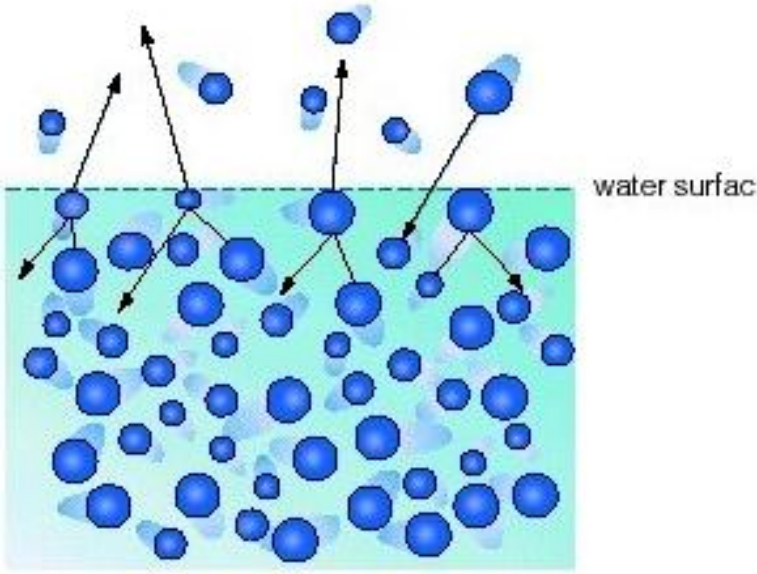

Thermostat in hypothalamus activates cooling mechanisms.
Sweat glands secrete sweat that evaporates, cooling the body.
Sweating
Increased body temperature (such as when exercising or in hot surroundings)
Homeostasis:
Internal body temperature of approximately 36–38°C

Evaporative Cooling

Cooling of a liquid's surface when a liquid evaporates.

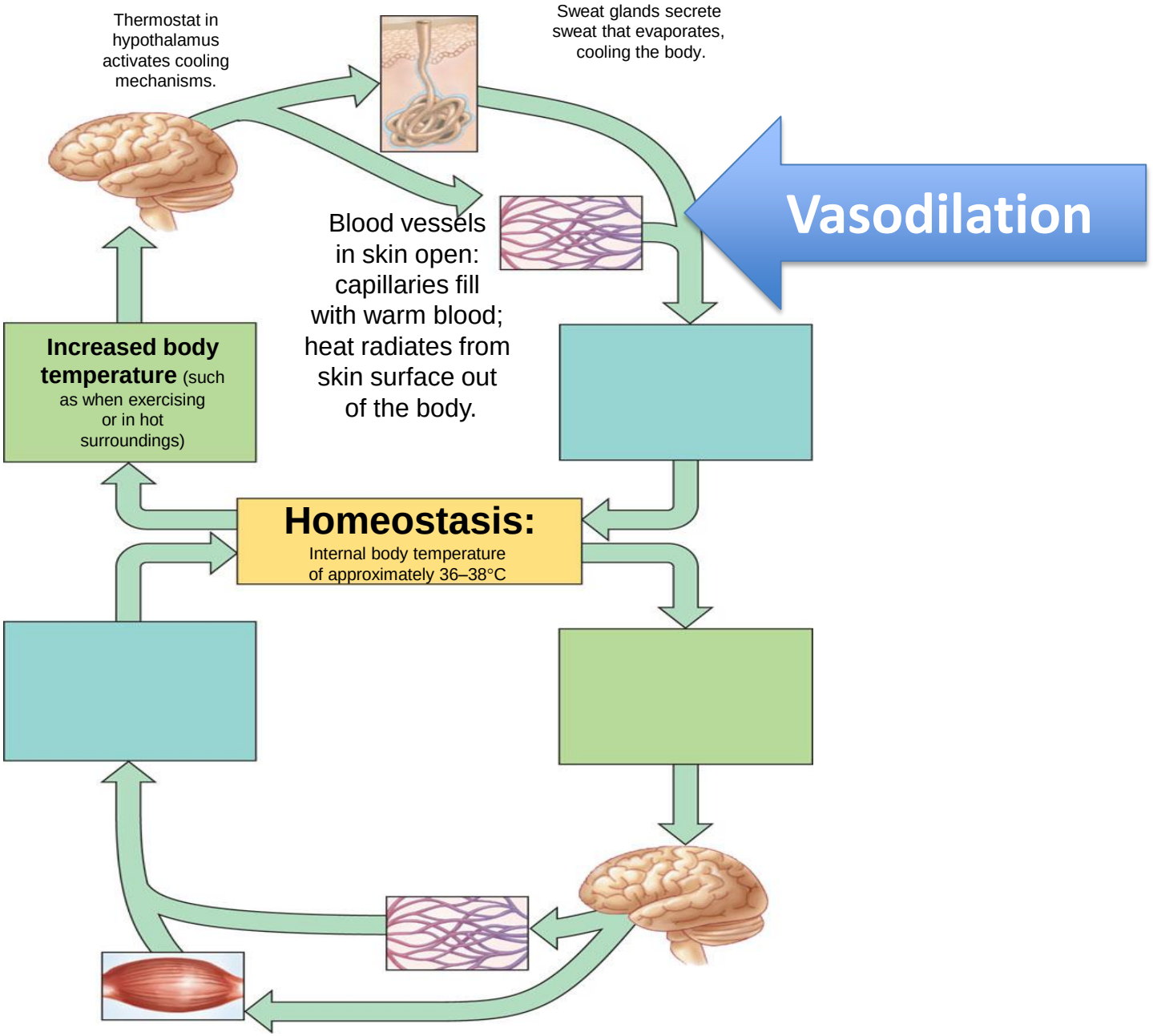
- From the surface, as select water molecules are untethered from all hydrogen bonds, they escape into the atmosphere.

