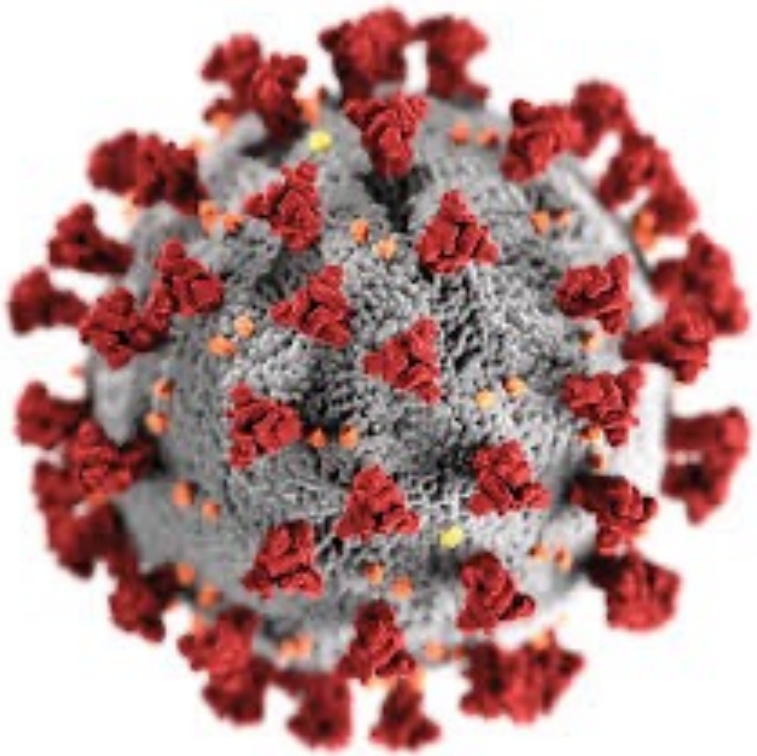
QUIZ SESSION 1



Quiz #1 – Intermolecular forces

The schematic shows the binding of Penicillin G to a bacterial protein. For simplicity only the side chains of the amino acids involved in drug binding are shown (the structure of Penicillin G alone is also shown on the right)

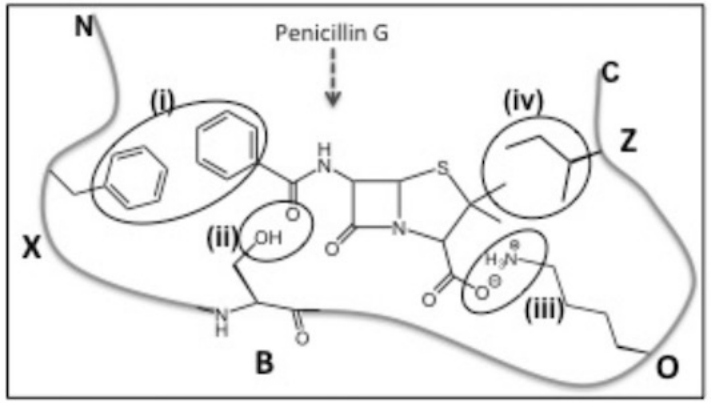
Identify the type of noncovalent interactions of Penicillin G with the protein at:

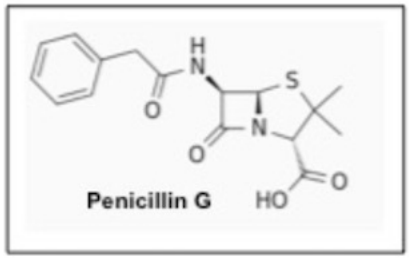
Q1. Region (i)
A1.

Q2. Region (ii)
A2.

Q3. Region (iii)
A3.

Q4. Region (iv)
A4.





