Introduction to physiology

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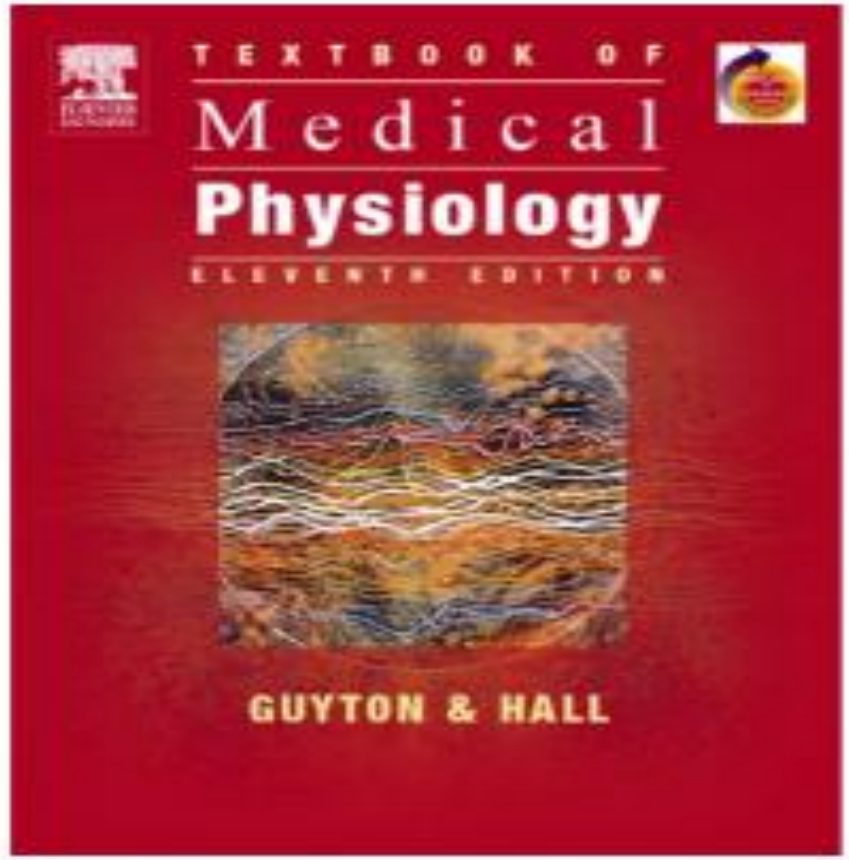
Objectives

- Describe homeostatic mechanisms of the major functional systems.
- Describe control systems of the body
- Examples of control mechanisms
- Characteristics of control mechanism

Suggested books&resources

- **Medical Physiology (A.C. Guyton)**



Physiology

- Study of function of the human body and its mechanisms
- Regulation positive feed back and negative feed back
- Communication by neurons or hormones
- Basic building block of human body 100 trillion
- body a coordinated solution 60%

Intracellular 2/3 inside the cell ICF

Extracellular 1/3 plasma and interstitial ECF

- ECF

Ions Na+, Cl-, HCO_3^-

O_2

Nutrients (amino acids, Fatty acids, glucose)

waste products

Co_2 lung volatile

Sulfuric acid, phosphoric acid, lactic acid kidneys non-volatile

- ICF

Water and ions

Na + Cl- Ca+ HCO_3^- Glucose outside

K + Mg^{+2} PO_4^- proteins inside

Homeostasis

Homeo: similar (normal)

Stasis: Stable

Maintenance of nearly constant circumstances in your body's internal environment (ECF)

- Hemostasis

Hemo: Blood

Stasis: Stable

The blood is not lost that is clotting (bleeding and Coagulation)

