Negative Feedback

Negative feedback is a mechanism involved in the maintenance of constant body conditions like temperature, pH and blood sugar levels.

- The body temperature of humans stays at approximately 37°C
- The blood acidity or pH at around 7.38

Negative feedback involves the following three steps:

- A change in the body is detected.
- A message is sent to a gland or organ.
- A response is initiated.

The response returns the body to its normal state.

Homeostasis

The maintenance of a constant internal environment despite changes in the surroundings is called **homeostasis**.

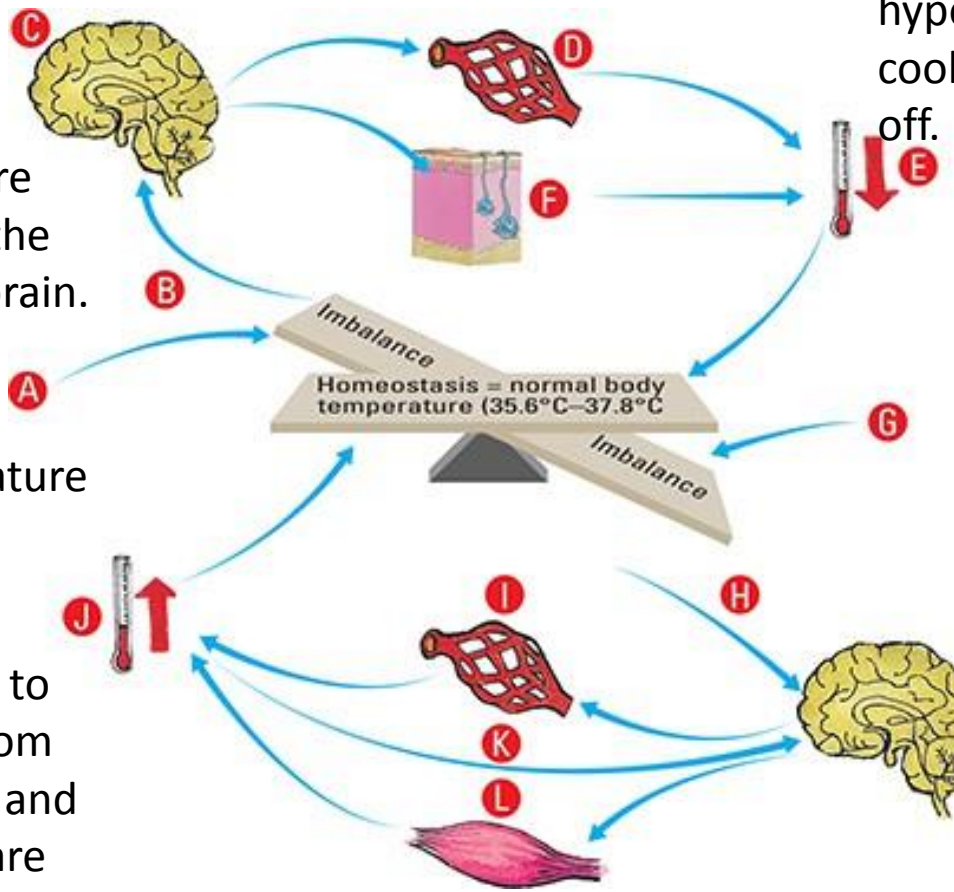
Significance

Homeostasis allows cells to keep
working efficiently, maintaining temperature,
glucose and water levels within strict limits.

Hypothalamus sends messages to sweat glands and walls of capillaries close to the skin

Capillaries close to the skin dilate and heat radiates from the skin surface.

Temperature returns to normal. Messages from hypothalamus cease and cooling responses are turned off.



Heat receptors detect increase in temperature and send message to the hypothalamus in the brain. Message travels along nerve cells.

Sweat production increases. Heat is lost as sweat evaporates from the skin.

Air temperature increases

Air temperature decreases.