Drug design
Drug resistance

Quiz #2 – Nucleotides

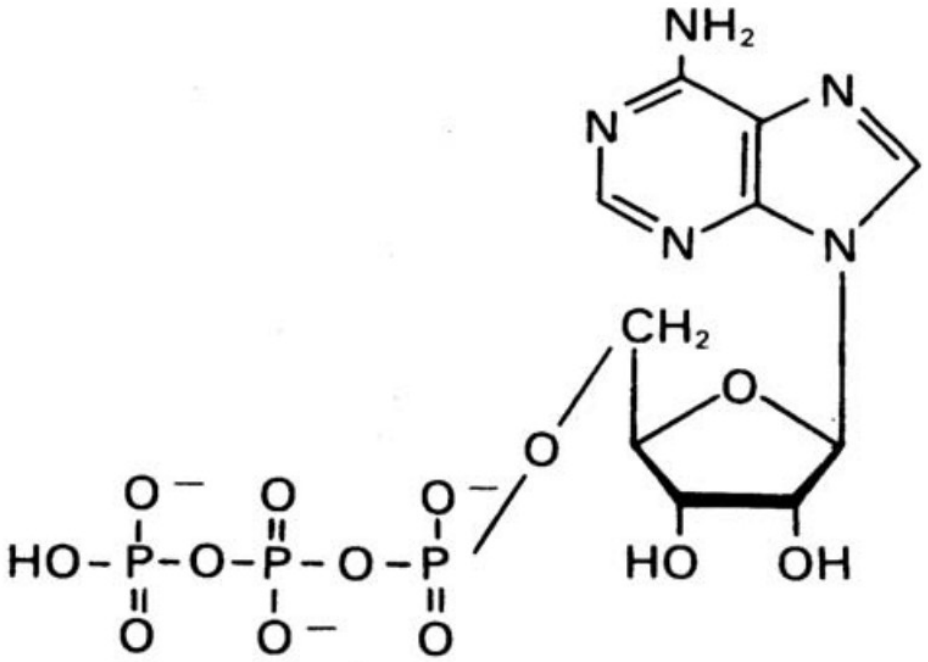
Q1. Which nucleotide is this?
A1.

Q2. Box the part that is added to a growing chain of nucleic acid
A2.

Q3. Mark with a star the atom(s) that can form a hydrogen bond with the complementary nitrogenous base
A3.

Q4. Which is its complementary base?
A4.

Q5. Draw an arrow to the part of this molecule that you would modify to prevent further elongation. Indicate what change you would make next to the arrow drawn
A5.



Quiz #3 – Protein structures

You have discovered a new enzyme, enzyme E, which breaks down proteins by cleaving peptide bonds after tyrosine or phenylalanine.

Q1. Enzyme E is the product of gene G that encodes a protein with the molecular weight of 50 kilodaltons (50 kD). When you purify enzyme E, you obtain a single type of polypeptide of 50 kD. However, active enzyme E has a molecular weight of 250 kilodaltons (250 kD), not 50 kD. Why might active purified enzyme E be larger than the product encoded by gene G?
A1.

Q2. Briefly define the primary, secondary, tertiary, and quaternary structure of proteins
A2.

Q3. Is the primary structure of the 50 kD protein the same or different than the primary structure of the 250 kD protein? Explain briefly
A3.

Q4. Is the tertiary structure of the 50 kD protein the same or different than the tertiary structure of the 250 kD protein? Explain briefly
A4.

Q5. Is the quaternary structure of the 50 kD protein the same or different than the quaternary structure of the 250 kD protein? Explain briefly
A5.

Quiz #4 – Free energy and enzymes

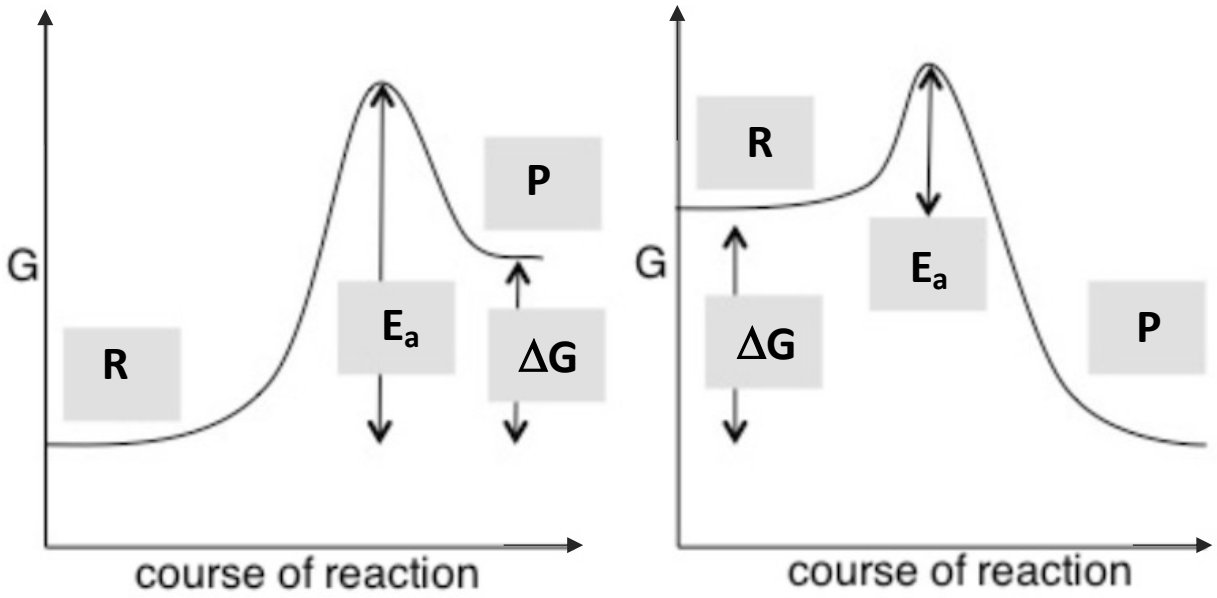
Q1. Reactions which require energy are called?
A1.

