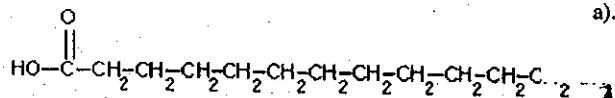
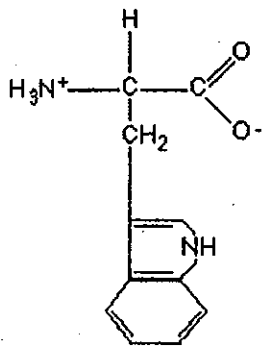
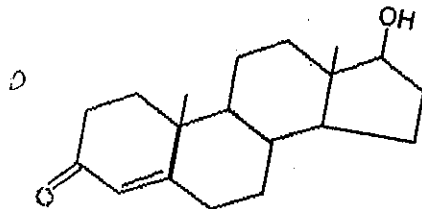
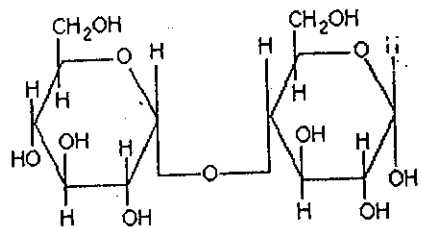


Identify the general group to which each of the following macromolecules belongs.

Give reasons for your choice.



The tertiary structure of a protein refers to the:

- Sequence of amino acids
- Presence of alpha-helices or beta-sheets
- Unique three dimensional folding of the molecule
- Interactions of a protein with other subunits of enzymes
- Interaction of a protein with a nucleic acid

2. Which statement is true concerning the structure of proteins?

- The primary structure is the sequence of amino acids.
- Alpha helices and beta sheets are examples of secondary structure.
- Side chains (R-groups) of amino acids can be hydrophilic or hydrophobic.
- Proteins made of two or more polypeptide chains have quaternary structure.
- All statements are true.

3. All the following are true concerning fats except

- their monomers consist of glycerol and three fatty acids
- they are used for protection of vital organs
- plants only contain fats in their seeds
- saturated fats have many double bonds between their carbons

4. The combination of a base and a sugar and a phosphate group is known as

- molecular unit
- nucleotide
- protein base
- base pair

5. Isomers of a given nutrient have:

- atomic numbers that vary
- different kinds of atoms
- different molecular weights
- the same molecular formula
- the same structural formula

6. Which of these hydrocarbons contains a triple bond in its carbon skeleton? a). C₂H₂ b). CH₄ c). C₂H₆ d). C₂H₄ e). C₃H₈

7. All the following reactions involve dehydration synthesis except

- the formation of a disaccharide
- the production of a polypeptide
- the formation of a fat
- digestion of a polysaccharide
- the production of a complex sugar.

8. Which of the following terms is most inclusive?

- glucose
- amylose
- sucrose
- carbohydrate
- fructose

9. The monosaccharide products of hydrolysis are:

- fructose and maltose
- galactose and glucose
- glucose and galactose
- sucrose and fructose
- glucose and glucose

10. Which of the following statements is true?

- Proteins are made of amino acids held together by ester bonds.
- A polysaccharide is a complex lipid needed for storage and structure.
- The primary protein structure is based on the order of its amino acids.
- Steroids are complex proteins needed to control the bodies chemistry.

11. In base pairing within DNA molecules:

- adenine is bound to thymine with hydrogen bonds
- adenine forms a peptide bond with thymine
- guanine bonds to uracil
- adenine bonds to uracil

12. The reason the cell membrane is composed of phospholipids is:

- it is hydrophobic at the ends and hydrophilic in the middle
- it is hydrophilic at the ends and hydrophobic in the middle
- a steroid
- a nonpolar molecule
- can produce energy

13. All the following are proteins except:

- hemoglobin
- keratin
- albumin
- venom
- glycogen

14. Of the elements essential to life the most abundant is

- carbon
- oxygen
- hydrogen
- nitrogen

15. An ion is an atom that contains

- more protons than electrons
- more neutrons than electrons
- more electrons than protons
- both a and c
- a, b and c.

16. All of the following are held together by nonpolar covalent bonds except

- O₂
- H₂
- N₂
- NaCl
- F₂

Organic Chemistry

Examine the chemical processes below, then determine if they are undergoing dehydration synthesis or hydrolysis.

The production of a disaccharide from glucose and fructose.

The digestion of fat into glycerol and 3 fatty acids.

Building a DNA molecule from nucleotides.

