Name _____ **Period** _____

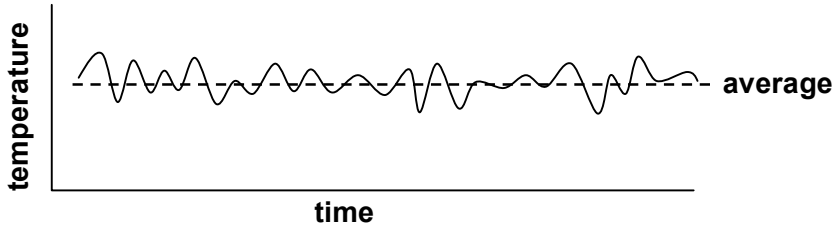
Regents Biology **Date** _____

REVIEW 1: CHEMISTRY OF LIVING CREATURES

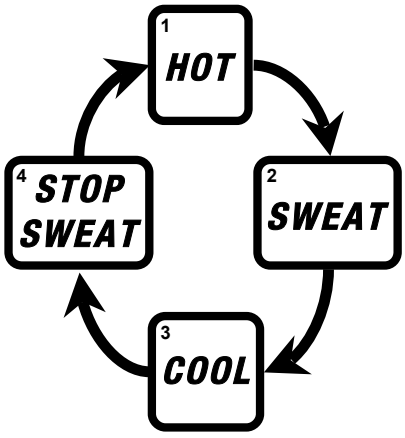
HOMEOSTASIS

All organisms live as a balancing act. They must maintain their internal conditions within an acceptable range. If any condition rises above this acceptable range, it has to be brought back down again. If any condition falls below this acceptable range, it has to be brought back up again. Maintaining the internal environment in this dynamic balance is called **homeostasis**. And there are lots of examples of this. If you get too hot, you need to cool. If you get too cold, you need to heat up. If your blood has too much salt, it needs to be diluted. If your blood has too little salt, you need get rid of the extra water. If your blood has too much sugar, it has to be removed and stored. If your blood has too little sugar, it has to be released from storage back into the blood. But while organisms are balanced, they are not unchanging. Organisms are actually making changes all the time to maintain homeostasis. The term used to describe this balanced state is **dynamic equilibrium**.

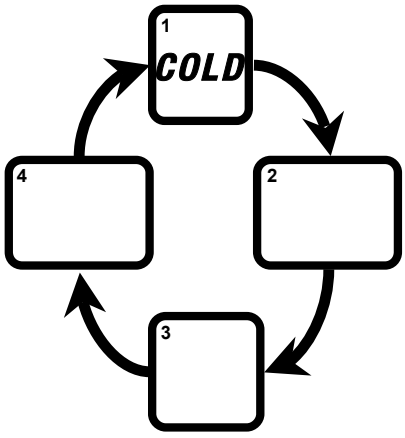
Dynamic equilibrium of body temperature



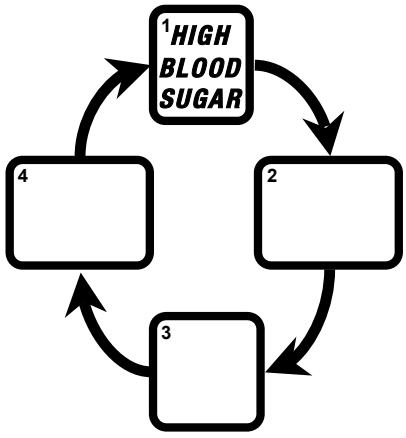
Homeostasis is often maintained by using **feedback mechanisms**. Feedback mechanisms are cycles in which the product of one reaction causes another to start or stop. Therefore a balanced state is created by many small, opposing changes.



EXAMPLE:
I'm Too Hot!
Feedback mechanism maintaining body temperature.



COMPLETE THIS EXAMPLE:
I'm Too Cold!
Feedback mechanism maintaining body temperature.



COMPLETE THIS EXAMPLE:
Blood Sugar Too High!
Feedback mechanism maintaining blood glucose levels

Failure to maintain homeostasis means that a body cannot function properly. This will lead to disease or death. For example, if blood sugar levels are not maintained properly then this can cause diabetes. Left untreated diabetes can lead to death.