- The surface molecules with the highest kinetic energy are most likely to escape into gaseous form; the average kinetic energy of the remaining surface molecules is thus lower.



During evaporation, the more energetic particles escape from the surface leaving the less energetic ones behind.

A terrestrial mammal bathing, an adaptation that enhances evaporative cooling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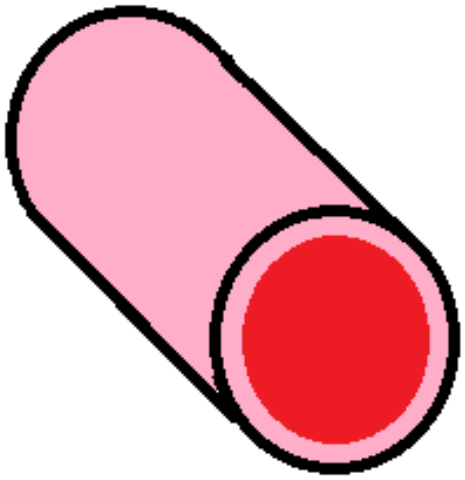
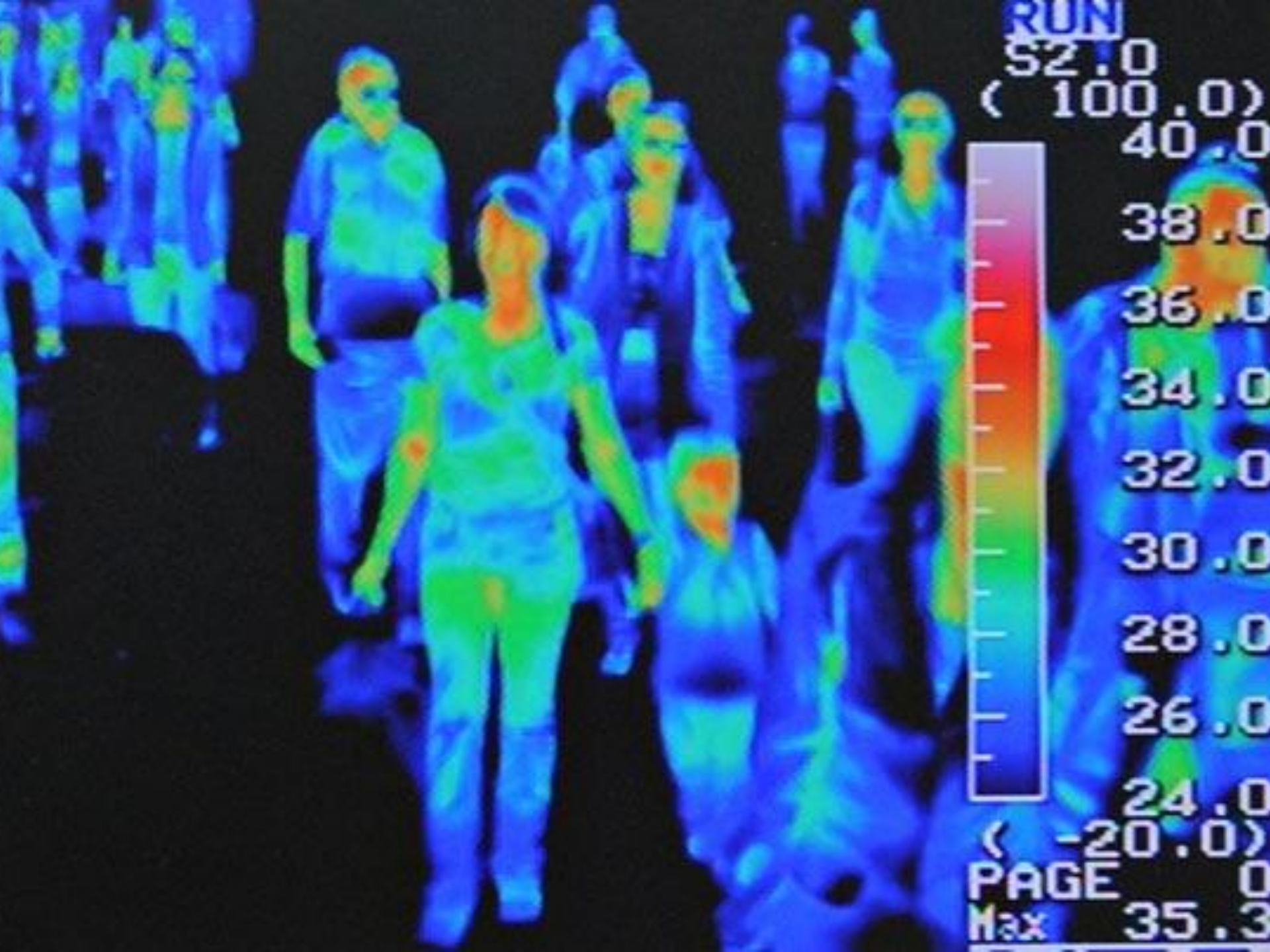
Vasodilation
Blood vessels in skin open: capillaries fill with warm blood; heat radiates from skin surface out of the body.
Increased body temperature (such as when exercising or in hot surroundings)
Homeostasis:
Internal body temperature of approximately 36–38°C