Stringing amino acid together to form a protein.

say:

Carbon and Water are both important to life. Discuss why carbon and water were chosen out of all other elements and molecules to base life upon.

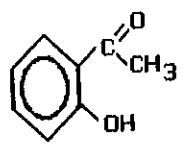
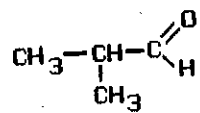
COMPLETE

MACROMOLECULE type	MESOMOLECULES (SUBUNITS)	Example	FUNCTIONS
		SUCROSE	
			Enzyme (catalyst)
	NUCLEOTIDE		
Nucleic acid			
		Starch and glycogen	
	Amino acids		
		HEMOGLOBIN	
CARBOHYDRATE			
			Immediate fuel molecule for cellular respiration
	ACGU		
		Lactase and lipase	
		RNA	

Tell whether each of the following is a carbohydrate, a protein, a lipid, or a nucleic acid.

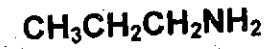
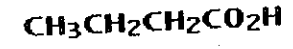
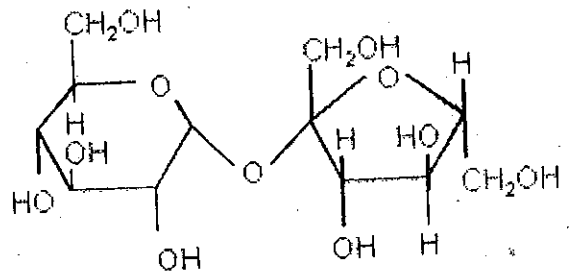
- ATP
- Cellulose
- Chitin
- DNA
- Enzyme
- Glucose
- Glycogen
- Oil
- Phospholipid
- RNA
- Starch
- Steroid

Circle and name the functional groups



Draw the following structural formulas (circle and name the functional groups)

To what group of macromolecules do the following belong?



PHOTOSYNTHESIS QUIZ

NAME: _____

- ____ 1. What are the products of photosynthesis?
a) water and carbon dioxide
b) oxygen and carbohydrate
c) water and oxygen
d) carbohydrate and water
- ____ 2. What organisms are capable of photosynthesis?
a) plants only
b) plants and some bacteria only
c) plants and algae only
d) plants, algae, and some bacteria
- ____ 3. Sunlight arrives at a plant in units of light energy called
a) protons b) photons c) electrons d) wavelengths
- ____ 4. The Greek root that means "light" is
a) synthesis b) logos c) kytos d) phos e) elektr A
- ____ 5. Which statement is **Not** true about sunlight?
a) Gamma rays are shorter than the wavelengths of visible light.
b) Only the visible portion of sunlight is used in photosynthesis.
c) Photons of ultraviolet light contain low energy, and so are harmless to cells.
d) Shorter wavelengths of radiation contain more energy than longer wavelengths.
e) Radio waves have longer wavelengths than gamma rays.
- ____ 6. Which of these is **Not** a major photosynthetic pigment in plants?
a) chlorophyll "a" b) chlorophyll "b" c) chlorophyll "c" d) carotenoid pigments
- ____ 7. Why are plants green?
a) They absorb only green wavelengths of light.
b) They absorb only yellow and blue wavelengths of light.
c) They reflect nearly all wavelengths of light.
d) They reflect green wavelengths of light.
e) They reflect yellow and blue wavelengths of light.
- ____ 8. The term "chloroplast" is derived in part from the Greek root that means
a) plant b) light c) green d) photosynthetic e) oxygen

____ 9. To what does the term stroma refer?

- a) the double membrane of the chloroplasts
- b) a flattened disk or sac in the chloroplast
- c) a central fluid filled space in the chloroplast
- d) the cytochrome system in the membranes of the thylakoids
- e) a stack of thylakoid membrane structures

____ 10. To what does the term grana refer?

- a) the cytochrome system in the membranes of the thylakoids
- b) a central fluid filled space in the chloroplast
- c) a flattened disk or sac in the chloroplast
- d) the double membrane of the chloroplasts
- e) a stack of thylakoid membrane structures

____ 12. Which statement is **Not** true about photosystems?

- a) Photosystem I passes electron on to photosystem II.
- b) Each photosystem contains numerous pigment molecules that act as antennas to capture light.
- c) Photosystem I contains a reaction center molecule that absorbs light best around 700 nm, so it is called P700.
- d) Electrons in the reaction center molecule are excited by absorbing photons of light and are passed along to an acceptor molecule.