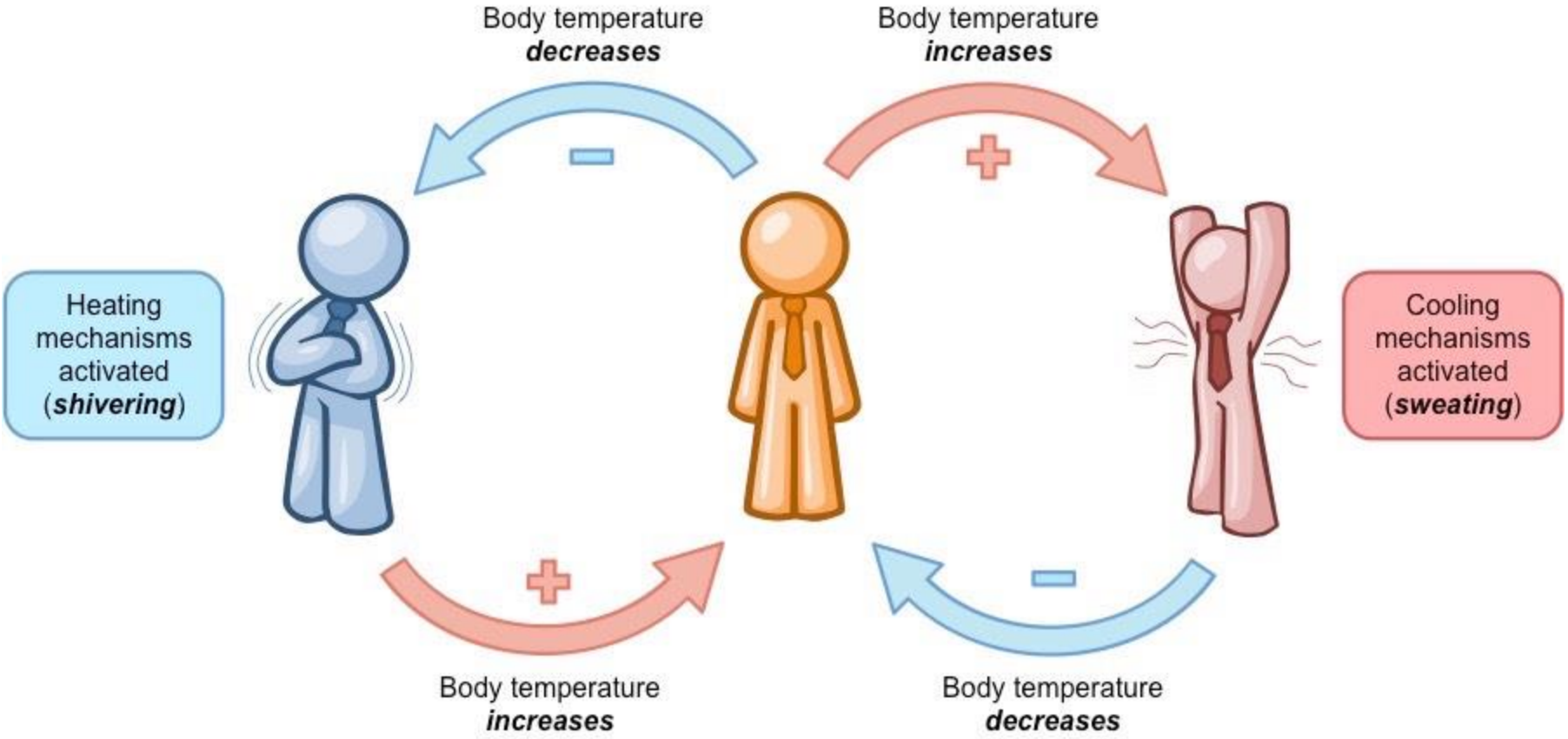
Heat receptors detect decrease in temperature and send message to the hypothalamus in the brain. Message travels along nerve cells.

Temperature returns to normal. Messages from hypothalamus cease and warming responses are turned off.

K Hypothalamus sends messages to muscles and walls of capillaries close to the skin.