Normal Cross Section

Vasoconstriction



Vasodilation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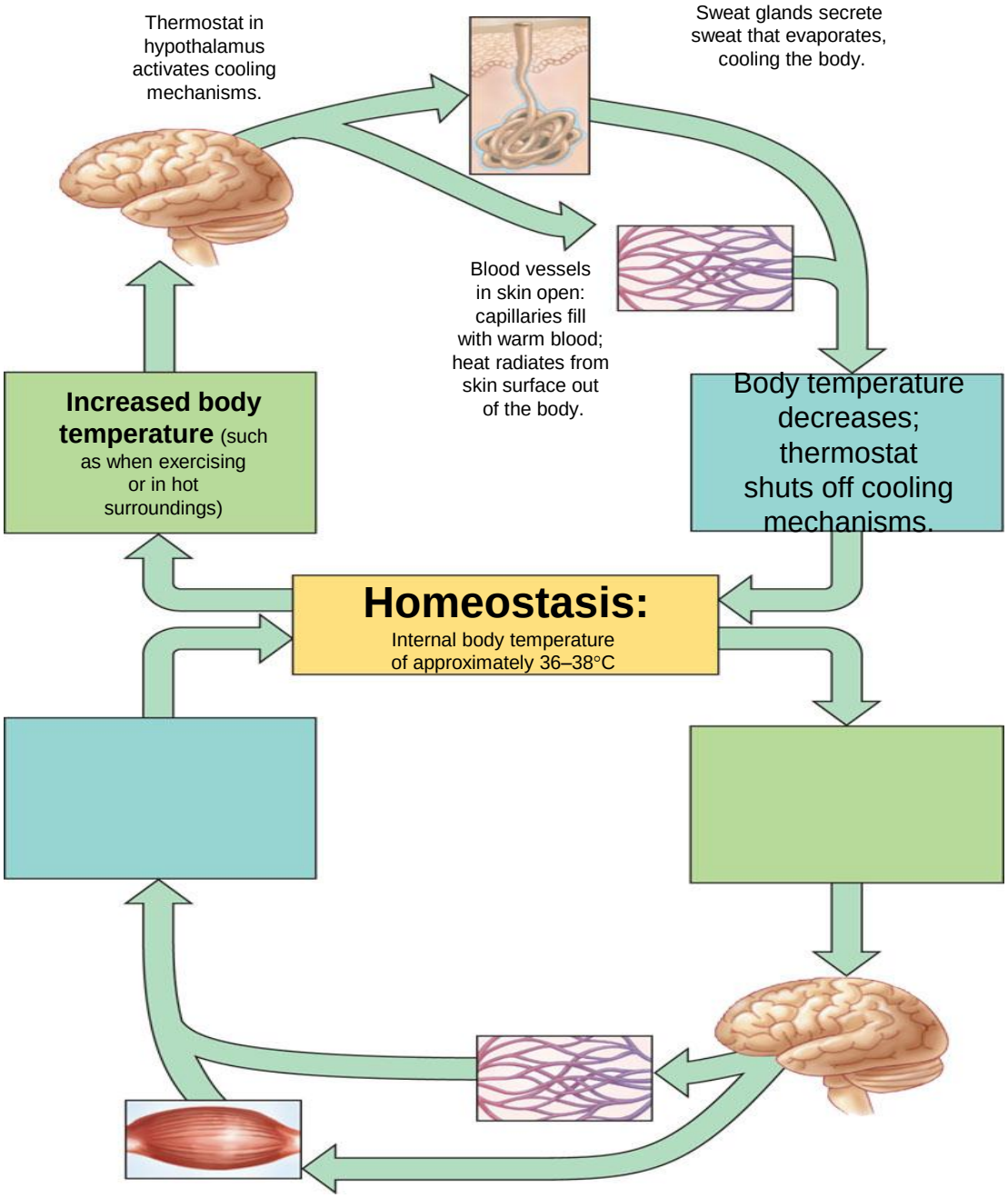
(100.0)
40.0
38.0
36.0
34.0
32.0
30.0
28.0
26.0
24.0
(-20.0)
PAGE 0
Max 35.3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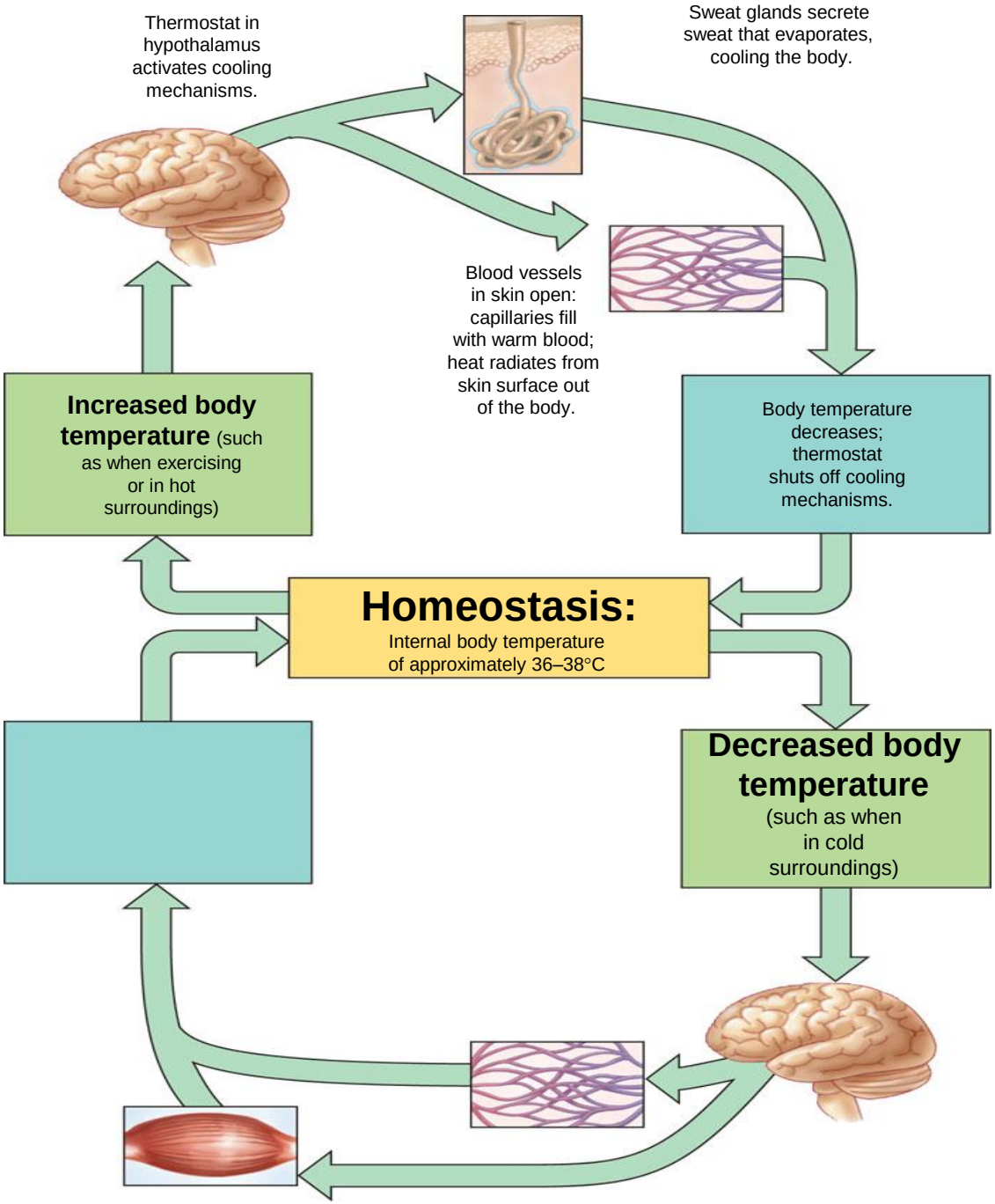
Sweat glands secrete sweat that evaporates, cooling the body.