____ 17. Which is most closely associated with the Calvin cycle?

- a) ATP production
- b) oxygen production
- c) carbon dioxide fixation
- d) carbon dioxide production
- e) removal of electrons from water for passage through an electron transport system

____ 19. When the stomates in a leaf close, then

- a) carbon dioxide in the air spaces in the leaf decreases.
- b) oxygen in the air spaces in the leaf increases.
- c) C3 plants carry on photorespiration, using oxygen and producing PGA and carbon dioxide.
- d) all photosystems as well as photorespiration come to a halt.
- e) A, B, and C are correct.

40. The process in which O_2 (oxygen) is released as a by product of oxidation-reduction reactions.
- a) glycolysis
 - b) Krebs cycle (citric acid cycle)
 - c) Calvin cycle (light-independent reactions of photosynthesis)
 - d) light dependent reactions of photosynthesis
 - e) chemiosmosis
41. Process in which carbon from CO_2 is incorporated into organic molecules.
- a) glycolysis
 - b) Krebs cycle (citric acid cycle)
 - c) Calvin cycle (light-independent reactions of photosynthesis)
 - d) light dependent reactions of photosynthesis
 - e) chemiosmosis

35. This process has as its products $NADP^+$ and ADP, and sugar.
- a) glycolysis
 - b) chemiosmosis
 - c) fermentation
 - d) Calvin cycle
 - e) photolysis

37. Which of the following photosynthetic reactions is known to occur in the thylakoid membrane?
- a) carbon fixation
 - b) light reactions
 - c) dark reactions
 - d) Calvin cycle
 - e) transpiration

44. Which of the following statements is **True** about RuBP (ribulose biphosphate)
- a) It is a 3 carbon product of the Calvin cycle.
 - b) It is the final oxidizing agent in the light reaction.
 - c) It is the CO_2 acceptor in the Calvin cycle.
 - d) It is the rarest substrate in the Calvin cycle and therefore a limiting reagent.
 - e) None of the above.

45. If 6 molecules of oxygen are released during photosynthesis, how many molecules of carbon dioxide would be fixed?
- a) 1
 - b) 3
 - c) 6
 - d) 12
 - e) 24

51. The products of the light reactions, or photophosphorylation, in photosynthesis are
- a) oxygen and water.
 - b) oxygen and ATP.
 - c) oxygen, ATP, and NADPH.
 - d) water, ATP, and NADPH.
 - e) water, ATP, and $NADP^+ + H^+$.

47. The basic photosynthetic unit in a chloroplast is the
- a) stroma
 - b) stoma
 - c) thylakoid
 - d) granum
 - e) chlorophyll

48. All of the following are end products of the light-dependent reactions of photosynthesis **Except**.
- a) NADPH
 - b) ATP
 - c) O_2 (oxygen)
 - d) H^+ (protons)
 - e) $C_6H_{12}O_6$ (glucose)

49. In C_3 plants, the enzyme that incorporates CO_2 into organic compounds is
- a) helicase
 - b) PEP carboxylase
 - c) RuBP carboxylase
 - d) carboxypeptidase
 - e) pyruvate decarboxylase

53. Which of the following is a specialized feature of plants that live in hot dry regions?
- a) Stomata that open and close
 - b) Transpiration
 - c) Photophosphorylation
 - d) C_4 photosynthesis
 - e) Carbon fixation

54. The light -dependent reactions of photosynthesis occur in the
- a) nucleus
 - b) cytoplasm
 - c) mitochondria
 - d) thylakoid membrane
 - e) stroma

Cellular Respiration Review

1. Which of the following processes produces the most ATP molecules per glucose molecule consumed?
 - a. Krebs Cycle
 - b. electron transport/chemiosmosis
 - c. glycolysis
2. The purpose of cell respiration is to:
 - a. synthesize carbohydrates from CO₂
 - b. break down carbohydrates to provide energy for the cell
 - c. provide oxygen for the cell
3. The NET RESULT of glycolysis is:
 - a. 4ATP and 4NADH
 - b. 4ATP and 2NADH
 - c. 2ATP and 2 NADH
4. $2K + Br_2 \rightarrow 2K^+ + 2Br^-$ In the reaction, potassium is:
 - a. neutralized
 - b. oxidized
 - c. reduced
5. In the course of the Krebs Cycle, how many molecules of ATP are produced?
 - a. 2
 - b. 4
 - c. 36
6. The process by which glucose is split into pyruvate.
7. The process by which a hydrogen gradient is used to create ATP
8. A process that makes a small amount of ATP and produces lactic acid
9. A series of membrane embedded electron carriers that ultimately create the hydrogen ion gradient to drive the synthesis of ATP
10. The process by which the breakdown of glucose is completed and CO₂ is produced
11. The process that does NOT occur in the mitochondria
12. Also known as the Citric Acid Cycle
13. Starts with Acetyl-CoA