Q2. Endergonic reactions are usually needed by the cell for?
A2.

Q3. Reactions which release energy are called?
A3.

Q4. Exergonic reactions are usually needed by the cell for?
A4.

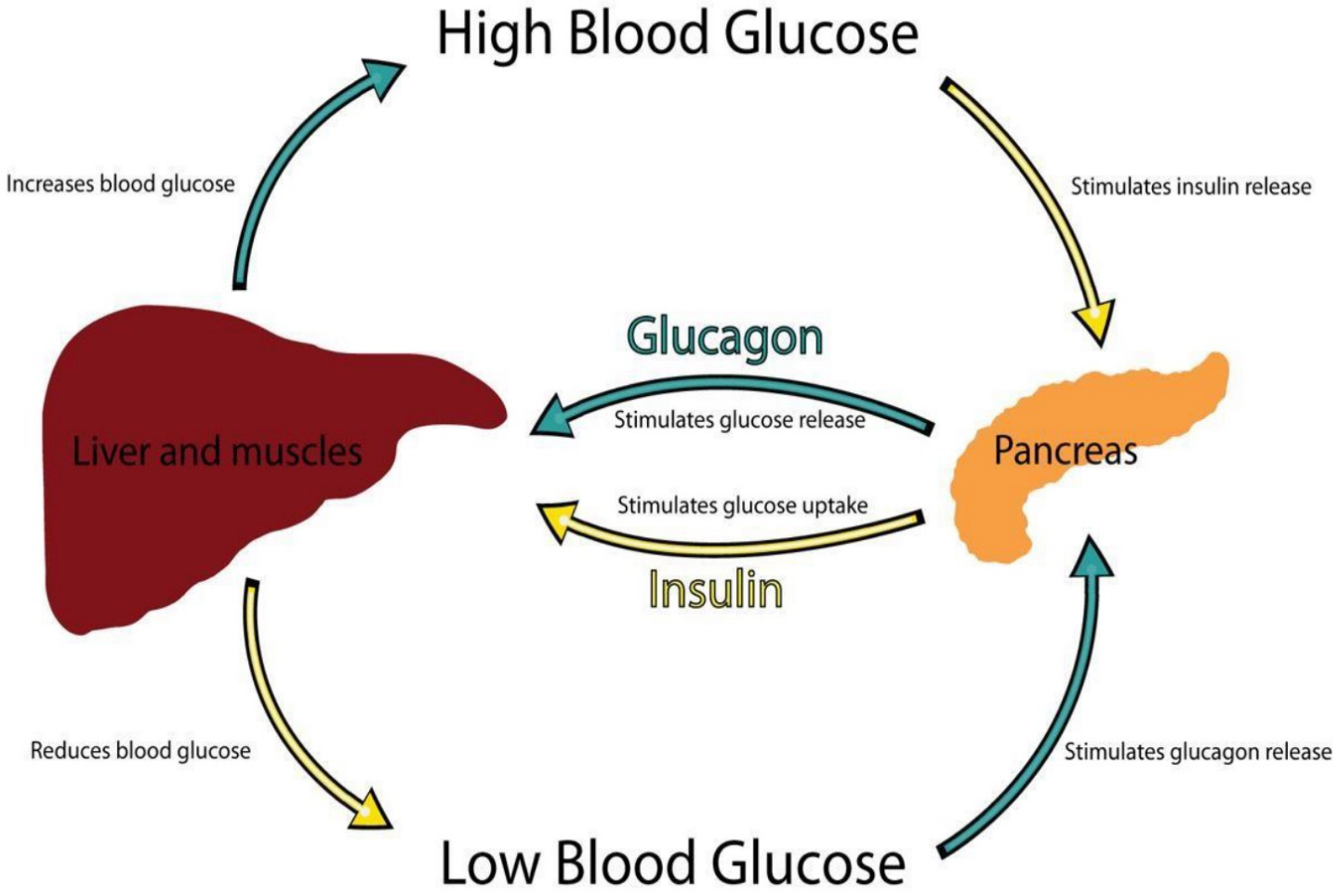
Q5. Which of the graphs refers to anabolic reactions and which to catabolic reactions? Explain then fill in the boxes with the corresponding thermodynamic terms
A5.



