

Biomolecules - Unit 2



I CAN -

- ☐ 1. Explain how a monomer is related to a polymer.
- ☐ 2. Discuss the function of a carbohydrate, lipid, protein, and nucleic acid
- ☐ 3. List examples of carbohydrates, lipids, proteins, and nucleic acid
- ☐ 4. Compare the functions of the 4 biomolecule groups to each other
- ☐ 5. Describe the structure of DNA and identify parts of DNA
- ☐ 6. Recognize that DNA components are common to all living things.
- ☐ 7. Describe the characteristics of an enzyme
- ☐ 8. Explain the function of an enzyme
- ☐ 9. Label and explain a graph showing a reaction using an enzyme
- ☐ 10. Predict the effect of different factors (temperature, pH, concentration, inhibitors) on the activity of an enzyme

Test Date:

Tuesday, Sept.
24

Words to Know

Monomer, polymer, biomolecule/macromolecule, carbohydrate, lipid, protein, amino acid, nucleic acid, nucleotide, nitrogenous base, Hydrogen bond, enzyme, activation energy, substrate, active site, catalyst, denature, DNA

Know the difference between polysaccharides and polypeptides

STUDENT OUTCOMES:

I can describe the relationship between a monomer and a polymer. (B.9.D)

I can compare the structure of the 4 main biomolecules and justify my classification. (B.9.A)

I can discuss the function of each of the main classes of biomolecules. (B.9.A)

I can describe the role of enzymes and their purpose. (B.9.C)

I can examine the conditions that effect enzyme activity (B.9.C)

I can use data to predict the effect of different factors on the activity of an enzyme. (B.9.C)

I can identify parts of DNA, determine how traits are carried and recognize that DNA is in all living things.

Fold on dotted line and glue this portion in notebook

Calendar

Biomolecules Unit

| Monday 9/2 | Tuesday 9/3 | Wednesday 9/4 | Thursday 9/5 | Friday 9/6 |
|--|---|--|---|--|
| <u>Holiday!</u> | <u>Topic:</u> Scientific Design <u>Activities:</u> Review for test | <u>Topic:</u> Scientific Design <u>Activities:</u> Test over Scientific Design and Safety | <u>Topic:</u> Biomolecules <u>Activities:</u> TRTW <u>By the end of the period I can:</u> 1, 2, 3, 4 | <u>Topic:</u> Biomolecules <u>Activities:</u> Monomers & Biomolecules <u>I can:</u> 1, 2, 3, 4 |
| Monday 9/9 | Tuesday 9/10 | Wednesday 9/11 | Thursday 9/12 | Friday 9/13 |
| <u>Topic:</u> Biomolecules <u>Activities:</u> Card Match, Practice <u>By the end of the period I can:</u> 1,2,3,4 | <u>Topic:</u> Biomolecules <u>Activities:</u> Chart and Graphs <u>By the end of the period I can:</u> 1, 2, 3, 4 | <u>Topic:</u> Enzymes <u>Activities:</u> Game Day <u>By the end of the period I can:</u> 7, 8, 9 | <u>Topic:</u> Enzymes <u>Activities:</u> Enzyme Notes <u>By the end of the period I can:</u> 7, 8, 9, 10 | <u>Topic:</u> Enzymes <u>Activities:</u> Lab <u>By the end of the period I can:</u> 7, 8, 9, 10 |
| Monday 9/16 | Tuesday 9/17 | Wednesday 9/18 | Thursday 9/19 | Friday 9/20 |
| <u>Topic:</u> Enzymes <u>Activities:</u> Enzyme Simulation & Graphs <u>By the end of the period I can:</u> 7, 8, 9, 10 Parent Night! | <u>Topic:</u> Enzymes <u>Activities:</u> Quiz <u>By the end of the period I can:</u> 7, 8, 9, 10 | Late Arrival ☺ ☺ ☺ ☺ <u>Topic:</u> DNA Notes <u>Activities:</u> <u>By the end of the period I can:</u> 5, 6 | <u>Topic:</u> DNA <u>Activities:</u> DNA model <u>By the end of the period I can:</u> 5, 6 | <u>Topic:</u> DNA <u>Activities:</u> Candy DNA <u>By the end of the period I can:</u> 5, 6 |
| Monday 9/23 | Tuesday 9/24 | Wednesday 9/25 | Thursday 9/26 | Friday 9/27 |
| <u>Topic:</u> All Biomolecules <u>Activities:</u> Review for test <u>By the end of the period I can:</u> 1 - 10 | Exam over Biomolecules! | <u>Topic:</u> Cells <u>Activities:</u> Pro vs Eu <u>By the end of the period I can:</u> | <u>Topic:</u> Cells <u>Activities:</u> Pro vs Eu <u>By the end of the period I can:</u> | <u>Topic:</u> Cells <u>Activities:</u> Pro vs Eu <u>By the end of the period I can:</u> |

