

Bio Std. 4.1 Understand how biological molecules are essential to the survival of living organisms.

Std 4.1.1 Compare structure & function of major biological molecules as related to the survival of living organisms

1. Compare the structure and function of each of the listed organic molecules in organisms. Check which are examples or are related to these biological molecules:

	Insulin	Glucose	Cellulose	DNA/RNA	Hemoglobin	Steroids	Starch	Enzymes
Carbohydrate								
Lipid								
Protein								
Nucleic Acid								

	Amino Acids	Protein synthesis	Denature	Cell membranes	Quick Energy	Tests to Identify
Carbohydrate						Simple: Complex:
Lipid						
Protein						
Nucleic Acid						

Match the following examples of biomolecules to their description. There will be two answers for every description (the name of the biomolecule and the type of biomolecule).

- _____ 2. Molecule used as an exoskeleton for organisms
- _____ 3. Molecule used to make up the cell membrane
- _____ 4. Is a monomer of carbohydrates; blood sugar
- _____ 5. Molecule used to store energy in animals
- _____ 6. Molecule used to store energy in plants
- _____ 7. Molecule used to make up the structure of the cell wall in plants
- _____ 8. Molecule used to store genetic information
- _____ 9. Molecule used to regulate the amount of glucose in the blood
- _____ 10. Molecule used to transport oxygen throughout the blood
- _____ 11. Found in the nucleus; contains recipe for building proteins
- _____ 12. Molecule used to speed up chemical reactions by decreasing activation energy.
- _____ 13. Makes copies of DNA, carries amino acids to ribosomes, travels out of nucleus and to ribosomes where proteins are made
- _____ 14. Substance that is a liquid at room temperature and stores energy.
- _____ 15. Substance that is a solid at room temperature and stores energy.

- a. enzyme
b. starch
c. glycogen
d. cellulose
e. lipid
f. protein
g. carbohydrate
h. nucleic acid
i. insulin
j. DNA
k. hemoglobin
l. saturated fat
m. phospholipid
n. ununsaturated fat
o. chitin
p. RNA
q. glucose

Subunits/Monomers:

- _____ 16) Made up of Amino Acids
- _____ 17) Made up of Nucleotides
- _____ 18) Made up of 1 Glycerol and 3 Fatty Acids
- _____ 19) Made up of Simple Sugars

Functions:

- _____ 20) Used to transport materials through cell membranes, transport oxygen in blood, speed up chemical reactions, regulate cell metabolism, antibodies, etc
- _____ 21) Used to encode genetic (hereditary) information.
- _____ 22) Used as a short-term energy source.
- _____ 23) Used as a long-term energy source, waterproofing.

Bio. 4.1.2 Summarize the relationship among DNA, proteins and amino acids in carrying out the work of cells and how this is similar in all organisms.

Word Bank: Anticodon, Cancer, Codon, DNA Replication, Hydrogen Bonds, Mutation, Protein Synthesis, Ribosome, Transcription, Translation

24. The process of copying DNA to create 2 identical copies of DNA molecules is called _____.
- During replication and transcription, the DNA unzips the _____ that connect the nitrogenous bases together.
 - When a mistake is made while copying DNA, this is called a _____.
 - Mistakes in DNA can cause a cell to divide rapidly without a limit, which can result in _____.
 - Copying DNA occurs during which phase of cell division: interphase (G₁, S, G₂), prophase, metaphase, anaphase, telophase, or cytokinesis? _____
25. The process of making proteins is called _____. There are two steps in this process:
- In the first step, a segment of DNA is unraveled and mRNA makes a copy of a DNA segment. This is called _____.
 - In the second step, the mRNA travels out of the nucleus to a _____ where tRNA brings amino acids and connects them with peptide bonds to form a protein. This process is called _____.
- An mRNA sequence of 3 bases is called a: _____
 - A tRNA sequence of 3 bases is called a: _____

		Second base in codon				
		U	C	A	G	
First base in codon	U	Phe	Ser	Tyr	Cys	U
		Phe	Ser	Tyr	Cys	C
		Leu	Ser	STOP	STOP	A
		Leu	Ser	STOP	Trp	G
C	Leu	Pro	His	Arg	U	
	Leu	Pro	His	Arg	C	
	Leu	Pro	Gln	Arg	A	
	Leu	Pro	Gln	Arg	G	
A	Ile	Thr	Asn	Ser	U	
	Ile	Thr	Asn	Ser	C	
	Ile	Thr	Lys	Arg	A	
	Met	Thr	Lys	Arg	G	
G	Val	Ala	Asp	Gly	U	
	Val	Ala	Asp	Gly	C	
	Val	Ala	Glu	Gly	A	
	Val	Ala	Glu	Gly	G	

26. A segment of DNA has the following bases: TAC GCA. What is the complementary strand of DNA (the other side of the double helix)?

