

Bi 102 Exam 1, Chapters 1 through 5: Active Study Guide

We'll do as much of this section as we can **in class**. Do the rest at home or with your study group. (Osmosis and diffusion will be on the next exam.)

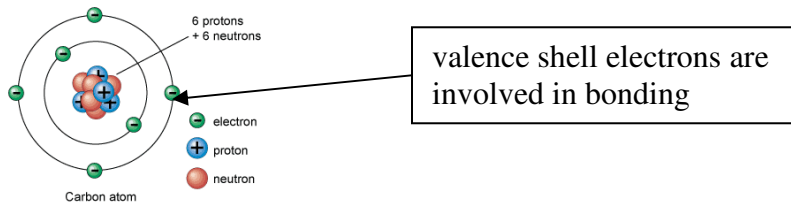
Atoms, molecules, and bonds

Test your knowledge. Match the statements with the best answers below. Answers can be used more than once.

- | | |
|-----------------------------|------------------|
| A. Ionic bond | D. hydrogen bond |
| B. Covalent bond (nonpolar) | E. atom |
| C. Polar covalent bond | F. ion |

- B or C** 1. Formed by the sharing of a pair of electrons.
 C 2. Formed when atoms share a pair of electrons from their outer shells, but the pairs are not shared equally.
 E 3. Has an equal number of electrons and protons.
 B 4. Type of bond found in a molecule that is insoluble in water.
 B 5. Formed when two atoms share pairs of electrons from their outer shells, and the electrons are shared equally.
 F 6. Has a different number of electrons than protons.
 C 7. Bond that produces a polar molecule.
 D 8. Bond between two polar molecules.
 C 9. Type of bond found in a water molecule.
 A 10. Bond formed when one atom donates an electron to another atom.
 C 11. Type of bond found in water soluble molecules.
 E 12. Two or more of these make up a molecule.

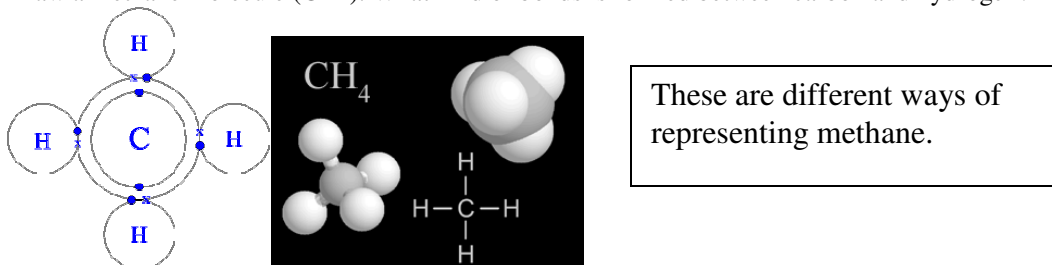
Draw a carbon atom and label its parts. Indicate which particles are involved in bonding:



Draw a water molecule. What kind of bond is formed between oxygen and hydrogen?



Draw a methane molecule (CH₄). What kind of bonds is formed between carbon and hydrogen?



The biomolecules

Complete this table without looking at your notes:

| Polymers | monomers | enzyme that breaks the polymer into its monomers |
|-----------------------|-----------------------------------|---|
| Complex carbohydrates | sugars | amylase (for starch) cellulose (for cellulose) |
| Proteins | amino acids | Pepsin Peptidases |
| Lipids | fatty acids & glycerol | lipases |

For each of these substances, name the reagent that you used to test for it in lab:

Starch: _____ **Lugol's** _____

Proteins: _____ **Biuret** _____

Glucose: _____ **Benedict's** _____

Amino acids: _____ **Ninhydrin** _____

Lipids: _____ **Sudan IV** _____

Listed below are specific macromolecules that have been mentioned in class. Identify each of these as a complex carbohydrate, protein, lipid, or nucleic acid

keratin _____ **protein** _____

testosterone _____ **lipid** _____

ATP _____ **nucleic acid** _____

cellulose _____ **carbohydrate** _____

starch _____ **carbohydrate** _____

hemoglobin _____ **protein** _____

amylase _____ **protein** _____

DNA _____ **nucleic acid** _____

pectin _____ **carbohydrate** _____

triglyceride _____ **lipid** _____

Enzymes

Cellulose is a carbohydrate. Keratin is the protein that hair, bird feathers, and reptile scales are made of. Mineral oil is a lipid. All of these are energy-rich carbon compounds, but we humans can't extract the energy out of any of them. Why?