Quiz #5 – Feedbacks

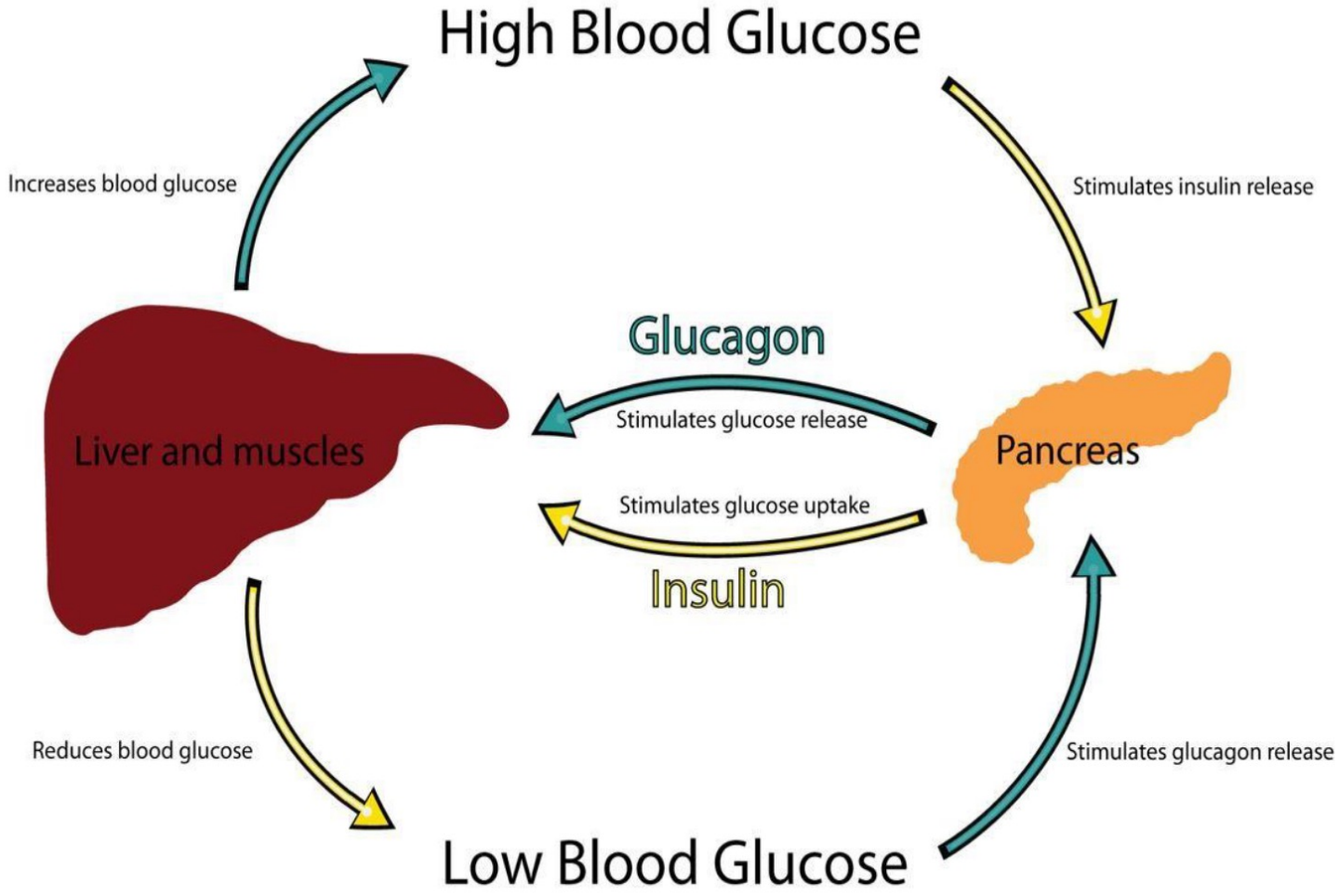
The image shows the cycle that regulate glucose levels in blood *via* the liver-pancreas liaison