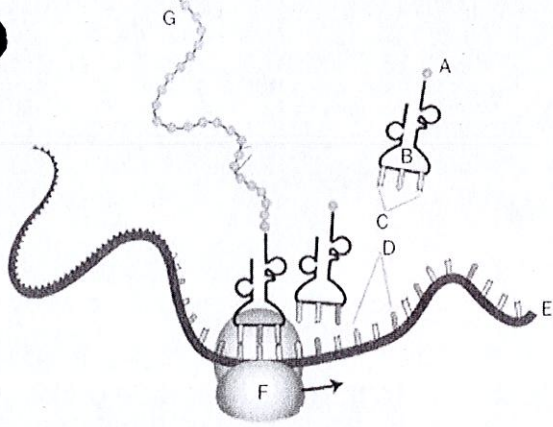
27. A segment of DNA has the following bases: TAC GCA. What is the complementary strand of mRNA? _____

28. When the mRNA strand from #2 goes to the ribosome for translation, what is the amino acid sequence? _____

29. What is the amino acid sequence from this DNA strand TAC CGT TCA: _____

30. If the DNA strand is TAC CAA CCA, what are the complementary mRNA codons? _____
What is the amino acid sequence? _____

31. What process is shown in the picture? _____ Label the structures involved in this process:

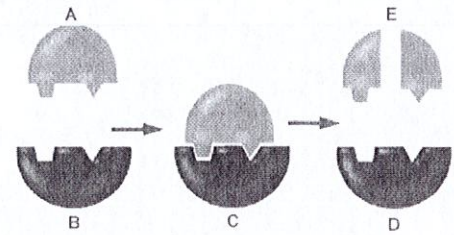


- A. _____
- B. _____
- C. _____
- D. _____
- E. _____
- F. _____

Bio.4.1.3 Explain how enzymes act as catalysts for biological reactions.

32. Identify the following in the diagram: enzyme (used twice), substrate, product, enzyme-substrate complex

- A) _____
- B) _____
- C) _____
- D) _____
- E) _____

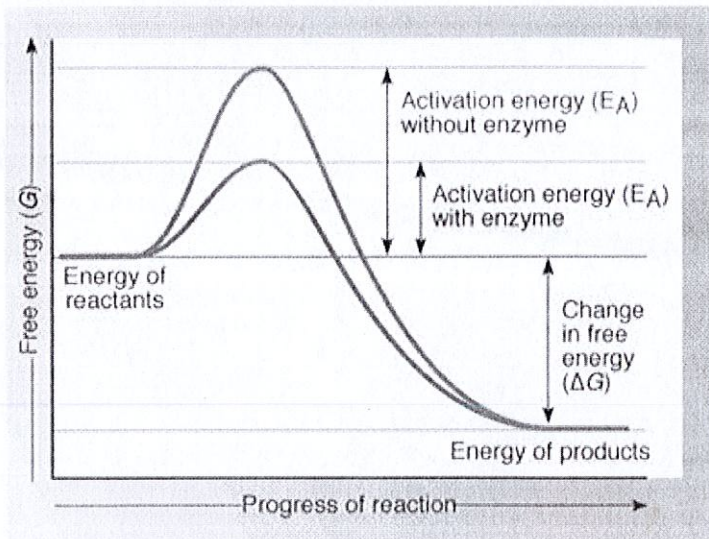
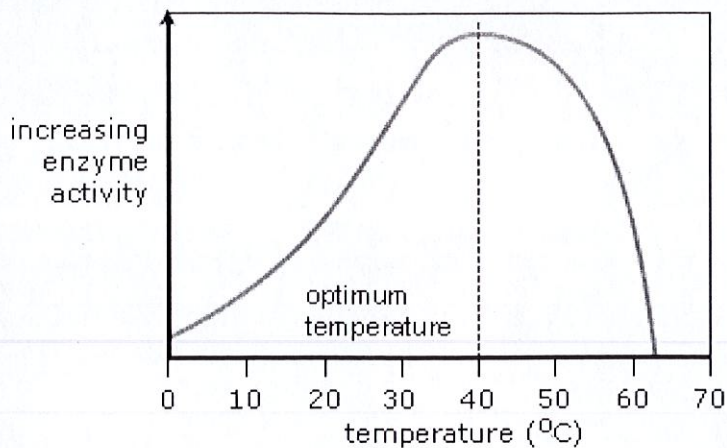


Word bank:
all, lower, pH, re-usable, 3-D, speed up, temperature, specific, catalysts

- 33. The folding of proteins produces a _____ shape that is linked to function.
- 34. Enzymes are proteins that _____ chemical reactions. Because of this, enzymes are called _____.
- 35. Enzymes _____ the activation energy of a reaction.
- 36. Enzymes are _____ and _____.
- 37. Enzymes are affected by factors such as _____ and _____.
- 38. Describe the lab that we performed that showed how these factors affect enzymes.
- 39. Enzymes are necessary for _____ biochemical reactions!
- 40. Will an enzyme bind to any substrate? (yes/no) _____
- 41. Are enzymes re-useable (are they used up in the reaction, or not) (yes/no)? _____

Interpret the Graphs:

41. At what temperature will the speed of the reaction be greatest? _____
 42. At a temperature of 30°C, will the reaction rate be faster or slower than the rate at 20°C? _____



Biology Std 4.2 Analyze the relationships between biochemical processes and energy use in the cell.