Choices for 6-13

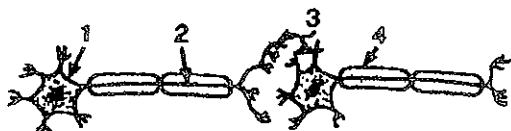
- | |
|--|
| <ol style="list-style-type: none">a. chemiosmosisb. Electron transport chainc. Krebs Cycled. Glycolysise. Fermentation |
|--|

REVIEW QUESTIONS: CELLULAR RESPIRATION

1. What materials are needed for a cell to produce a molecule of adenosine triphosphate?
2. How do adenosine diphosphate and adenosine triphosphate differ in structure? in energy content?
9. Which has more energy: one molecule of glucose, or two molecules of pyruvic acid?
10. What does glycolysis mean?
11. Where in the cell does glycolysis occur?
12. How much oxygen is used during glycolysis?
13. What does aerobic mean?
14. What does anaerobic mean?
15. Products of glycolysis include:
48. The primary function of respiration is:
 - A. manufacture energy;
 - B. destroy energy;
 - C. transfer energy from storage molecules such as glucose to usable molecules (ATP);
 - D. deliver oxygen to the lungs.
49. What happens to a cell that cannot respire?

Nervous System Practice Test

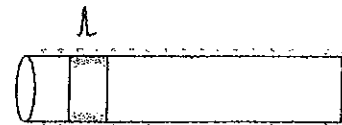
- 1) In the diagram of the two neurons shown below, at which point would a substance that interferes with the action of a neurotransmitter be most effective?



- A) 1 B) 2 C) 3 D) 4
- 2) Animal cells that are specialized for conducting electrochemical impulses are known as
 A) synapses B) neurotransmitters C) nephrons D) neurons
- 3) In humans, which structure is primarily responsible for maintaining balance and coordinating motor activities?
 A) cerebrum B) spinal cord C) cerebellum D) medulla
- 4) A student's ability to think about a question and answer it correctly is directly controlled by the
 A) cerebrum B) spinal cord C) cerebellum D) medulla
- 5) Neurotransmitters, such as acetylcholine, are initially detected by which part of a neuron?
 A) terminal branch B) nucleus C) dendrite D) mitochondrion
- 6) Which best illustrates the pathway of an impulse in a reflex arc? (associative neuron = interneuron)
 A) receptor → motor neuron → associative neuron → sensory neuron → effector
 B) effector → sensory neuron → associative neuron → motor neuron → receptor
 C) effector → motor neuron → associative neuron → sensory neuron → receptor
 D) receptor → sensory neuron → associative neuron → motor neuron → effector
- 7) A student accidentally places her hand on a tack and quickly pulls her hand away. The tack represents
 A) a response B) a stimulus C) an impulse D) an effector
- 8) Which is the first structure stimulated in a reflex arc?
 A) motor neuron B) effector C) interneuron D) receptor
- 9) Which homeostatic adjustment does the human body make in response to an increase in environmental temperature?
 A) increase in urine production C) increase in the production of perspiration
 B) storage of fats to provide insulation D) secretion of insulin to decrease blood glucose levels
- 10) The space between two adjacent neurons is known as a
 A) linkage B) joint C) synapse D) dendrite

- Ne/K
15. The purpose of the pump in a neuron is to
 A. pump out sodium ions / pump potassium ions in
 B. pump out potassium ions / pump sodium ions in
 C. keep sodium & potassium ions in equal concentrations on both sides of the cell membrane
 D. pump excess water out

Question #16 & #17 refers to the graphic



16. The above represents
 A. an action potential (electrical impulse) traveling down a nerve cell
 B. a reflex arc
 C. a synapse
 D. an extension cord
17. The charges on the inside & outside of the cell are the result of
 A. osmosis
 B. the concentration of different ions
 C. neurotransmitters outside the cell membrane
 D. phospholipids

DNA & Protein Synthesis



Section 10-1 DNA

1. What does DNA stand for?
2. What is DNA's primary function?
3. What is the function of proteins?
4. What are the repeating subunits called that make up DNA?
5. Name the 3 parts of a DNA nucleotide.
6. Sketch and label a DNA nucleotide.
7. Name the 4 nitrogen bases on DNA.
8. What is the difference between a purine & a pyrimidine?
9. Name 2 purines.
10. Name 2 pyrimidines.
11. Who is responsible for determining the structure of the DNA molecule & in what year was this done?
12. The model of DNA is known as a _____ because it is composed of two _____ chains wrapped around each other.
13. What makes up the sides of a DNA molecule?
14. What makes up the "steps" of a DNA molecule?
15. How did Rosalind Franklin contribute to determining the structure of