**** This is a tentative calendar and subject to change.

Biomolecule Unit

Expectation Sheet

"I can" statements on back!

Name: _____

Test Date: _____

Period: ____

VOCAB

Biomolecule

Macromolecule

Polymer

Monomer

Denature

Active site

Activation energy

Substrate

Carbohydrate

Lipids

Proteins

Nucleic acid

Nucleotides

Monosaccharide

Amino acids

Fatty acids

Glycerol

DNA

Insulation

Catalyst

Enzyme

Disaccharide

**Macromolecule = Biomolecule
= Organic Compound:**

(these three terms are used interchangeably but refer to the same thing: carbohydrates, lipids, proteins and nucleic acids)

MonoMers and Polymers

- Monomers are the smaller unit that makes up the polymer
- Polymers are large structures that are known as biomolecules.
- Multiple Monomers make up one Polymer.

ANALOGIES:

Monomer



Person

Polymer



Population

Monomer



House

Polymer



Neighborhood

The 4 biggies: Biomolecules

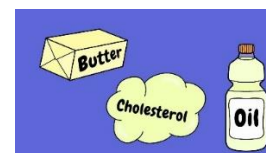
- Biomolecules are found in all living things and are needed in order to live.
- These 4 macromolecules are the key ingredients that make up cells (which are the basic building blocks of life). So, they make up YOU!
- Each molecule has a specific function and structure.
- They all contain C, H, O (Carbon, Hydrogen and Oxygen). Some have more elements.



CARBOHYDRATES

Polymer: Carbohydrate

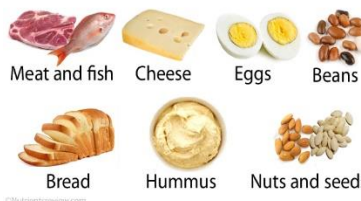
- **Function:** Short term energy storage, cell wall structure
- **Monomer:** Monosaccharide
- **Elements:** C, H, O
- **Example:** Bread, Pasta, glucose, fructose, -ose
- **Info:** Most are sugars (sugars are not all sweet). "GIVE YOUR SUGAR A SWEET RIDE IN YOUR CAR . . ." Also called a polysaccharide.



Polymer: Lipid

- **Function:** (LIP) Long term energy storage, insulation, protection
- **Monomer:** Fatty acids and a glycerol
- **Elements:** C, H, O
- **Example:** Fat, oils, waxes (like ear wax)
- **Info:** This makes up fat and blubber. Great for insulation. This molecule has long chains of carbons. FAT LIP!

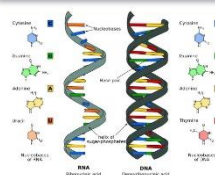
Foods High in Protein



Polymer: Protein

- **Function:** build cells, enzyme formation, transport
- **Monomer:** Amino Acids
- **Elements:** C, H, O, N (amino acid)
- **Example:** Meat, hair, fur, nails, enzymes (-ase)
- **Info:** Also called a polypeptide.