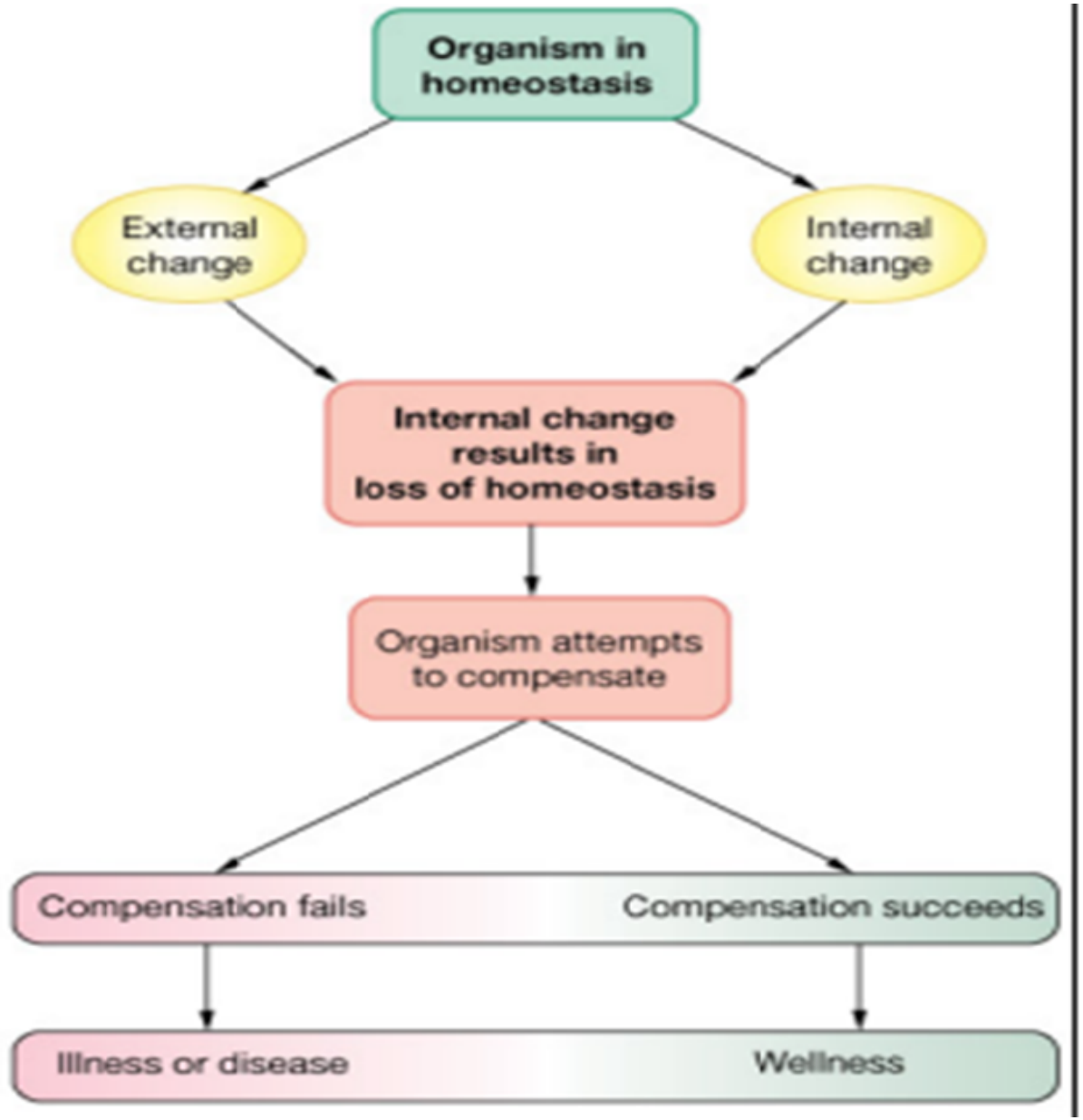
- Blood pH very tightly regulated

Less than 7 dead 7.4 ABG 7.7

Low High

- Tetany Ca heart suffer systole Stop
- Arrythmia K Heart suffers diastole stop
- Coma Glucose coma

- Succesful compensation
  - Homestasis re-established
- Unable to compensate
  - Pathophysiology
    - Sickness
    - Death



What things in your body need to be kept within a range?

- Body Temperature
- Blood pressure
- Blood pH
- O_2 and CO_2 concentration
- Osmoregulation-Water balance
- Blood glucose

How is your body works?

