



Medical Physics Lab

Human Homeostasis

Exp-4



Salahaddin University –Erbil

College of Science, Physics Department, Medical Branch, Third Stage-2021

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Outline

What is Homeostasis?

Homeostatic variables

Feedback types

–Examples on the types of feedbacks

Homeostasis

Homeostasis in a general sense refers to stability, balance or equilibrium.

It is the body's attempt to maintain a constant internal environment

Maintaining a stable internal environment requires constant monitoring and adjustments as conditions change.

This adjusting of physiological systems within the body is called homeostatic regulation.

Homeostasis

The internal environment of the body is in a dynamic state of equilibrium (dynamic constancy) Chemical,

Thermal, and Neural factors interact to maintain homeostasis

Loss of homeostasis results in **disease or death.**

Homeostatic Variables

Body Temperature

Blood glucose

Concentrations of O₂ and CO₂ in the blood

Blood PH

Blood pressure, cardiac output, and cardiac rate

Respiratory rate and depth

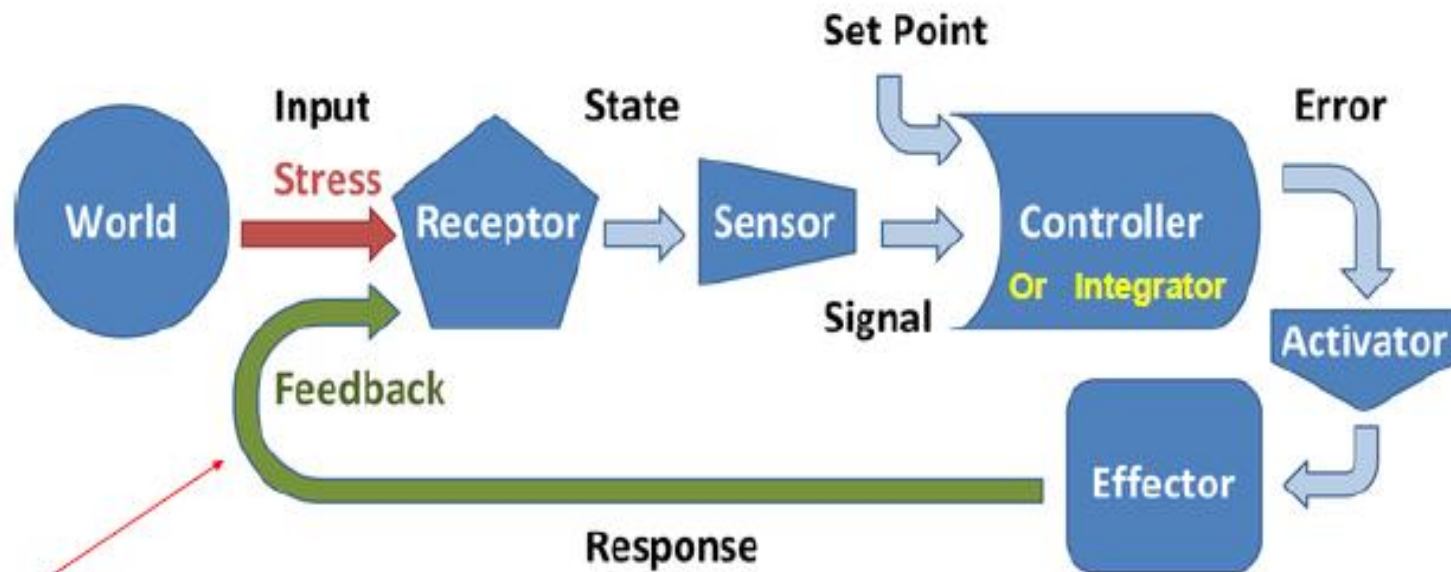
Secretions of endocrine glands

Calcium levels

Sodium concentration

Potassium concentration

Homeostatic control mechanism



② Types

Homeostatic Feedback

Types of Feedback

Negative Feedback

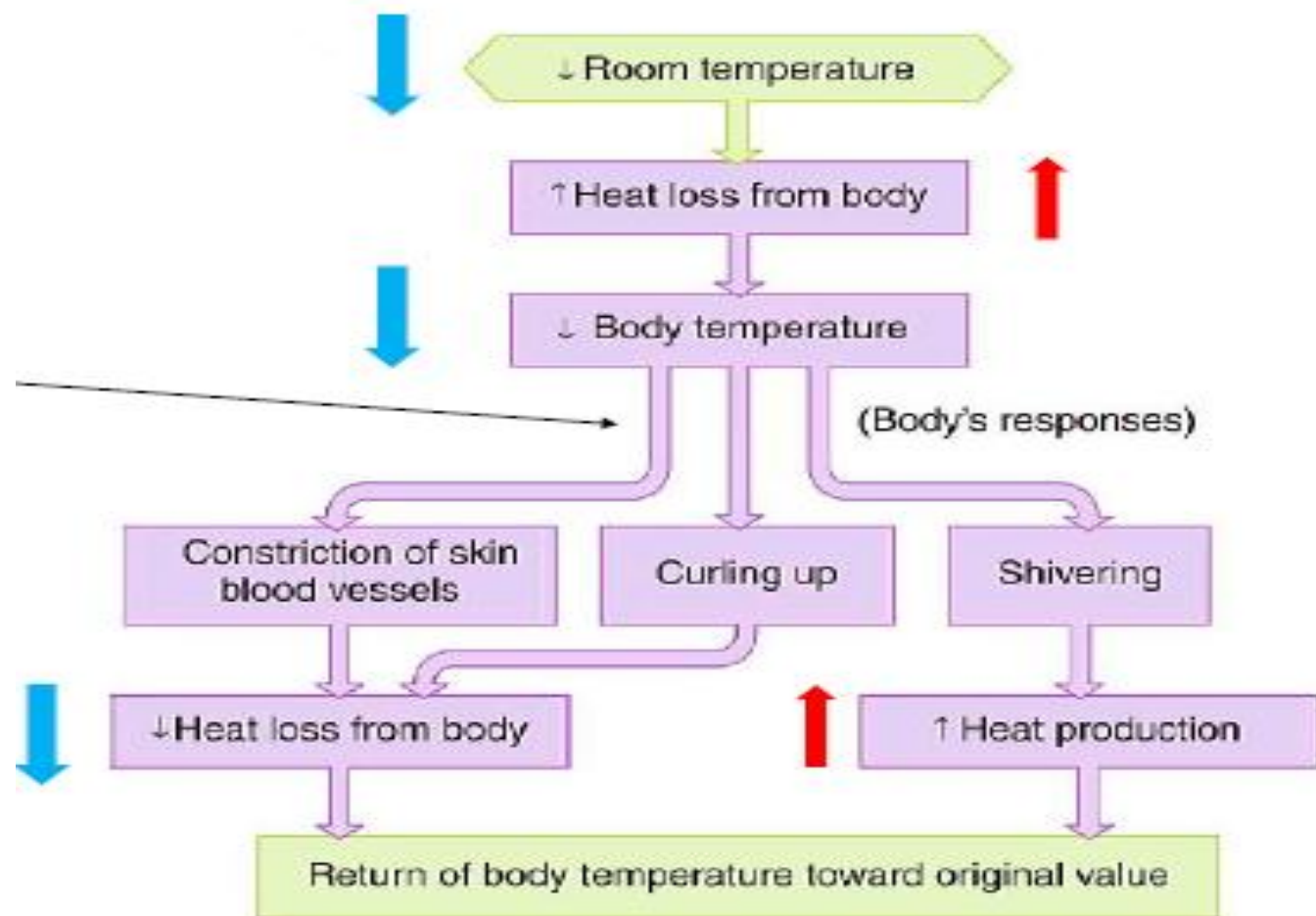
Positive Feedback

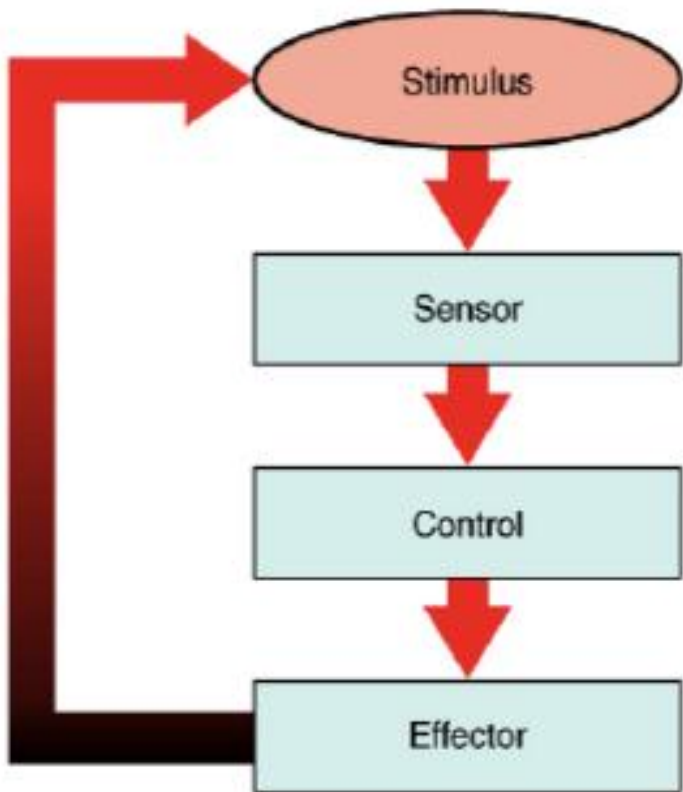
Negative Feedback

It is a reaction in which the system responds in such a way as to **reverse** the direction of change.

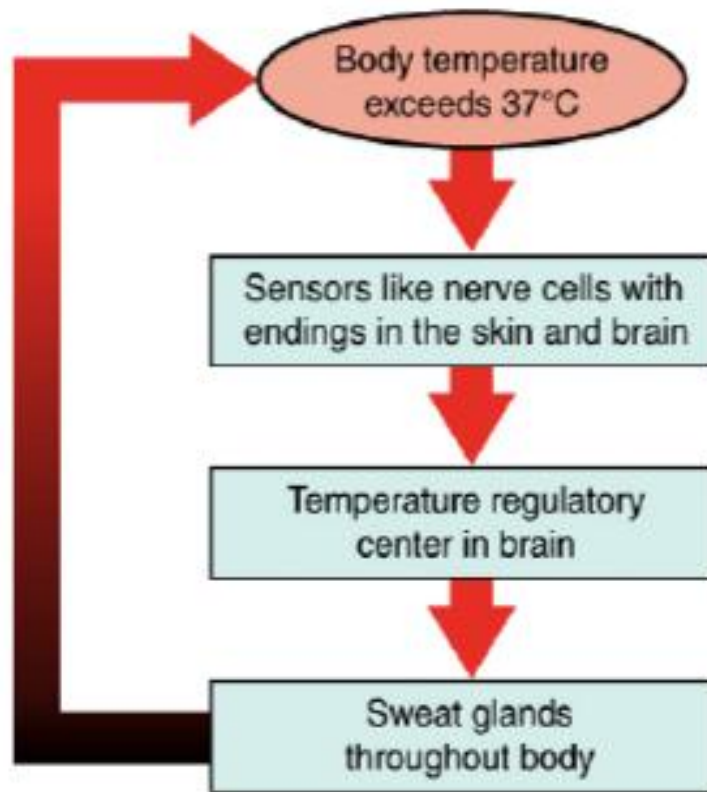
Since this tends to keep things constant, it allows the maintenance of homeostasis.

For instance: When the concentration of carbon dioxide in the human body increases. the lungs are signaled to increase their activity and expel more carbon dioxide





Negative feedback loop



Body temperature regulation

Hot

Vasodilation

Arterioles dilate (enlarge) so more blood enters skin capillaries and heat is lost.

Sweating

Sudorific glands secrete sweat which removes heat when water changes state.

Pilorelaxation

This means the hairs flatten.

Stretching Out

By opening up, the body was a larger surface area.

Cold

Vasoconstriction

Arterioles get smaller to reduce blood going to skin: keeping core warm.

Shivering

Rapid contraction and relaxing of skeletal muscles. Heat produced by respiration.