NUCLEIC ACID – DNA & RNA

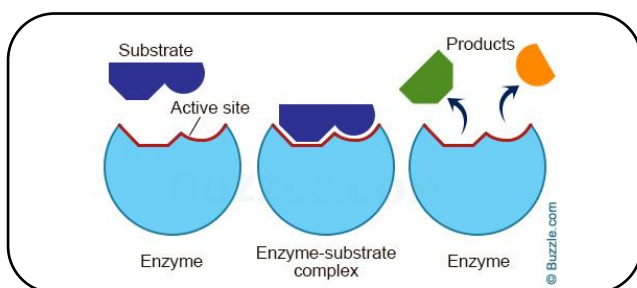


Polymer: Nucleic Acid

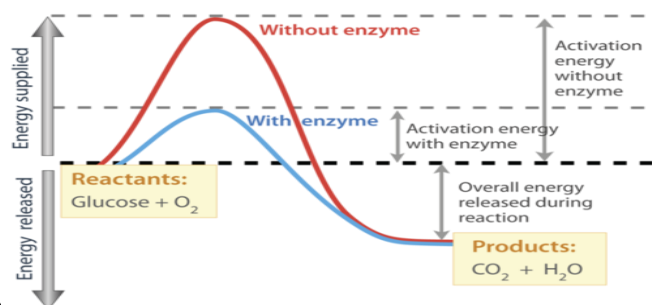
- **Function:** Make up DNA, code for proteins (traits)
- **Monomer:** Nucleotides
- **Elements:** C, H, O, N, P
- **Example:** DNA, RNA
- **Info:** DNA is in every living thing. The bases are just in different orders. Nucleotides are a phosphate, sugar and base.

Enzymes

- Enzymes belong to the **PROTEIN** biomolecule family.
- Enzymes** are **catalysts**. Catalysts **speed up chemical reactions by lowering the activation energy** (The amount of energy needed to perform a chemical reaction)
- Enzymes are specific to a **substrate** (what it attaches to).
- The specific **substrate** binds to an **active site** causing the reaction to occur, resulting in products.
- Enzymes can either break down or build molecules.
- They have the ending **-ASE** to their name.
- Enzymes can **denature** (break down and lose their function forever) by being exposed to extreme temperatures and being outside their optimum pH range.



Enzyme Action



DNA STRUCTURE

Basic Information:

- Other names for DNA
Genetic Materials
Biological Blue Print
- Formed in a **double helix** with both strands of the ladder bonded in **complimentary base pairs** and is **anti-parallel**
- DNA's biomolecules: **Nucleic Acids**
- DNA's Monomer: **Nucleotide**
- Genetic code, codes for proteins

Nucleotides:

- The basic unit to the DNA Strand.
- All living organisms contain DNA.
- DNA structures** in all living things have the **same parts**. The **difference in sequences** of the bases will determine the type of organism and their specific traits.
- Contains three parts
 - Phosphate**
 - Sugar**
 - Nitrogenous Bases**

Nitrogenous Bases (Carry the Genetic Code)

- These molecules make up the **ladder** of the DNA
- Bound by **weak hydrogen bonds**.

4 Different Types (Adenine, Guanine, Cytosine, Thymine) **A-T, C-G**



I CAN STATEMENTS

- I can describe the relationship between a monomer and a polymer. (B.9.D)
- I can compare the structure of the 4 main biomolecules and justify my classification. (B.9.A)
- I can discuss the function of each of the main classes of biomolecules. (B.9.A)
- I can describe the role of enzymes and their purpose. (B.9.C)
- I can examine the conditions that effect enzyme activity (B.9.C)
- I can use data to predict the effect of different factors on the activity of an enzyme. (B.9.C)
- I can identify parts of DNA, determine how traits are carried and recognize that DNA is in all living things.

Nitrogenous Bases (Carry the Genetic Code)

- These molecules make up the **ladder** of the DNA
- Bound by **weak hydrogen bonds**.

4 Different Types of bases (2 specific matches) **A-T, C-G**

1. Find the square around a base pair on the DNA strand to the right.
2. Find the circled nucleotide.
3. Hydrogen bonds hold these bases together.
4. The amount of Adenine must equal the amount of Thymine and the amount of Cytosine and Guanine must be equal since they bond together.
5. If there was 14% guanine and 14% cytosine, how much thymine would there be? $14+14=28\%$. So, $100\%-28\% = 72\%$. $72\%/2 = 36\%$ each T and A.
6. Complimentary base pairing for the following strands:

3' ATC CGG GCA TTC GCC 5'

5' TTA GTA CCC TAG GGT AAC 3'

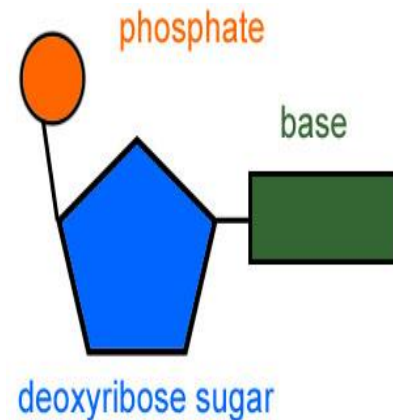
5' TAG GCC CGT AAG CGG 3'

3' AAT CAT GGG ATC CCA TTG 5'

7. Traits are determined by the genetic code, what part of the DNA actually carries the code? The nitrogenous bases (A, T, C, G) carry the code for all of your traits.!