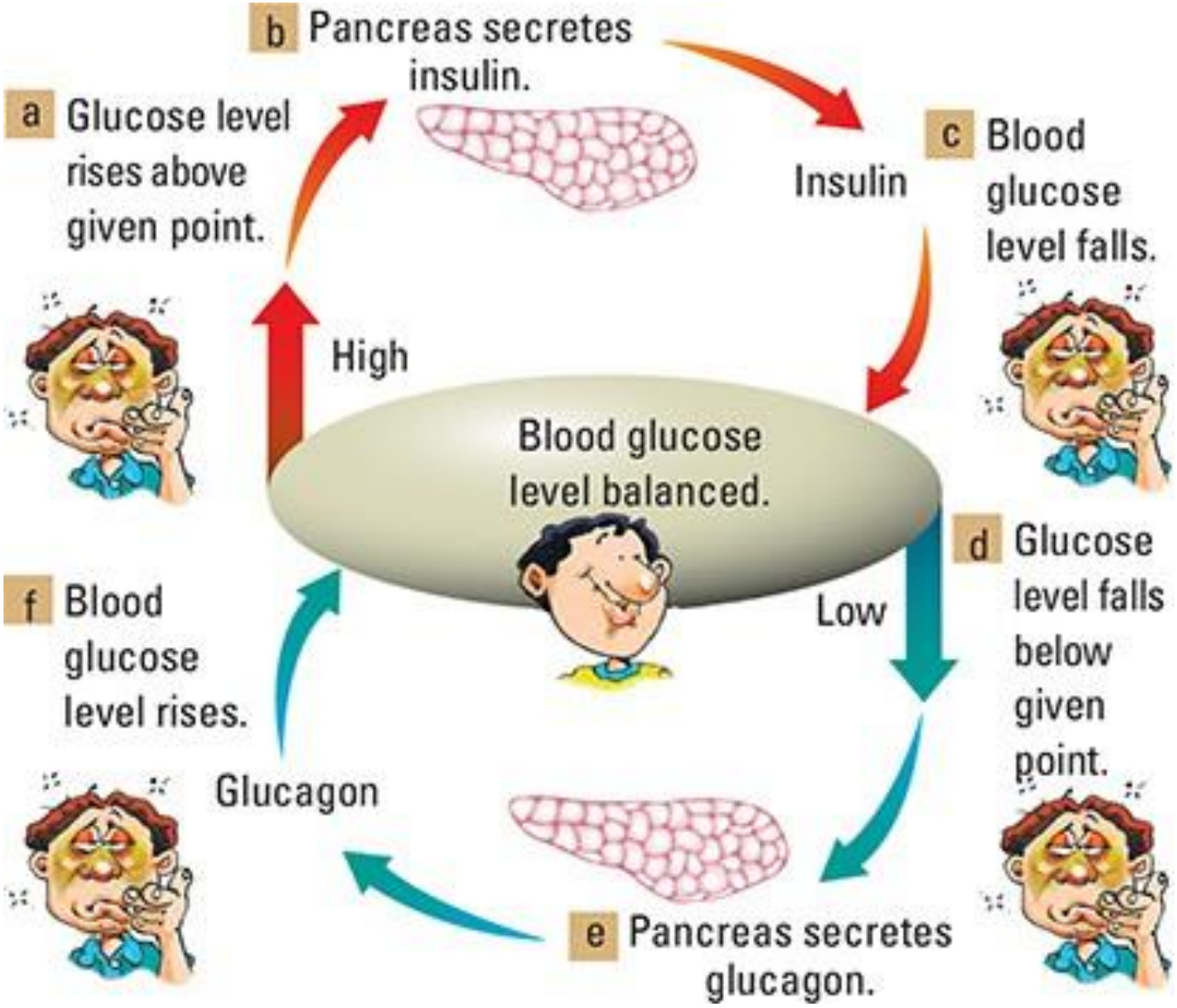
I Capillaries close to skin contract. Less heat radiates from skin