Bio.4.2.1 Analyze photosynthesis and cellular respiration in terms of how energy is stored, released, and transferred within and between these systems.

43. Label the following molecules in these equations (*water, glucose, oxygen, carbon dioxide, ethyl alcohol*)



44. Which of the above reactions is photosynthesis? (*A, B or C?*) _____
 45. Which of the above reactions is fermentation (anaerobic cellular respiration)? (*A, B or C?*) _____
 46. Which of the above reactions is cellular respiration (aerobic)? (*A, B or C?*) _____
 47. Which reaction(s) requires or stores energy?
 48. Which reaction(s) release energy (ATP)?
 49. Which reaction releases the most energy? _____
 50. Which reaction requires chlorophyll? _____ What is the purpose of the chlorophyll?
 51. Which reaction requires light? _____ What is the light used for?
 52. Which organisms carry out process A?
 53. Which organisms carry out process B?
 54. Which organisms carry out process C?
 55. Which process uses chloroplasts in eukaryotes? _____
 56. Which process uses mitochondria in eukaryotes? _____
 57. Compare and contrast: **Alcoholic Fermentation and Lactic Acid Fermentation.** (# ATP, where it occurs)

Word Bank (can be used more than once): Photosynthesis, Aerobic Respiration, Anaerobic Respiration, Lactic Acid Fermentation, Alcoholic Fermentation

- _____ 58) The process of breaking down sugar for energy without oxygen.
 _____ 59) This type of anaerobic respiration that yeast and some bacteria use. Glucose is broken down without oxygen; carbon dioxide and ethanol are produced.
 _____ 60) This type of anaerobic respiration that occurs when your muscles run out of oxygen and results in an aching sensation.
 _____ 61) This type of anaerobic respiration that is used to make bread.
 _____ 62) Which type of respiration produces the most ATP (energy)?

***Remember, energy is released when ATP is broken down into ADP + P. This energy is used to power other chemical reactions in cells.**

- _____ 63) Process by which plants & some protists use sunlight, carbon dioxide, & water to make sugar.

Word Bank for Table (will be used only once): 36 ATP, 2 ATP, 2 ATP, carbon dioxide, carbon dioxide, carbon dioxide, ethanol, lactic acid, oxygen, oxygen, sugar, sugar, sugar, sugar, sunlight, water, water

	Reactant #1	Reactant #2	Reactant #3		Product #1	Product #2	Product #3
Photosynthesis							
Aerobic Respiration				→			
Anaerobic Respiration: Lactic Acid Fermentation							
Anaerobic Respiration: Alcoholic Fermentation							

64. The goal of photosynthesis is to produce: _____.
 65. The goal of respiration is break down _____ to obtain _____ in the form of _____.
 66. What gas is produced by photosynthesis that is needed for aerobic respiration? _____

Word Bank (will be used only once): carbon dioxide, oxygen, sugar, sugar, energy, carbon dioxide, ATP

67. What gas is taken out of the atmosphere by photosynthesis but is released into the atmosphere by aerobic respiration?: _____

68. What gas is thought to cause the greenhouse effect (and global warming)? _____
69. Do all organisms use photosynthesis? Yes or No?
70. Do all organisms use respiration? Yes or No?
71. If an organism does not use photosynthesis to make sugar, how does it get the sugar it needs for respiration?

Bio 4.2.2 Explain ways that organisms use released energy for maintaining homeostasis (active transport).

Transport Across the Plasma Membrane:

Word Bank: Active, ATP, Carrier, Simple Diffusion, Energy, Facilitated Diffusion, Osmosis, Passive

72. In _____ transport, energy IS NOT required. In this type of transport, materials can only move WITH the concentration gradient – from [high or low?] concentration to [high or low?] concentration.
- a. Types:
- i. _____: when materials move from high to low concentration through the membrane.
 - ii. _____: when materials move from high to low concentration through the membrane, but require a channel protein to help them move through.
 - iii. _____: when water moves from high to low concentration through the membrane.
73. In _____ transport, energy IS required. In this type of transport, materials can be moved AGAINST the concentration gradient – from [high or low?] concentration to [high or low?] concentration. _____ proteins are used to force materials to move from low concentration to high concentration. Energy in the form of _____ is needed.

Write the appropriate letter (letters can be used more than once):

74. Hydrophilic (water-loving) head: _____
75. Hydrophobic (water-fearing) tail: _____
76. Phospholipid: _____
77. Phospholipid Bilayer: _____
78. Carrier protein: _____
79. Protein Channel: _____
80. Used for Facilitated Diffusion: _____
81. Used for Active Transport: _____
82. Requires Energy: _____
83. Water can go through this by osmosis: _____
84. Materials can go through this by simple diffusion: _____