Piloerection

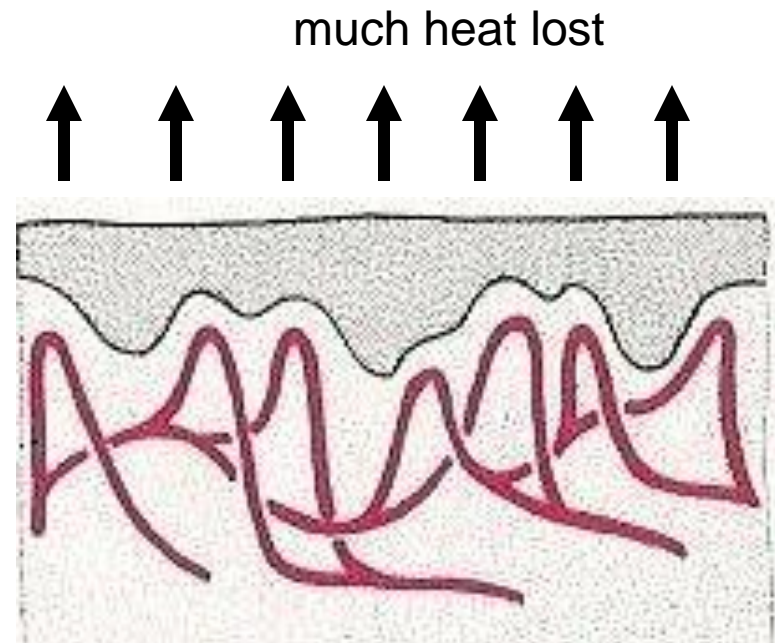
Hairs on skin stand up.

Curling Up

Making yourself smaller so smaller surface area.

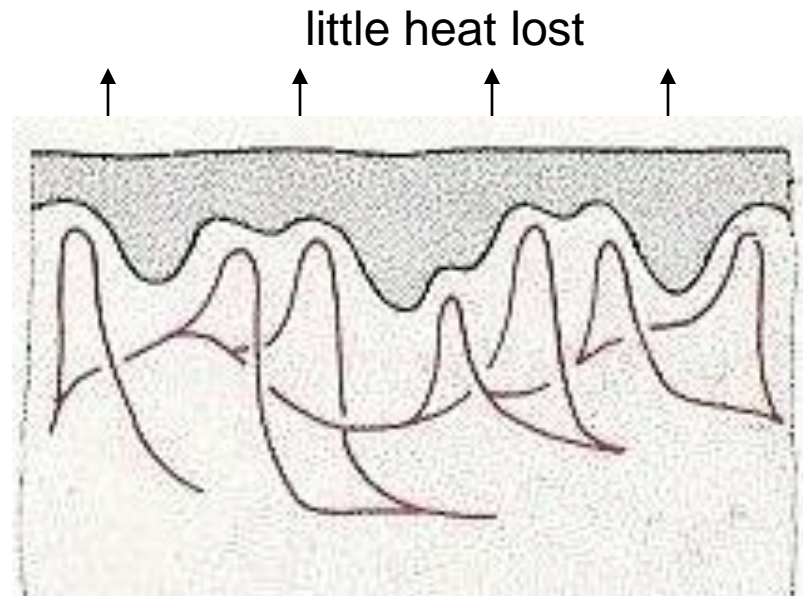
Vasodilation

If the body temperature rises, the blood vessels in the skin dilate (become wider) and allow more blood to flow near the surface. The heat loss from the blood through the skin helps cool the circulating blood