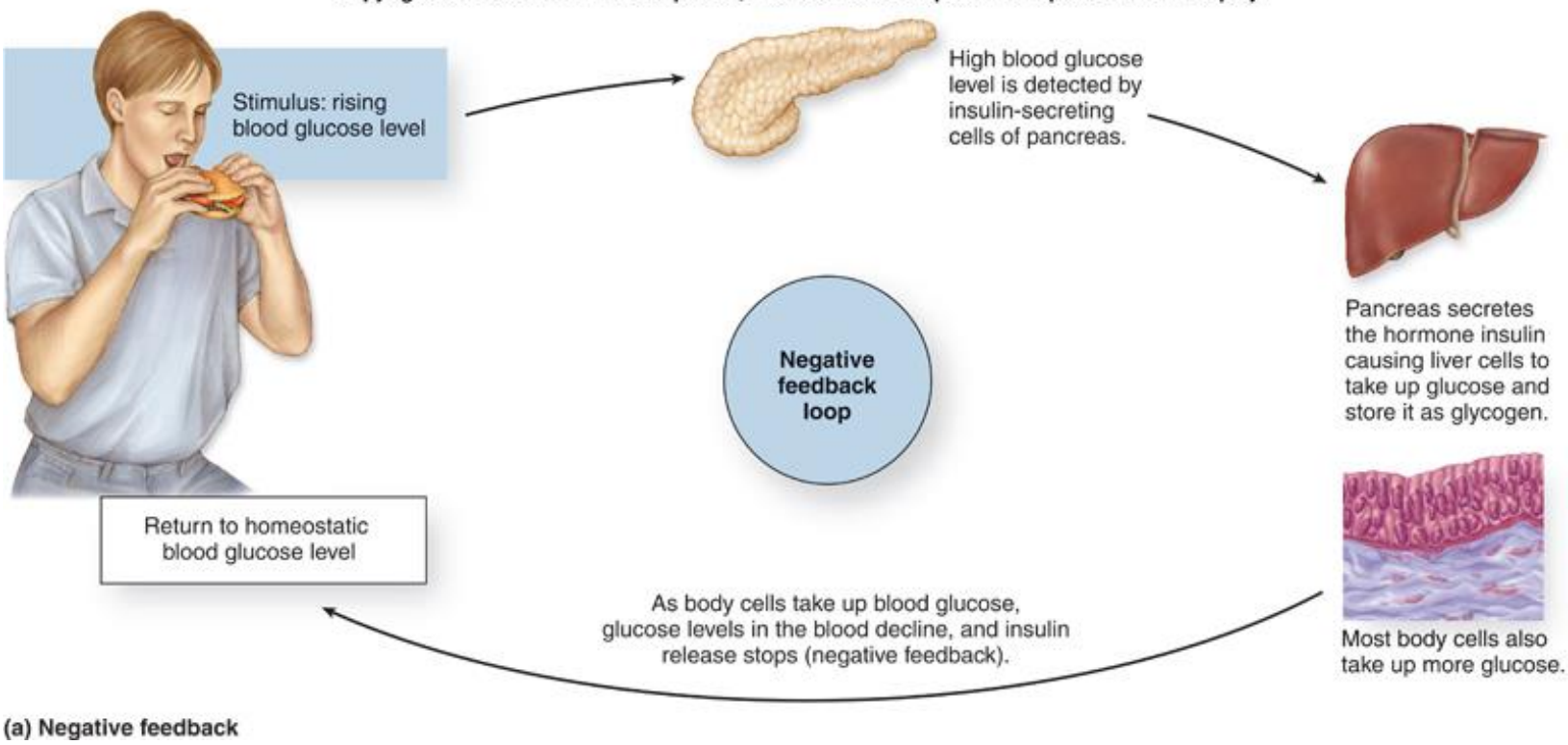
L Muscles shiver, generating heat.


Body temperature
decreases
Body temperature
increases
Heating mechanisms activated (*shivering*)
Cooling mechanisms activated (*sweating*)
Body temperature
increases
Body temperature
decreases