Blood vessels in skin open: capillaries fill with warm blood; heat radiates from skin surface out of the body.
Increased body temperature (such as when exercising or in hot surroundings)
Body temperature decreases; thermostat shuts off cooling mechanisms.
Homeostasis:
Internal body temperature of approximately 36–38°C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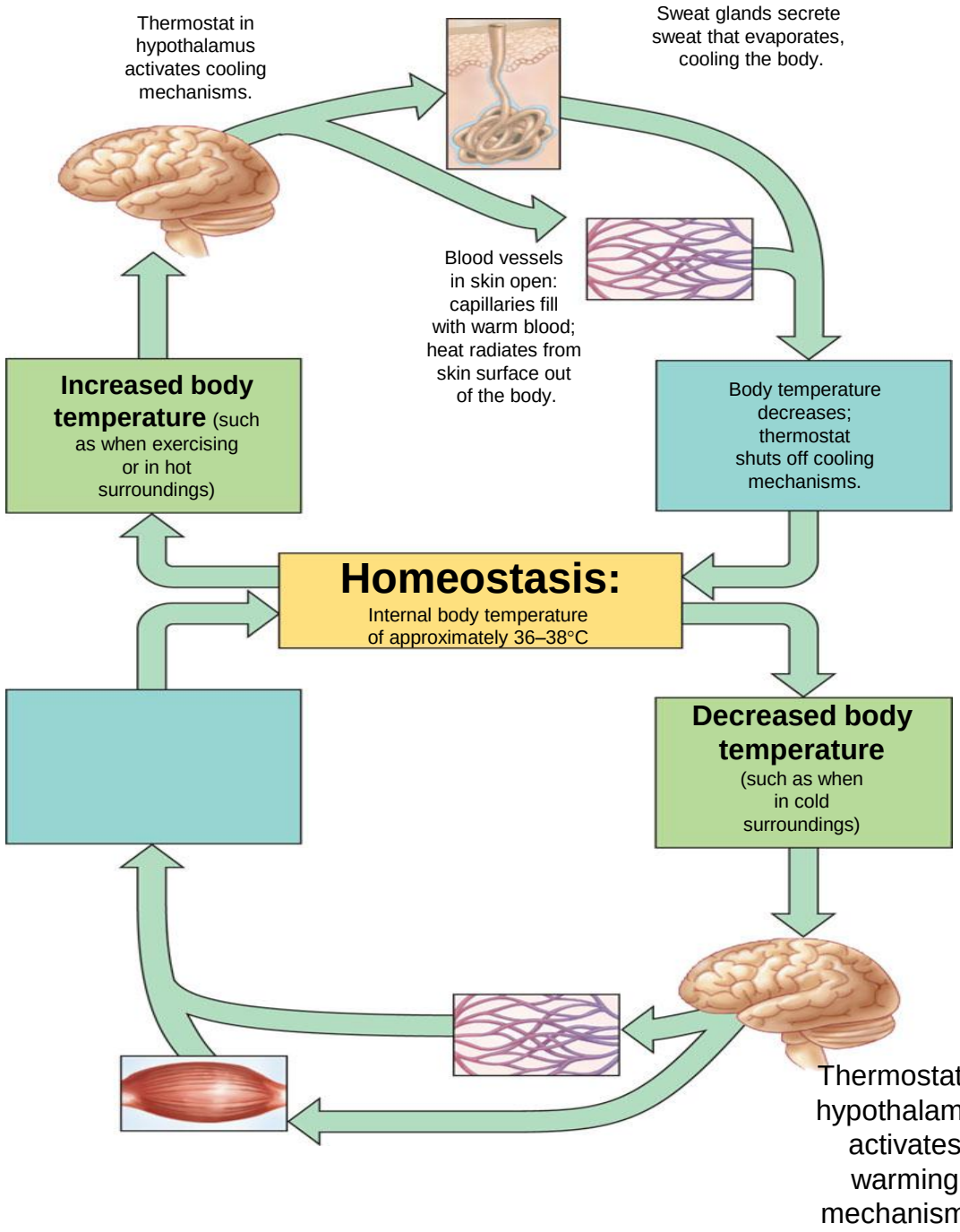
Increased body temperature (such as when exercising or in hot surroundings)
Body temperature decreases; thermostat shuts off cooling mechanisms.
Homeostasis:
Internal body temperature of approximately 36–38°C
Decreased body temperature
(such as when in cold