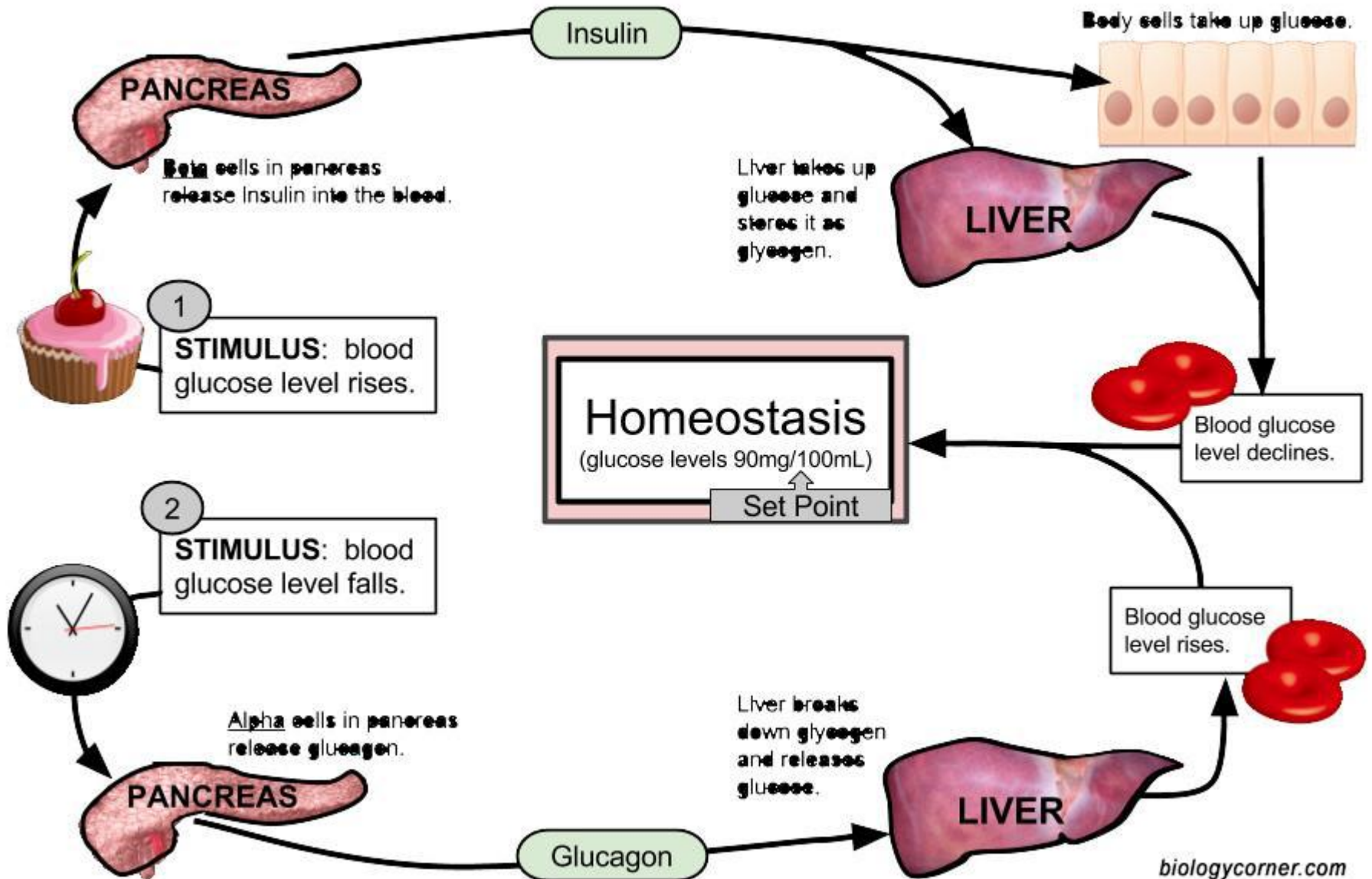


Vasoconstriction

If the body temperature falls. The blood vessels in the skin constrict. Less warm blood flows near the surface so less heat is lost