QUESTIONS

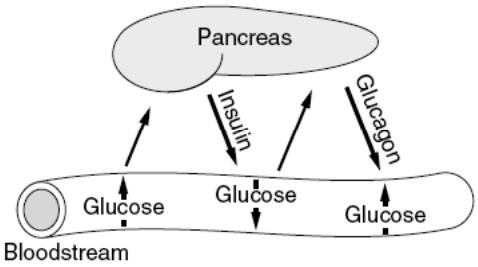
1. Explain homeostasis. _____

   _____

2. Failure to maintain homeostasis results in _____ or _____

3. Homeostasis is often maintained using _____ mechanisms.

4. Use the diagram below to explain how feedback mechanisms maintain homeostasis.



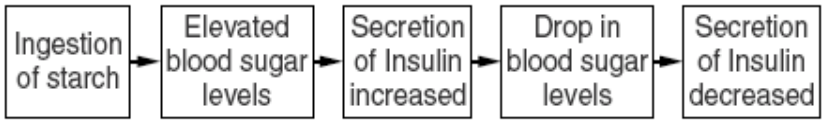
   _____

   _____

   _____

   _____

5. What process is represented by the boxed sequence below?



   a. a feedback mechanism in multicellular organisms
   b. the differentiation of organic molecules
   c. an immune response by cells of the pancreas
   d. the disruption of cellular communication

6. Why might a blood clot be important to maintaining homeostasis?
   a. It slows the flow of blood through the body.
   b. It prevents the loss of blood from the body.
   c. It increases the amount of water in the blood.
   d. 4 It adds more cells to the blood tissue.

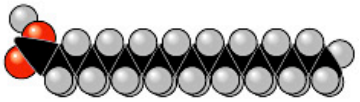
THE CHEMICALS THAT BUILD BODIES

Bodies are built out of both organic compounds and inorganic compounds. Organic compounds are larger, more complex molecules that always contain carbon and hydrogen. The four major organic molecules that make up living organisms are: carbohydrates, proteins, lipids, and nucleic acids. These larger molecules are synthesized from smaller building blocks. The inorganic chemicals that are important to living organisms are smaller and simpler compounds, such as water, carbon dioxide, oxygen, and nitrogen.

7. Organic Molecules
   a. **Carbohydrates**:

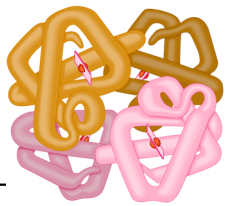
   - Examples: _____
   - Building blocks: _____
   - Functions:
     - _____(sugars in all organisms)
     - _____(starch in plants)

   b. **Lipids**:



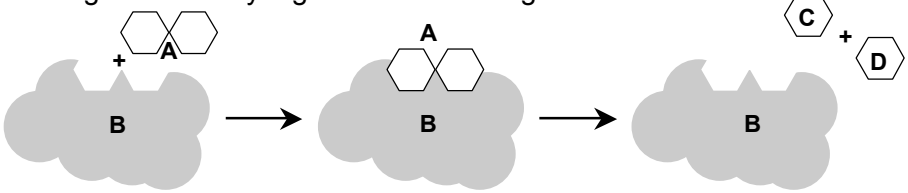
   - Examples: _____
   - Functions:
     - _____(fats in animals)
     - _____(phospholipids in all organisms)
     - _____(steroids in animals)

   c. **Proteins**: Complex compounds that carry out all the body's activities



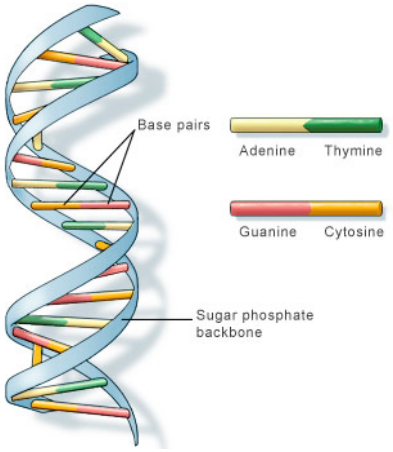
   - Building blocks: _____
   - Functions:
     - Have many different functions as determined by their _____
     - **<u>Enzymes</u>:** act as <u>catalysts</u> controlling all chemical reactions in the body
     - <u>Hormones and neurotransmitters</u>: carry messages around the body
     - <u>Cell receptors</u>: in cell membrane; receive hormones and neurotransmitters
     - <u>Antibodies</u>: attack foreign invaders (pathogens)
   - **<u>Lock and Key Model</u>**: Proteins must have the right shape to "fit" with other molecules.
     - Changing shape of a protein will change its function
     - Changes in pH or high temperatures will cause enzymes to denature (lose their shape) and stop functioning. This is why high fevers are dangerous.