Good Stuff: Gastrointestinal tract digestion and absorption

Respiratory tract Oxygen

Cardiovascular system cellular respiration

Bad Stuff: Liver Laboratory of your body metabolism of food and medication

Storage of food Vit B12 elimination of waste product urea cycle

Kidney non volatile waste

Filtration of plasma reabsorption and excreting urine

Acid Base Balance

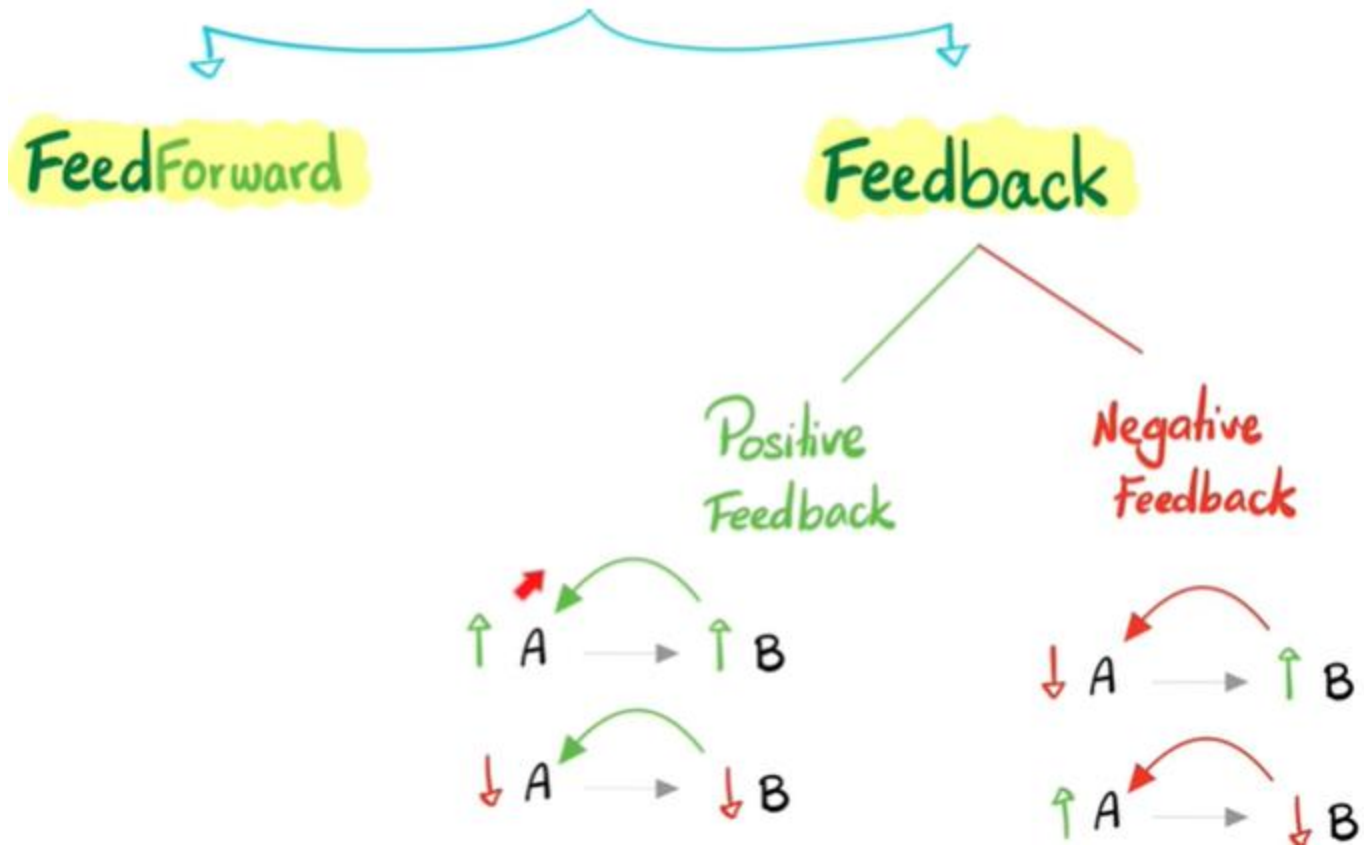
Endocrine function Renin

Lungs volatile waste

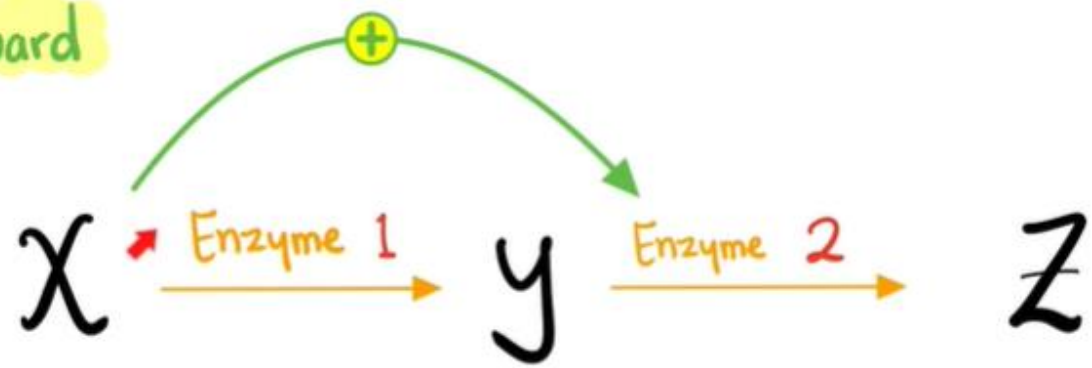
Communications:

Fast - Neurons

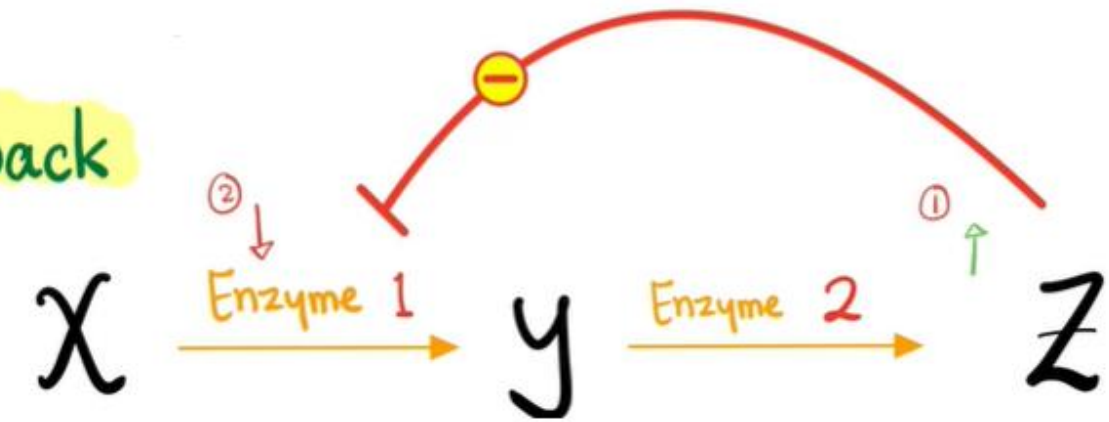
Slow- Hormones


FeedForward
Feedback
Positive Feedback
Negative Feedback
A
B
A