Blood Glucose Regulation



Positive feedback

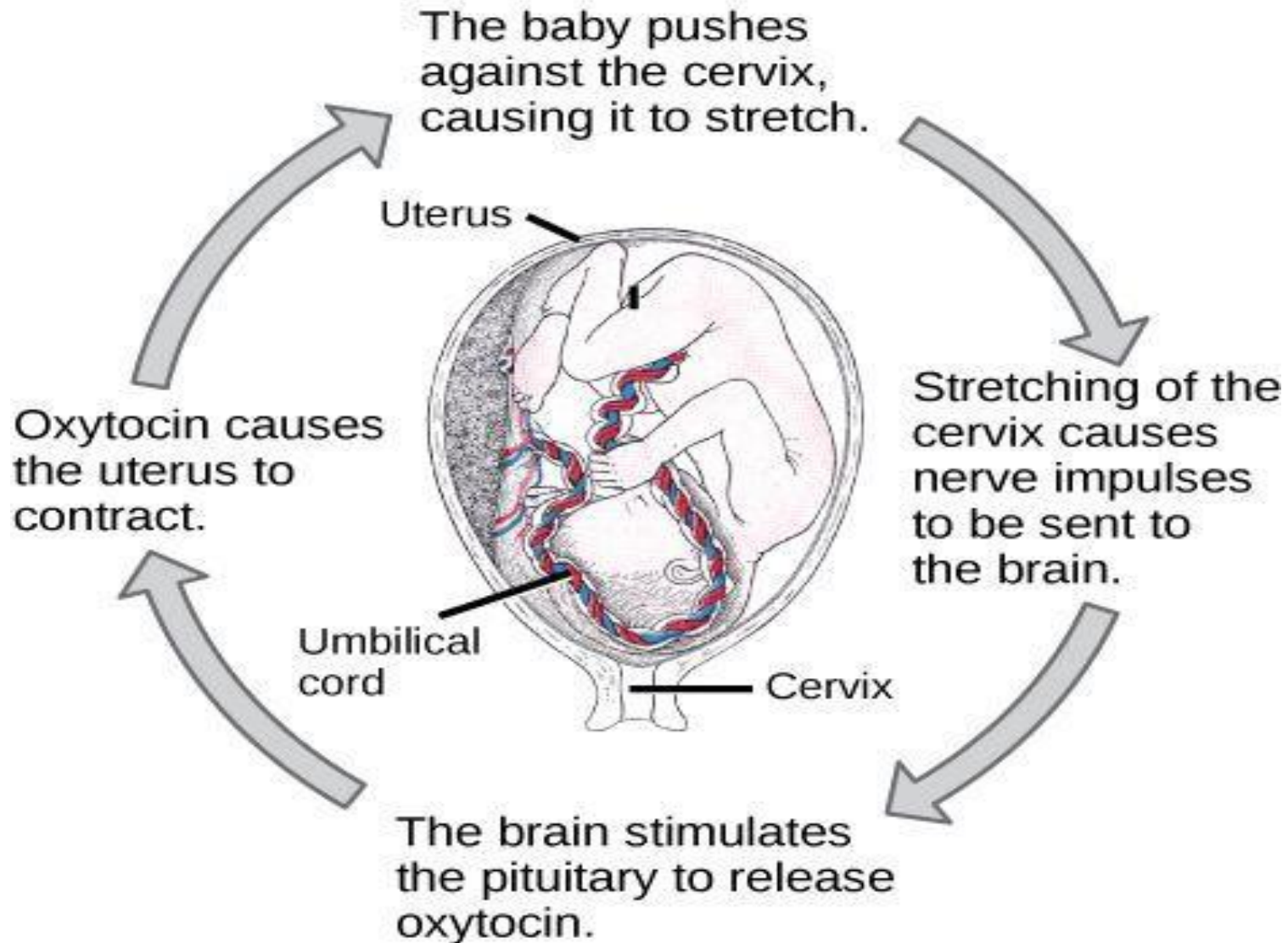
Its a response is to amplify the change in the variable.

A body mechanism by which any change from an ideal normal value is made greater.

For example, in nerves, a threshold electric potential triggers the generation of a much larger action potential.

Blood clotting and events in childbirth are other types of positive feedback.