surroundings)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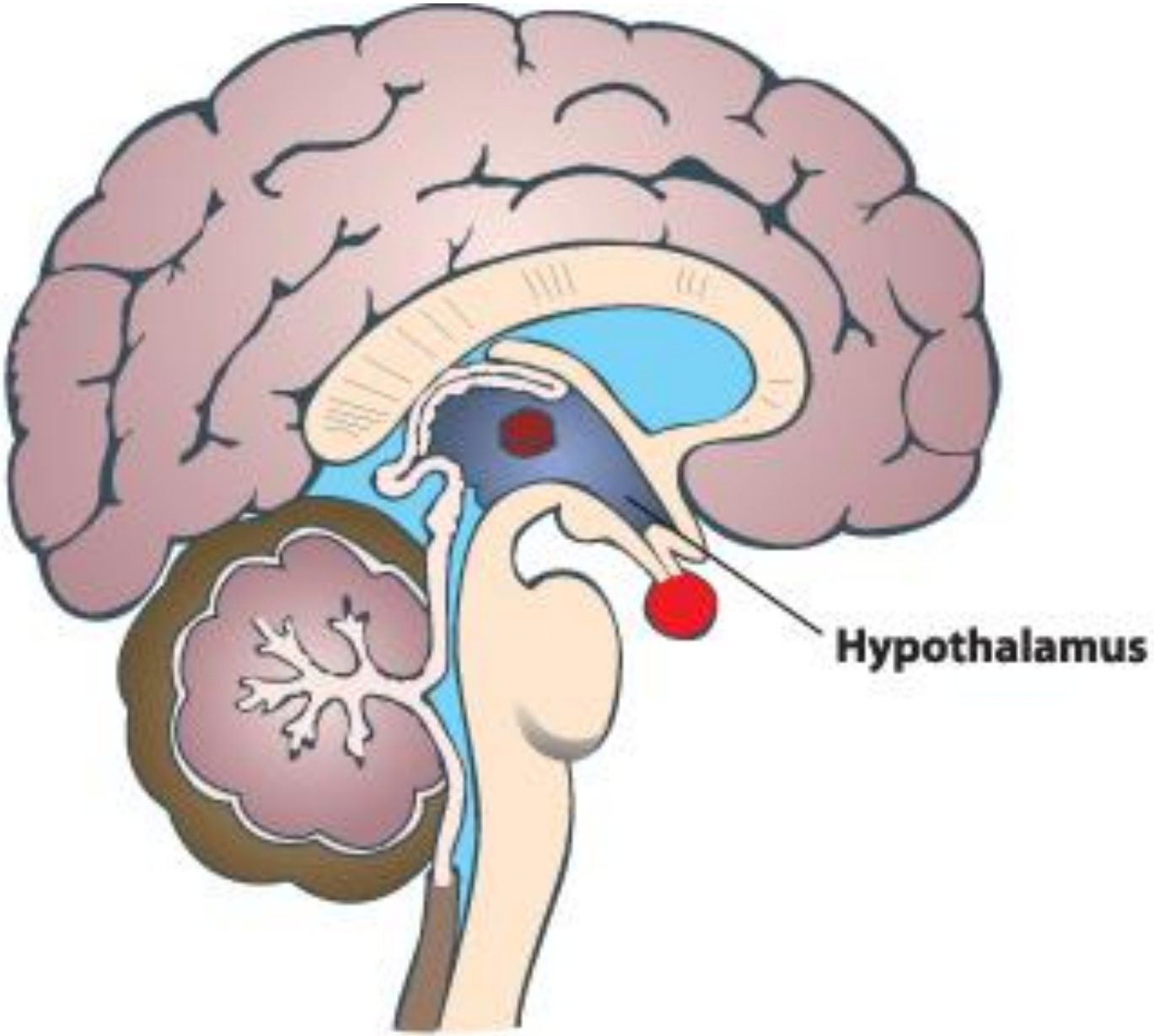
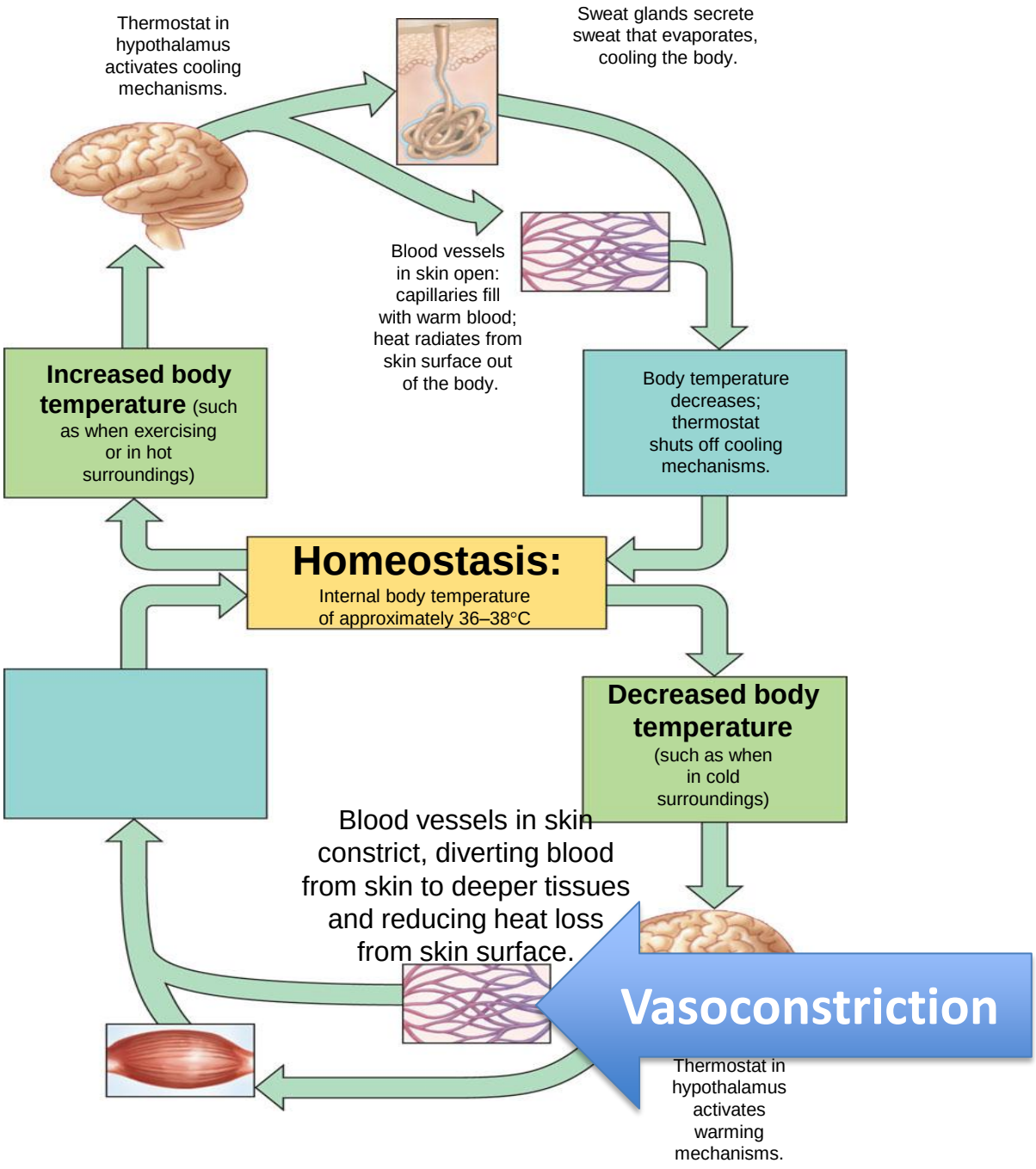
Body temperature decreases; thermostat shuts off cooling mechanisms.
Homeostasis:
Internal body temperature of approximately 36–38°C
Decreased body temperature (such as when in cold surroundings)
Thermostat in hypothalamus activates warming mechanisms.