Q1. According to the feedback loop, what does high blood sugar promotes? Explain



Quiz #5 – Feedbacks

A1.

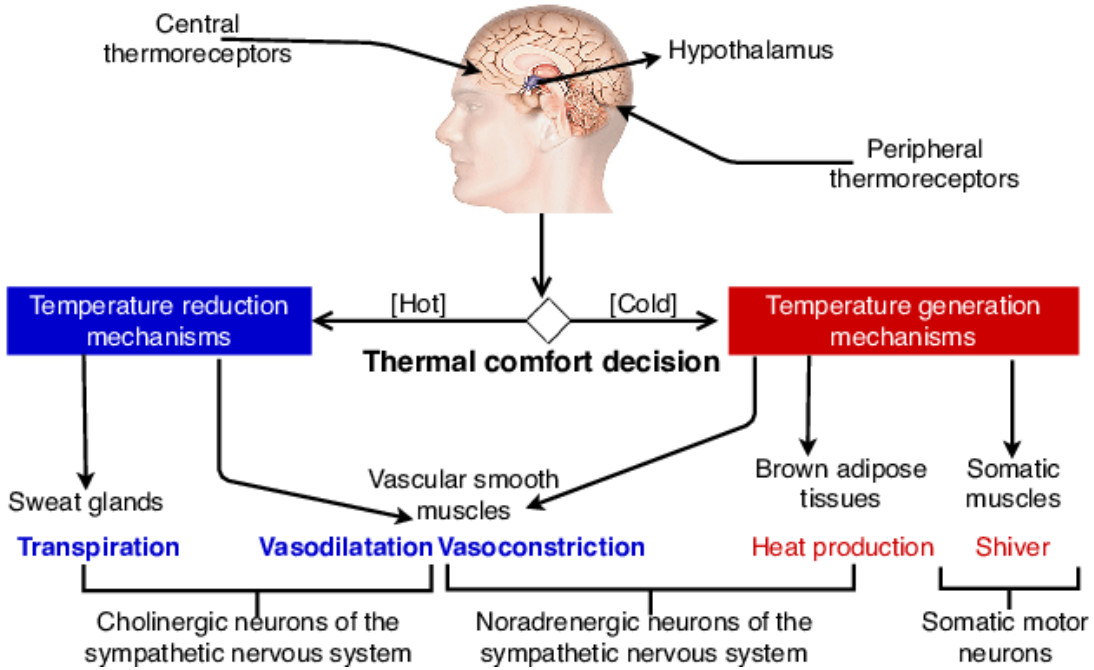


Body temperature control

Homeostasis is maintained prevalently by negative feedback loops

A prototypical example is **body temperature regulation**

The human body's temperature regulatory center is the **hypothalamus** in the **brain**