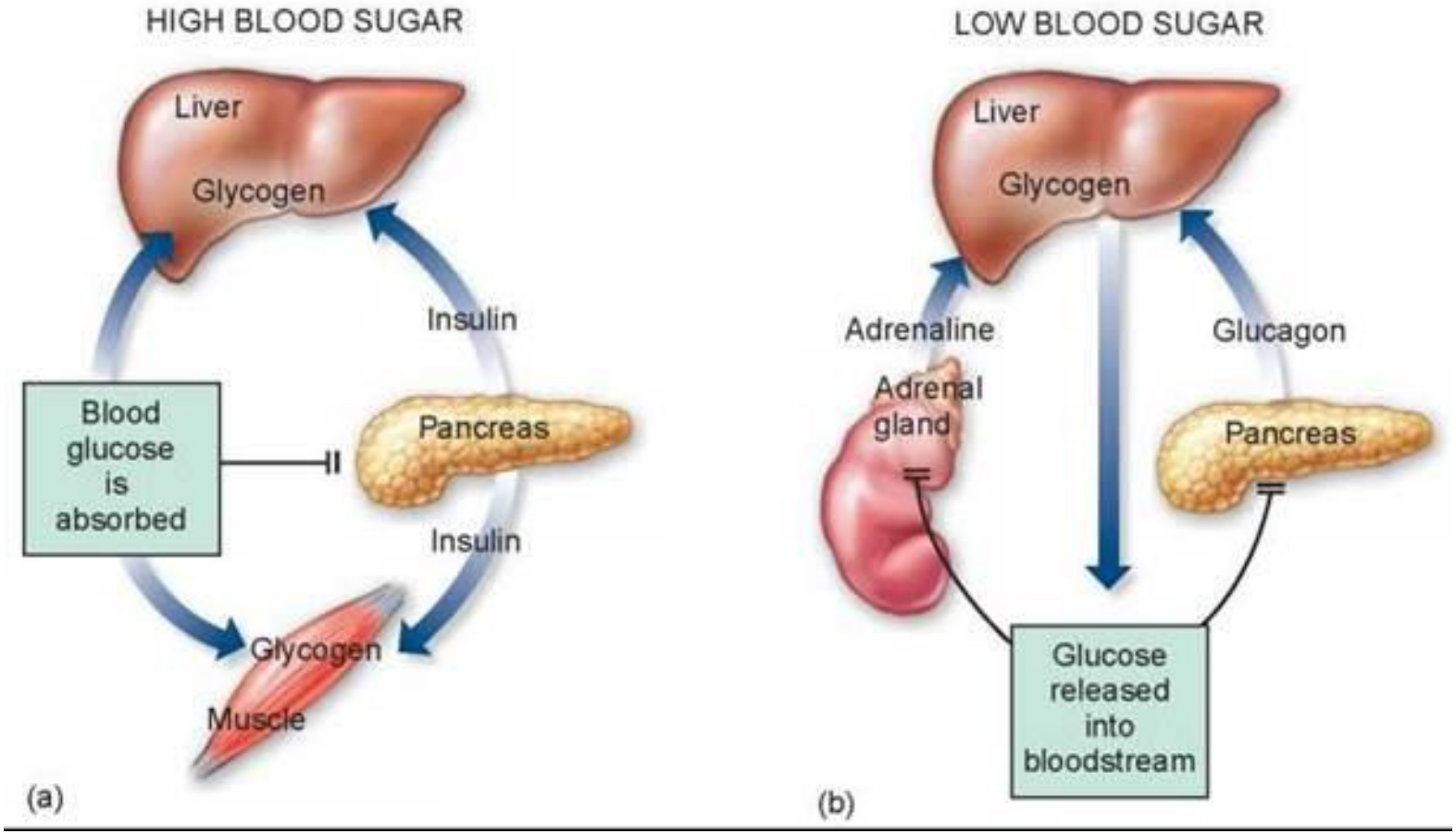
Research

The causes and effects of hypothermia


b Pancreas secretes insulin.
a Glucose level rises above given point.
Insulin
c Blood glucose level falls.
High
Blood glucose level balanced.
Low
d Glucose level falls below given point.
f Blood glucose level rises.
Glucagon
e Pancreas secretes glucagon.



(a) Negative feedback


HIGH BLOOD SUGAR
Liver
Glycogen
Insulin
Blood glucose is absorbed
Pancreas
Insulin
Glycogen
Muscle
(a)
LOW BLOOD SUGAR
Liver
Glycogen
Adrenaline
Glucagon
Adrenal gland
Pancreas
Glucose released into bloodstream
(b)

Blood glucose levels are usually maintained in a very narrow range by the action of two hormones, **insulin** and **glucagon**, both produced by the pancreas

If blood glucose levels increase, for example after eating chocolate, insulin is released.

This stimulates storage of glucose in the liver

Blood glucose levels then drop, inhibiting further release of insulin.

Glucagon works in a similar way.

In response to low blood glucose levels it directs the liver and cells to release glucose.

Research

The possible effects of diabetes on the body
And
The treatment for diabetes

Salt and water balance

If you drink a lot of water

↓

receptors send a message to the hypothalamus in the brain to release less ADH

↓

ADH causes nephrons in the kidney to reabsorb less water

↓

kidneys produce a large amount of dilute urine

↓

returns water balance to normal

If you are dehydrated

receptors send a message to the hypothalamus

More ADH is released

kidneys excrete less water

restore water balance