B
A
B
A
B

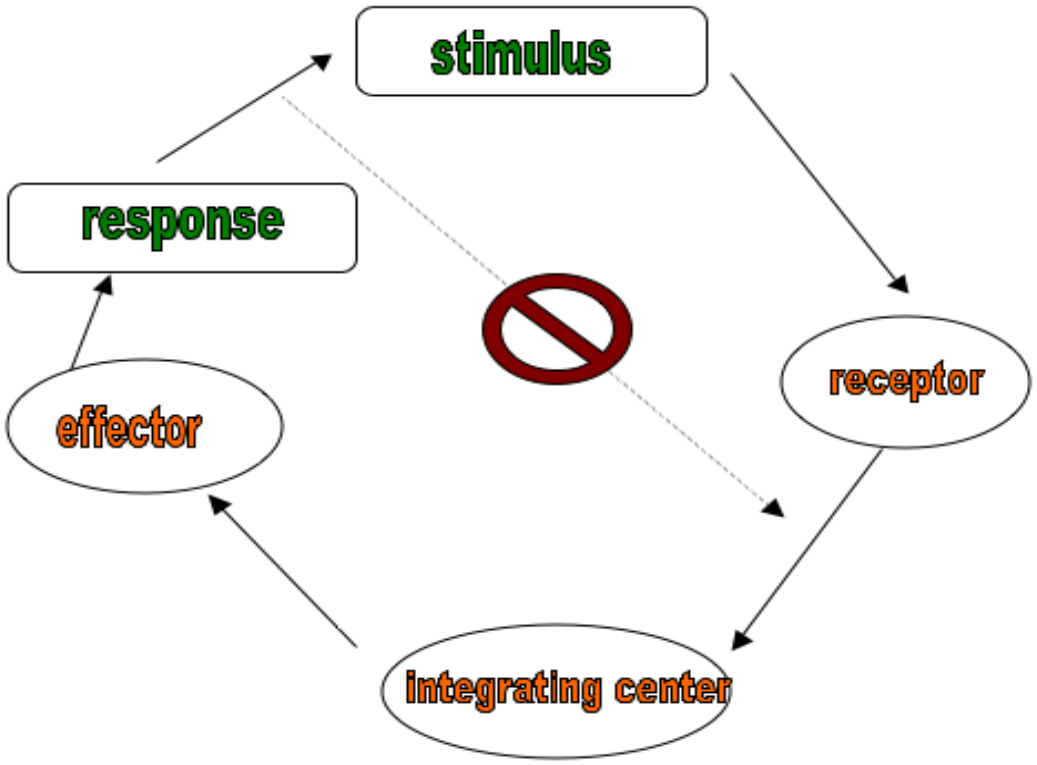
FeedForward



Feedback

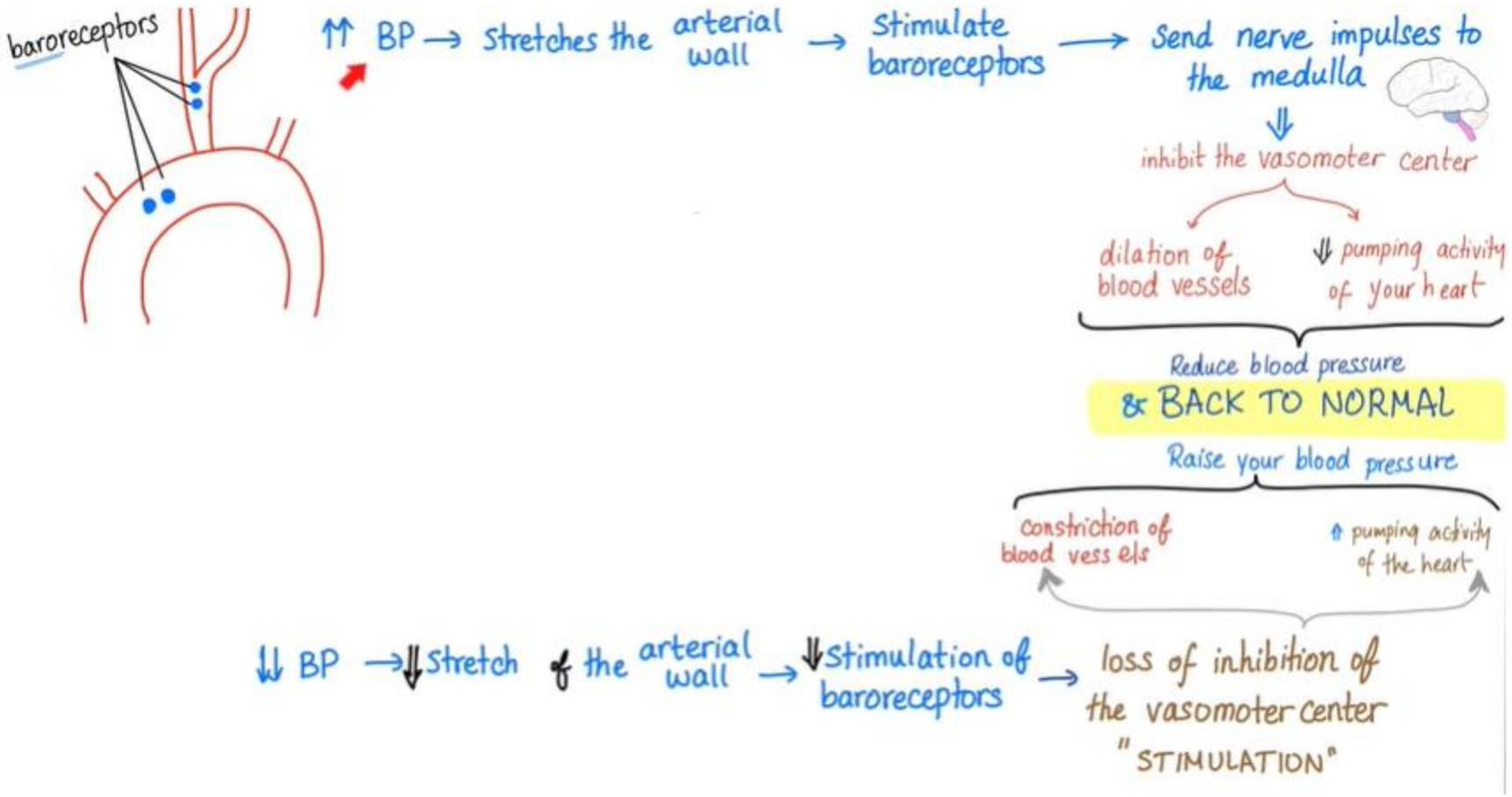


Cellular relay race