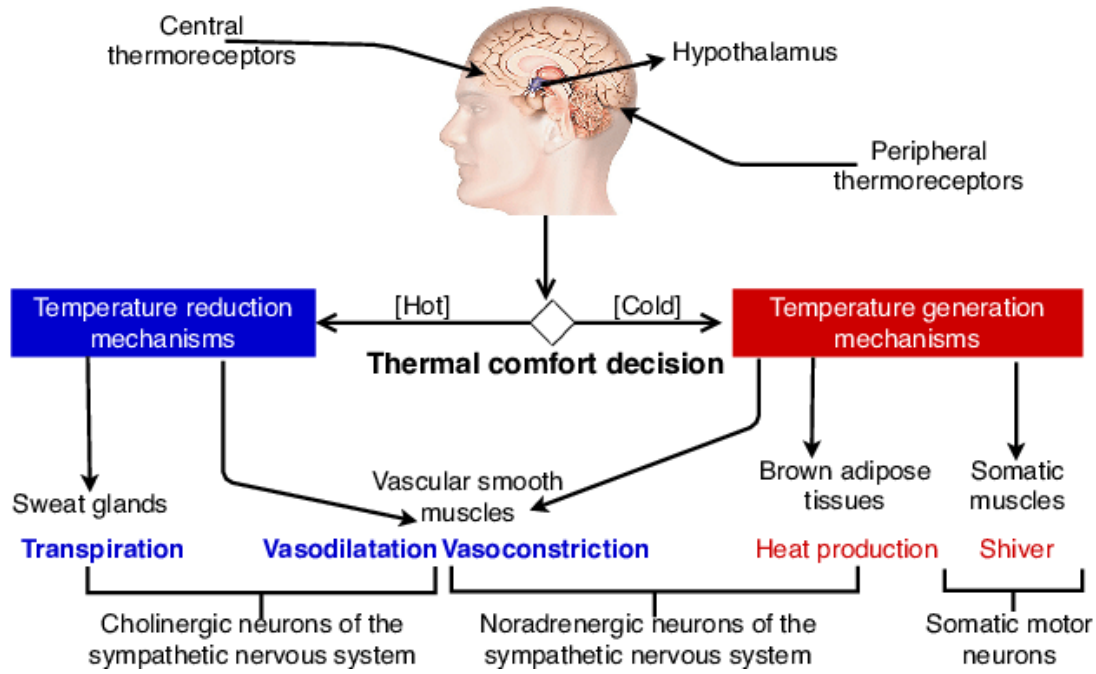


Cooling Down

When the hypothalamus receives data from sensors in the skin and brain that **body temperature is higher than the set point**, it sets into motion the following responses:

- Blood vessels in the skin dilate (vasodilation) to allow more blood from the warm body core to flow close to the surface of the body so heat can be radiated into the environment
- As blood flow to the skin increases, sweat glands in the skin are activated to increase their output of sweat (diaphoresis):
  - When sweat evaporates from the skin surface into the surrounding air, it takes the heat with it
- Breathing becomes deeper, and the person may breathe through the mouth instead of the nasal passages
  - This increases heat loss from the lungs (remember dogs?)

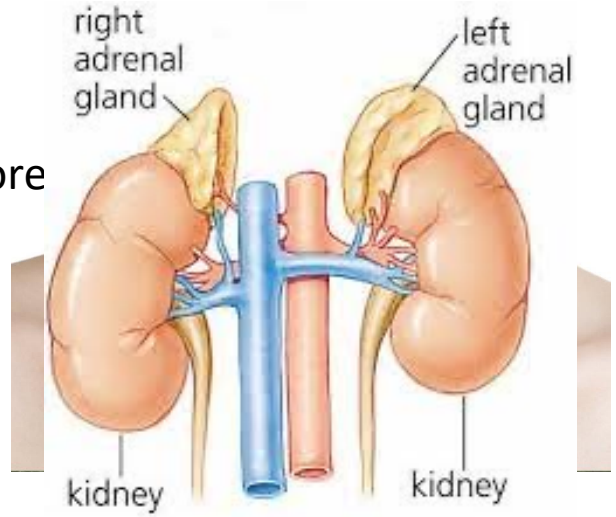
Body temperature control



Heating Up

When hypothalamus get the opposite message
it sets into motion the following responses:

- Blood vessels in the skin contract (vasoconstriction)
  to prevent blood from flowing close to the surface of the body, thereby reducing heat loss from body surface
- Random signals to skeletal muscles are triggered, causing them to contract
  - this causes shivering, which generates a small amount of heat
- The thyroid gland may be stimulated by the brain (via the pituitary gland) to secrete more thyroid hormone
  - this hormone increases metabolic activity and heat production in cells throughout the body
- The adrenal glands may also be stimulated to secrete the hormone adrenaline
  - this hormone causes the hydrolysis of glycogen (the carbohydrate used for energy storage in animals) to glucose, which can be used as an energy source (catabolic process, exergonic or heat producing!)



Quiz #6 – Feedbacks

- Q. Can you mention a couple of prototypical macroscopic POSITIVE FEEDBACK LOOPS?