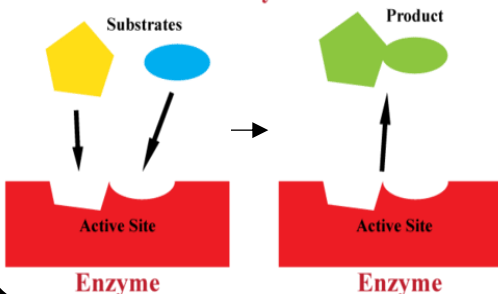
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Thymine (T) = Adenine (A)
Guanine (G) = Cytosine (C)



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How An Enzyme Works



ENZYMES

Protein is a biomolecule with **monomers** called **amino acids**.

Enzymes speed up chemical reactions.

Can only **work** within a **specific** pH range and Temperature range.

When working out of their **optimum conditions** they will **denature**.



B.A.T. (Be Able To) Review

Name: _____ Period: _____

Biochemistry: Unit 2

1. **Fill in the chart below:**

| Name of Biomolecule | Monomer What it's made of | Function | Example | Foods |
|---------------------|------------------------------|----------|---------|-------|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

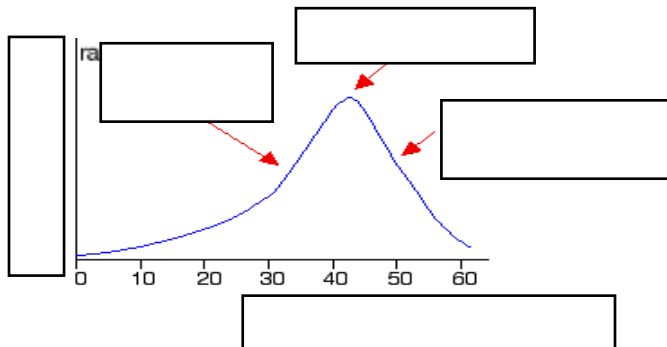
- What biomolecule is also called a polysaccharide? _____
- What biomolecule examples commonly end in -ose? _____
- What biomolecule is found in cell membranes? _____
- What biomolecule is made of Fatty Acids and glycerol? _____
- What biomolecule provides structure to plants as cellulose? _____
- What are the only two biomolecules that provide energy? _____
- Which biomolecule provides insulation? _____
- Which biomolecule is for building and transport of molecules? _____
- What biomolecule is also called a polypeptide? _____

B.A.T. (Be Able To) Review



Name: _____ Period: _____

1. Label the **Rate of Reaction vs. Temperature** graph using the choices on the right.



optimum temperature

rate falls
rapidly after
about 40°C

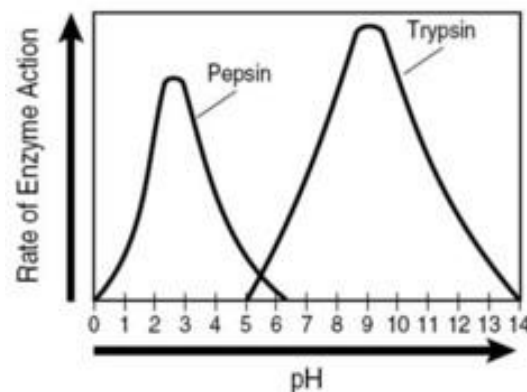
temperature (°C)