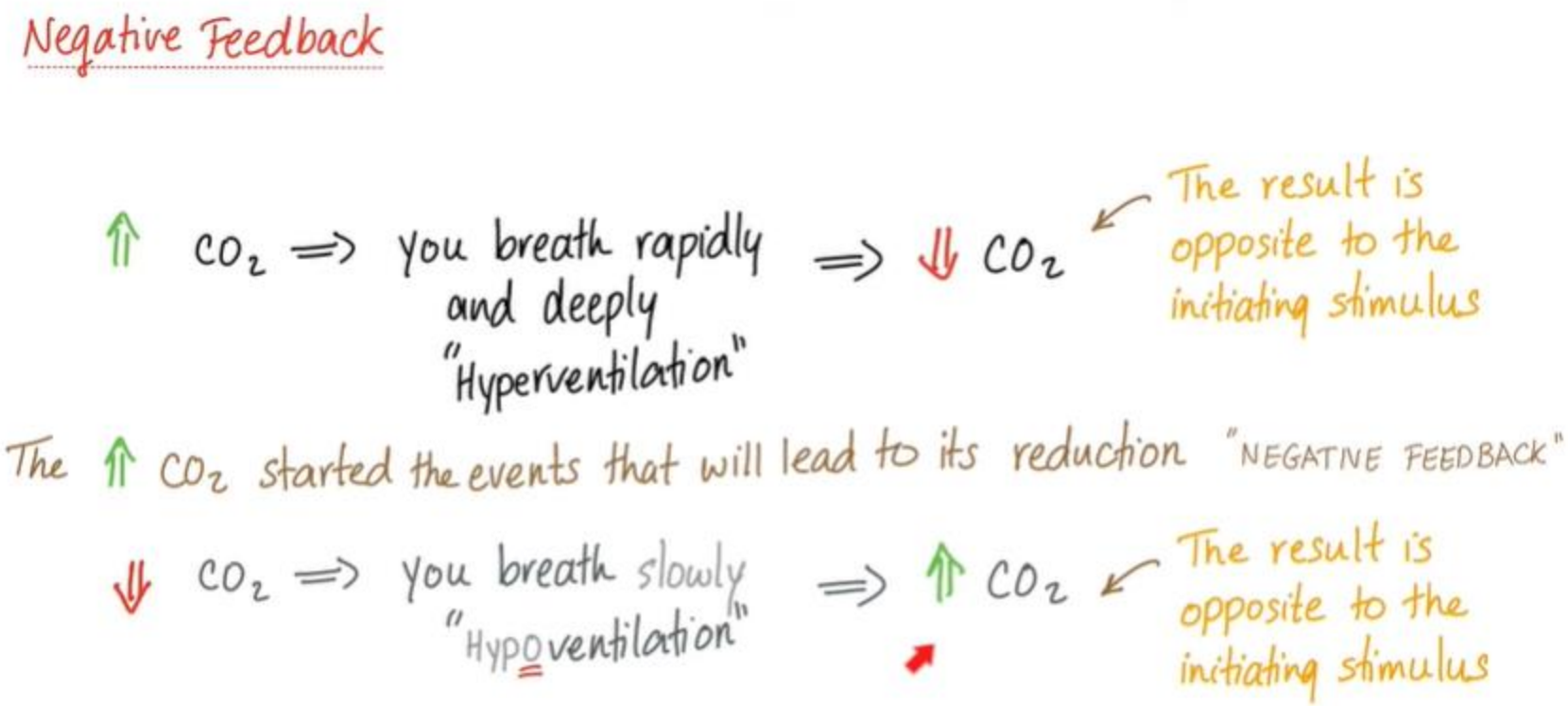


- Stimulus
- Receptor
- Integrating center
- Effector
- Response
  - Reverses the stimulus