Hypothalamus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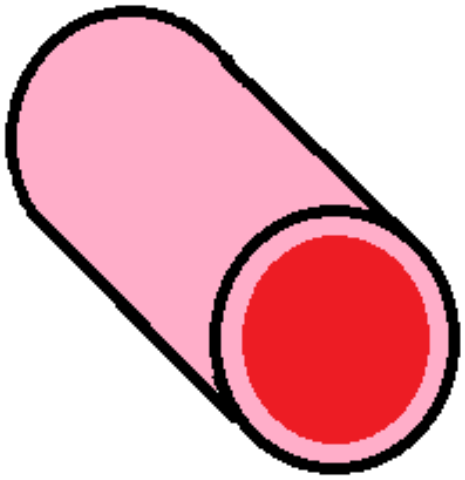
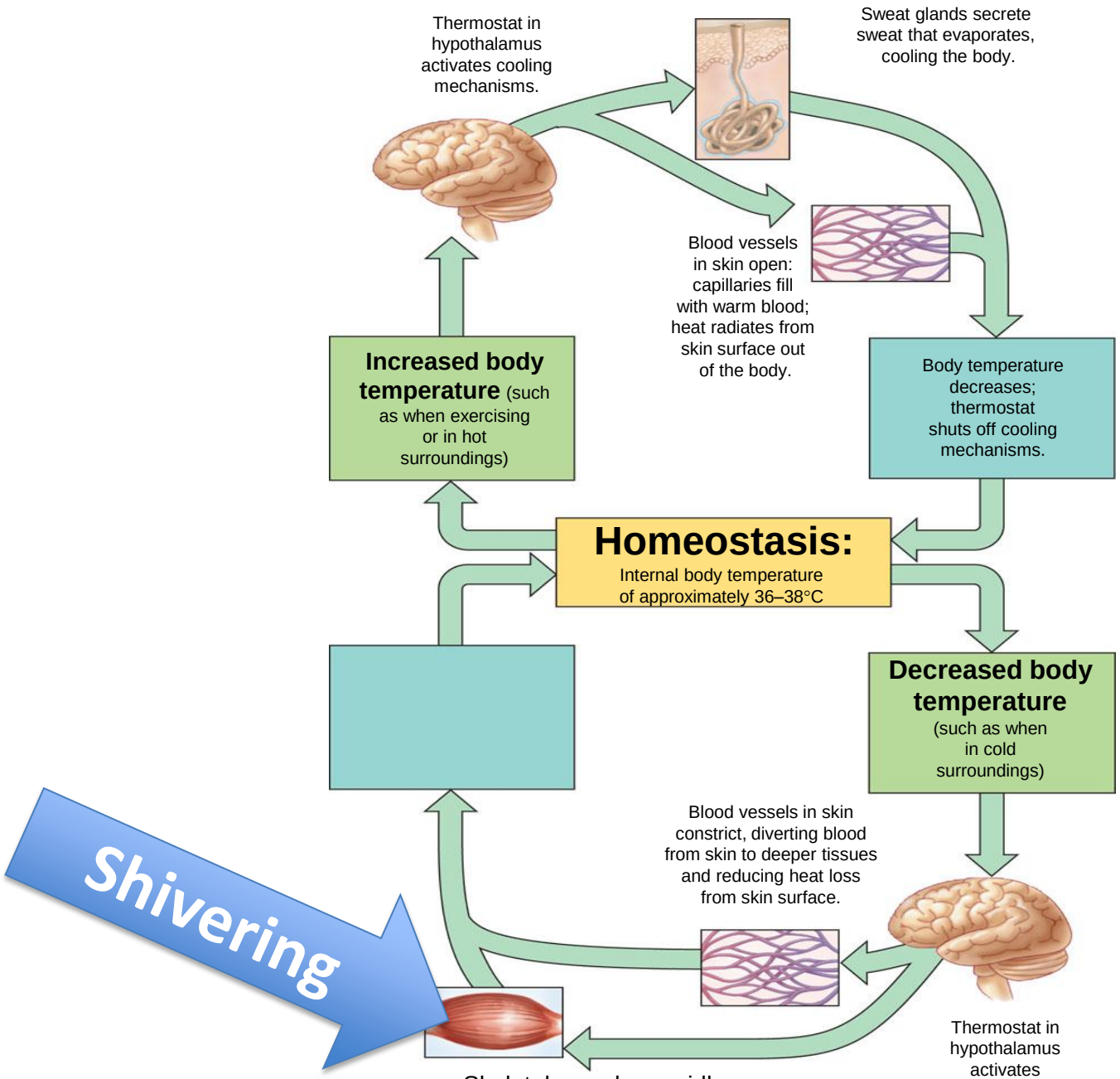
Sweat glands secrete sweat that evaporates, cooling the body.
Blood vessels in skin open: capillaries fill with warm blood; heat radiates from skin surface out of the body.
Increased body temperature (such as when exercising or in hot surroundings)
Body temperature decreases; thermostat shuts off cooling mechanisms.
Homeostasis:
Internal body temperature of approximately 36–38°C
Decreased body temperature (such as when in cold surroundings)
Blood vessels in skin constrict, diverting blood from skin to deeper tissues and reducing heat loss from skin surface.
Vasoconstriction
Thermostat in hypothalamus activates warming mechanisms.