rate

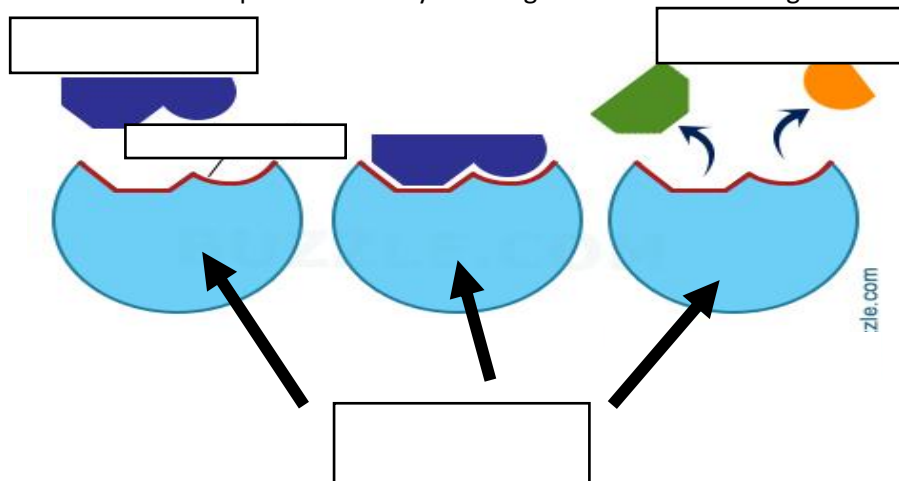
rate increases

2. Answer the questions about the graph on the right.

- What is the optimum pH level for Pepsin? _____
- What is the optimum pH level for Trypsin? _____
- What is the reaction range for pepsin? _____
- What is the reaction range for trypsin? _____
- Will pepsin denature at a pH range of 7-13? _____
- Will trypsin denature at a pH range of 7-13? _____



3. Label the parts to an enzyme using the choices on the right.



Active Site

Products

Enzyme

Substrate

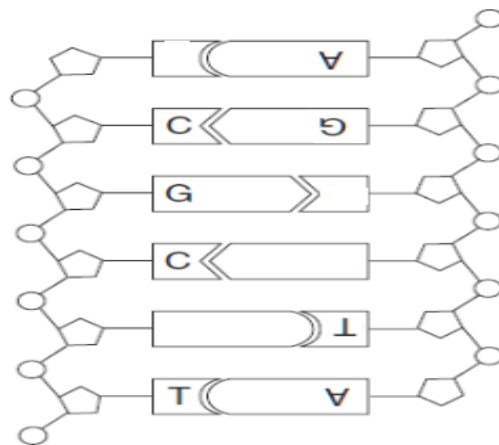
Is the enzyme destroyed
or Is the enzyme reusable?

Look at the DNA strand on the right.

1. Fill in the missing bases . . .
2. Circle one nucleotide . . .
3. What type of bond holds these bases together? _____
4. How many nucleotides are in this image of DNA? _____
5. If there was 26% Adenine, how much thymine would there be?

6. If there was 20% guanine, how much Cytosine would be present?

7. If there was 14% guanine and cytosine, how much thymine would there be? (show your math)



8. If there was 44% thymine and adenine, how much guanine would there be? (show your math)
9. Traits are determined by the genetic code, what part of the DNA actually carries the code?

10. What is the direction that DNA? _____
11. What is the formation of DNA?

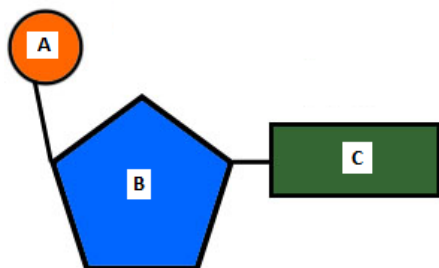
12. Write the complimentary bases for the following strands:

3' ATC CGG GCA TTC GCC 5'

5' TTA GTA CCC TAG GGT AAC 3'

13. What determines what an organism is and their specific traits?

14. (YES / NO) Does a human and potato have the same DNA molecular parts?
15. (YES / NO) Does a human and a potato have the same nitrogenous base sequence within their DNA?
16. What is the monomer of a DNA molecule? _____
17. What is the polymer of a DNA molecule? _____



18. What is the name of this structure? _____
19. Name structure A _____
20. Name structure B _____
21. Name structure C _____
22. What is the polymer of this structure? _____
23. Which part of this structure carries the genetic code

22. What are the four bases possible on a DNA nucleotide?

_____, _____, _____, _____