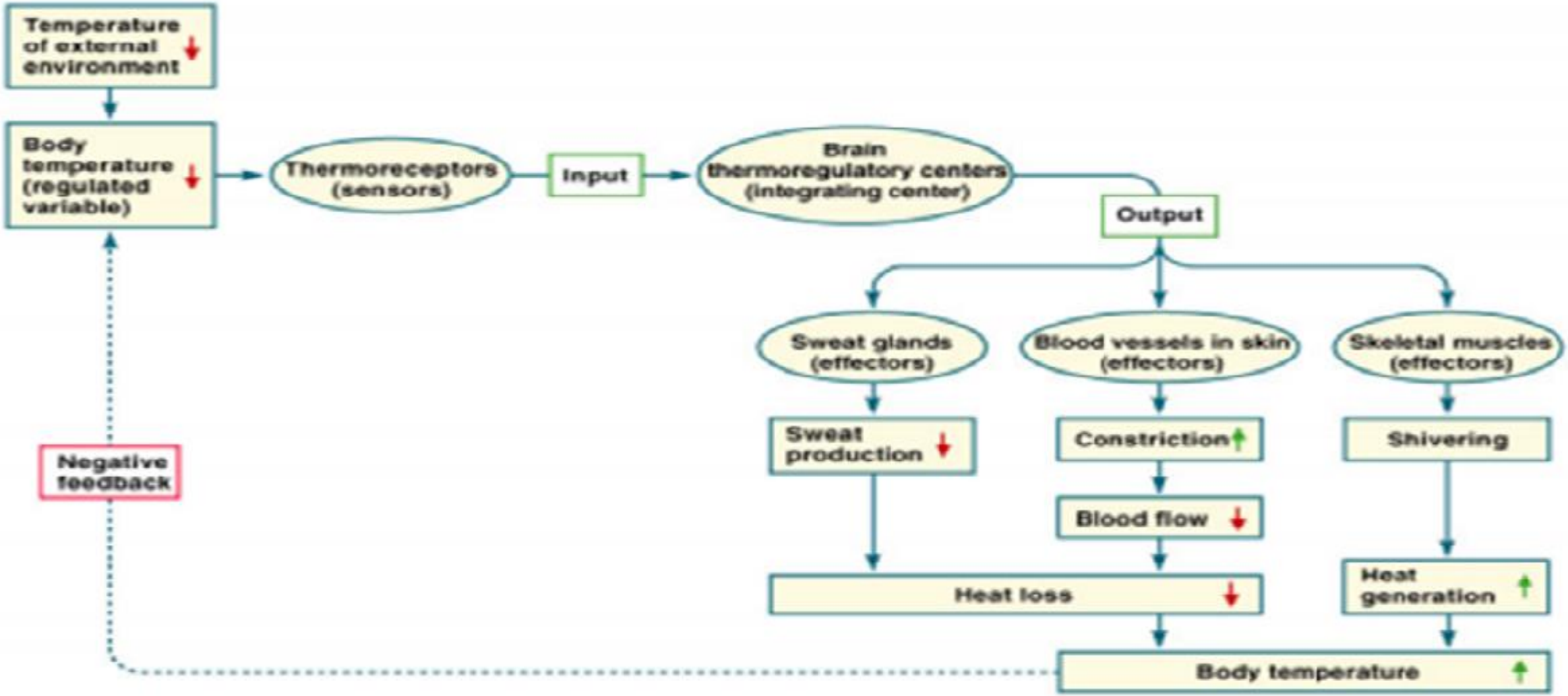
Negative feedback



Negative feedback



Examples of Negative feedback pathways



Negative Feedback

⇑ CO_2 ⟹ you breath rapidly and deeply "Hyperventilation" ⟹ ⇓ CO_2 ← The result is opposite to the initiating stimulus

The ⇑ CO_2 started the events that will lead to its reduction "NEGATIVE FEEDBACK"

⇓ CO_2 ⟹ you breath slowly "Hypoventilation" ⟹ ⇑ CO_2 ← The result is opposite to the initiating stimulus

Positive feedback pathways

- **Response enhances the stimulus**
- Examples:
  - Blood coagulation
  - Birth
  - Generation of action potentials

Feed-forward controls (preparing the body for an anticipated change):

- Control of movement and balance
- Monitoring the external environment
- Learning