Positive feedback

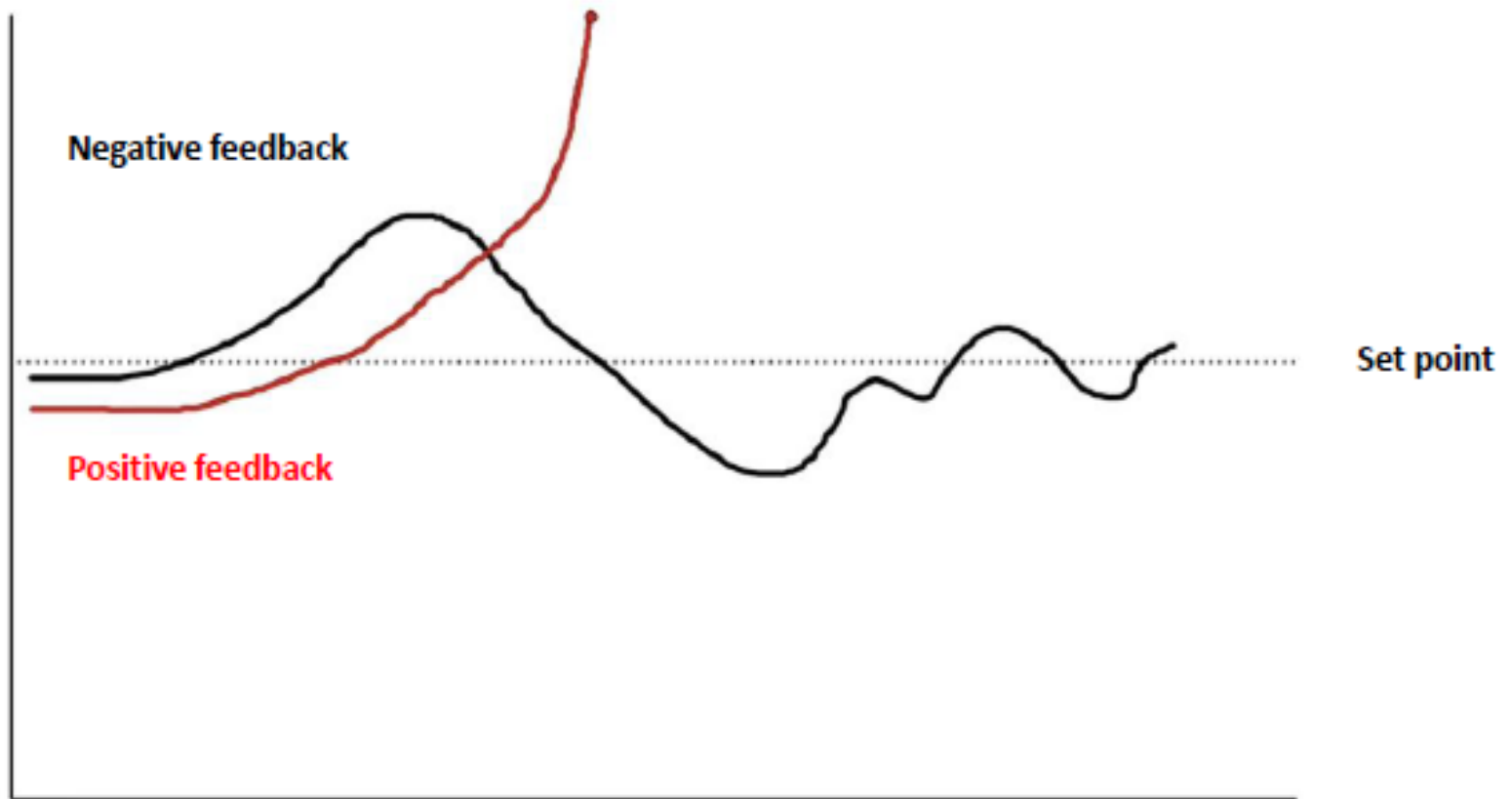


Positive feedback

Examples of normal positive feedback:
childbirth and depolarization of neurons

Example of harmful positive feedback: When you have a high fever it causes a metabolic change that can push the fever higher and higher

Positive Vs Negative Feedback



Graph Analysis

Plot the measured data (body temperature, heart rate, breathing rate) for each subject on 1 graph. You should plot 1 graph using 3 different colors for body temperature RED, heart rate BLUE and breathing rate GREEN versus the duration of exercise (i.e. 0, 2, 4, 6, 8, min).

CREATE A LEGEND, TITLE, AND MARK THE UNIT OF MEASUREMENT FOR THE GRAPH

| Name of student | Blood pressure systolic/ mm Hg | Blood pressure diastolic/ mm Hg | Body Temp (Celsius) | Heart Rate (beats/min) | Breathing Rate number of breaths per minute |
|---|---------------------------------------|--|----------------------------|-------------------------------|--|
| REST/ BASE LINE | | | | | |
| AFTER 2 min of exercise | | | | | |
| AFTER 4 min of exercise | | | | | |
| AFTER 6 min of exercise | | | | | |
| AFTER 8 min of exercise | | | | | |
| 1 min after exercise HAS STOPPED | | | | | |