A starch (A) is broken down by an enzyme (B) into two simple sugars (C, D). This is also a good example of the **lock & key model**.



d. **Nucleic Acids**

- Function: make up genes and chromosomes; carry genetic information
- Examples: _____
- Building blocks: nucleotides
  - DNA: A, T, C, G nitrogen bases
  - RNA: A, U, C, G nitrogen bases



8. Inorganic Compounds

a. **Water** (___H_2O___)

- most common substance in all living organisms (about 60% of body mass)
- needed for chemical reactions (won't happen in "dry" conditions)
- dissolves other molecules into solution, allows them to be transported through body.

b. **Oxygen** (_____)

- needed by most organisms in the process of _____
- released as a waste product by plants during the process of _____
- **aerobic respiration**: process that uses oxygen to extract energy from glucose (sugar). Used by most organisms.
- anaerobic respiration (fermentation): process that extracts energy from glucose *without* using oxygen. Converts less energy, so only used by some simple organisms (some bacteria, yeast). These organisms do not need to breathe in oxygen.

c. **Carbon Dioxide** (_____)

- needed by plants to make glucose in the process of _____
- released as a waste product by organisms during the process of _____

d. **Nitrogen** (_____)

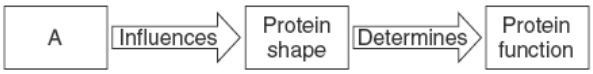
- needed to make protein and DNA / RNA
- converted into nitrates by soil bacteria. Nitrates are absorbed by plants and then eaten by animals
- excreted as waste in ammonia, urea (mammals) or uric acid (birds & reptiles)

e. **Acids and Bases**:

- used for different functions in body (such as digestion).
- measured by the pH scale: 1-6=_____; 7=_____; 8-14=_____;
- very high and very low pHs are usually lethal
- pH is different in different parts of body, like acid (pH 3) in stomach and basic (pH 8) in small intestines

QUESTIONS

1. Which phrase does the letter A most likely represent?

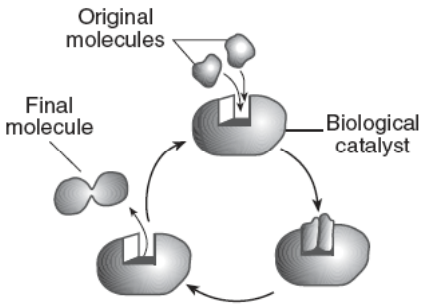


   a. sequence of amino acids
   b. sequence of starch molecules
   c. sequence of simple sugars
   d. sequence of ATP molecules

2. The subunits of DNA are called
   a. amino acids
   b. nucleotides
   c. polysaccharides
   d. cell units

3. Which group contains only molecules that are each assembled from smaller organic compounds?
   a. proteins, water, DNA, fats
   b. proteins, starch, carbon dioxide, water
   c. proteins, DNA, fats, starch
   d. proteins, carbon dioxide, DNA, starch

4. The diagram below represents a series of reactions that can occur in an organism.

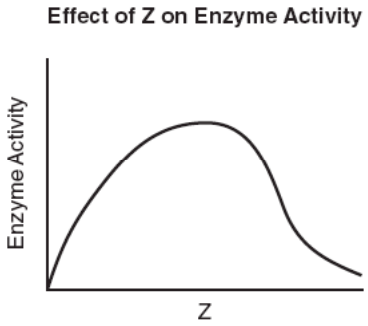


   This diagram best illustrates the relationship between
   a. enzymes and synthesis
   b. amino acids and glucose
   c. antigens and immunity
   d. ribosomes and sugars

5. Most of the starch stored in the cells of a potato is composed of molecules that originally entered these cells as
   a. enzymes
   b. simple sugars
   c. amino acids
   d. minerals

6. Which statement concerning proteins is *not* correct?
   a. Proteins are long, usually folded, chains.
   b. The shape of a protein molecule determines its function.
   c. Proteins can be broken down and used for energy.
   d. Proteins are bonded together, resulting in simple sugars.

7. An incomplete graph is shown below.



What label could appropriately be used to replace letter *Z* on the axis?

_____

8. All chemical breakdown processes in cells directly involve
   a. reactions that are controlled by catalysts
   b. enzymes that are stored in mitochondria
   c. the production of catalysts in vacuoles
   d. enzymes that have the same genetic base sequence

Questions 9–10.

Some internal environmental factors may interfere with the ability of an enzyme to function efficiently.

9. Identify *two* internal environmental factors that directly influence the rate of enzyme action.

_____ _____

10. Explain why changing the shape of an enzyme could affect the ability of the enzyme to function.

_____

_____