Normal Cross Section

Vasoconstriction



Vasodilation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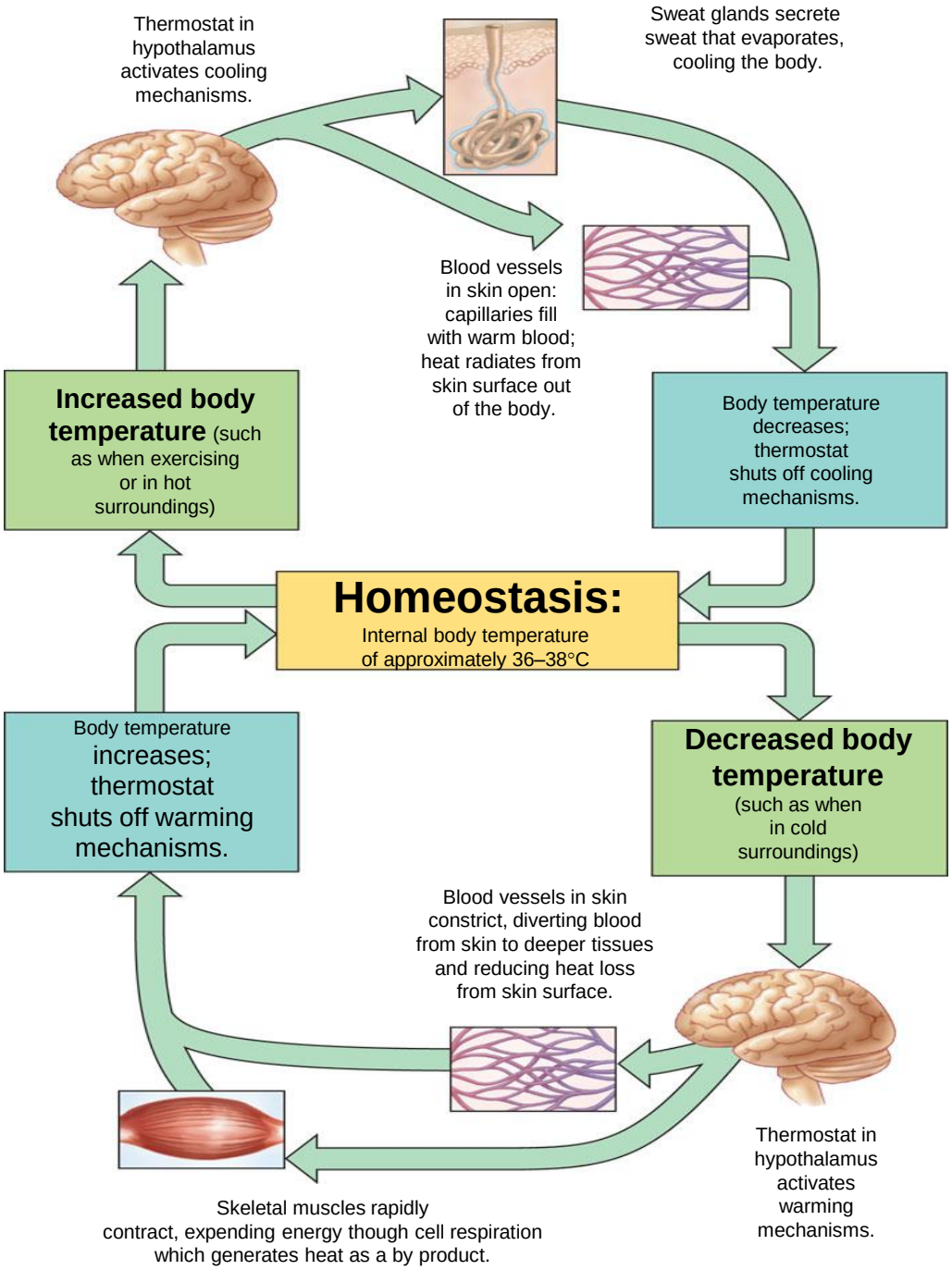
Sweat glands secrete sweat that evaporates, cooling the body.
Blood vessels in skin open: capillaries fill with warm blood; heat radiates from skin surface out of the body.
Increased body temperature (such as when exercising or in hot surroundings)
Body temperature decreases; thermostat shuts off cooling mechanisms.
Homeostasis:
Internal body temperature of approximately 36–38°C
Decreased body temperature (such as when in cold surroundings)
Shivering
Blood vessels in skin constrict, diverting blood from skin to deeper tissues and reducing heat loss from skin surface.
Thermostat in hypothalamus activates warming mechanisms.
Skeletal muscles rapidly contract, expending energy though cell respiration which generates heat as a by product.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Sweat glands secrete sweat that evaporates, cooling the body.
Blood vessels in skin open: capillaries fill with warm blood; heat radiates from skin surface out of the body.
Increased body temperature (such as when exercising or in hot surroundings)
Body temperature decreases; thermostat shuts off cooling mechanisms.
Homeostasis:
Internal body temperature of approximately 36–38°C
Body temperature increases; thermostat shuts off warming mechanisms.
Decreased body temperature (such as when in cold surroundings)
Blood vessels in skin constrict, diverting blood from skin to deeper tissues and reducing heat loss from skin surface.
Thermostat in hypothalamus activates warming mechanisms.
Skeletal muscles rapidly contract, expending energy though cell respiration which generates heat as a by product.

BILL

Draw the negative feedback loop for temperature regulation without looking at your notes.

Statement 6.5.10

Explain the control of body temperature, including the transfer of heat in blood, and the roles of the hypothalamus, sweat glands, skin arterioles and shivering.