Because we lack the enzymes that would break these substances into monomers that could be absorbed.

Which of the following statements about enzymes are true and which are false?

- | | | |
|---|----------|----------|
| 1. Enzymes are proteins | T | F |
| 2. An enzyme can work under a wide range of conditions | T | F |
| 3. Each enzyme carries out a specific reaction | T | F |
| 4. Enzymes are used up in a reaction | T | F |
| 5. Enzymes change shape during a reaction, but return to their original shape | T | F |
| 6. Enzymes lower the activation energy of a reaction | T | F |

Suppose you were handed some small beakers and told that they had been filled with either starch or albumin protein. They may or may not have been treated with an enzyme that breaks down the polymer. You perform the same tests on them as you did in lab and get the following results. Given these results, what originally went into your beakers?

| results | original beaker contents | results | original beaker contents |
|--|---|--|--------------------------------|
| Ninhydrin: strong positive Biuret: weak positive Benedicts: negative Lugols: negative | albumin protein pepsin | Ninhydrin: negative Biuret: weak positive Benedicts: negative Lugols: strong positive | starch pepsin |
| Ninhydrin: negative Biuret: weak positive Benedicts: strong positive Lugols: negative | starch amylase | Ninhydrin: negative Biuret: negative Benedicts: negative Lugols: positive | starch |

Cell structures

Fill in the following table, which compares viruses, prokaryotic organisms (such as bacteria) and eukaryotic organisms, with "yes" or "no" to indicate which are true for each:

| | Viruses | Prokaryotes | Eukaryotes |
|---|------------|-------------|------------|
| Has a membrane-bound nucleus | no | no | yes |
| Has genetic material | yes | yes | yes |
| Has a cell membrane | no | yes | yes |
| Reproduces independently | no | yes | yes |
| Has membrane-bound organelles | no | no | yes |
| Has a metabolism | no | yes | yes |
| Is a living organism | no | yes | yes |
| Can be killed with antibiotics | no | yes | no |
| Reproduce using mitosis (preview of next exam!) | no | no | yes |

Complete the following table without using your notes

| Organelle | Function | In plants? | In animals? |
|------------------|---|-------------------|--------------------|
| Nucleus | Directs cell processes | yes | yes |
| Rough E.R. | Manufactures proteins | yes | yes |
| Smooth E.R. | Manufactures lipids | yes | yes |
| Golgi apparatus | Finishes and packages ER products | yes | yes |
| Vesicles | Delivers ER products | yes | yes |
| Lysosomes | Digests and recycles materials in the cell | no | yes |
| Mitochondria | Breaks down carbon compounds and makes ATP | yes | yes |
| Chloroplasts | Makes sugars and other carbon compounds | yes | no |
| Cell membrane | Controls what goes into and out of the cell | yes | yes |
| Cell wall | Provides rigid support for the cell | yes | no |
| Central vacuole | Stores substances, controls water pressure in the cell | yes | no |

In a classroom experiment, a student grinds up some spinach in distilled water and filters the liquid onto a piece of filter paper. Organelles isolated from the filter paper absorb carbon dioxide and release oxygen. Which organelle did the student isolate? Explain.

The student found chloroplasts. During photosynthesis, chloroplasts take in carbon dioxide for making carbon compounds, and release oxygen.

If the student does the same experiment with mushrooms, would the same organelle be present? Why or why not?

No. Fungi are not photosynthetic, and do not have chloroplasts.

Sketch the arrangement of phospholipids and proteins in the cell membrane. Mark where the hydrophobic and hydrophilic regions are.

Cell Membrane