16. What type of bonds holds the DNA bases together? Are they strong or weak bonds?
17. What makes up the "backbone" of the DNA molecule?
18. On DNA, a _____ base will always pair with a _____ base.
- ~~19.~~ What is the most common form of DNA found in organisms?
- ~~20.~~ How many base pairs are in a full turn or twist of a DNA molecule?
21. Name the complementary base pairs on DNA.
22. How many hydrogen bonds link cytosine & guanine? adenine & thymine?
23. How does the nucleotide sequence in one chain of DNA compare with the other chain of DNA?
24. Why must DNA be able to make copies of itself?
25. Define DNA replication.
26. What is the first step that must occur in DNA replication?
27. What acts as the template in DNA replication?
28. What is a replication fork?
29. What enzymes help separate the 2 strands of nucleotides on DNA? What bonds do they break?
30. What is the function of DNA polymerases?
31. _____ are joined to replicating strands of DNA by _____ bonds.
32. If the sequence of nucleotides on the original DNA strand was A - G - G - C - T - A, what would be the nucleotide sequence on the complementary strand of DNA?

33. Does replication of DNA begin at one end and proceed to the other? Explain.
34. Why does DNA replication take place at many places on the molecule simultaneously?
35. When replication is complete, how do the 2 new DNA molecules compare to each other & the original DNA molecule?
36. Is DNA replicated (copied) before or after cell division?
37. Sketch & label DNA replication. (Figure 10-5, page 188)
38. What is the error rate in DNA replication? What helps lower this error rate to 1 in 1 billion nucleotides?
39. What is a mutation?
40. Name several things that can cause DNA mutations.

Section 10-2 RNA

41. What sugar is found on DNA?
42. What base is missing on RNA, & what other base replaces it?
43. Uracil will pair with what other on DNA?
44. Is RNA double or single stranded?
45. Name the 3 types of RNA and tell the shape of each.
46. Which type of RNA copies DNA's instructions in the nucleus?
47. Which type of RNA is most abundant?
48. What does tRNA transport?

49. What 2 things make up ribosomes?
50. Define transcription.
51. In what part of a cell are proteins made?
52. What is RNA polymerase & tell its function.
53. What are promoters?
54. Where does RNA polymerase bind to the DNA it is transcribing?
55. What makes the beginning of a new gene on DNA in eukaryotes?
56. What do promoters mark the beginning of on prokaryotic DNA?
57. When a promoter binds to DNA, What happens to the double helix?
58. Are both strands of DNA copied during transcription?
59. As RNA polymerase moves along the DNA template strand, what is being added?
60. What bases pair with each other during transcription?
61. What is the termination signal?
62. What happens when RNA polymerase reaches the termination signal?
63. What are the products of transcription called?
64. Transcripts are actually _____ molecules.
65. In transcription, _____'s instructions for making a protein are copied by _____.
66. Which RNA molecules are involved in the synthesis (making) of a protein?
67. What happens to the newly made mRNA molecule following transcription

68. What makes up proteins, what are the subunits called, & what bonds them together?
69. How many different kinds of amino acids make up proteins?
70. What determines how protein polypeptides fold into 3-dimensional structures?
71. Why does a protein need a 3-dimensional structure?
72. What is the genetic code & why is it important?
73. What is a codon & what does each codon code for?
74. How many codons exist?
75. Name the amino acid coded for by each of these codons:
- UUA
 - AUU
 - UGU
 - AAA
 - GAG
 - UAA
76. What codon starts protein synthesis?
77. What codons stop protein synthesis?
78. Proteins are synthesized (made) at what organelle in the cytosol?
79. Sketch and label a tRNA molecule & tell its function.
80. Define translation & tell how it starts.
81. Where are amino acids found in a cell & how are they transported?
82. What is an anticodon & where is it found on tRNA?
83. What codon on mRNA would bind with these anticodons: (use table 10-1, page 194)
- AAA
 - GGA
 - UAC
 - CGU
84. What are ribosomes made of and in what 2 places can they be found in a cell?
85. What is the difference between proteins made by free ribosomes & those made by attached, membrane proteins on the ER?
86. How many binding sites are found on the ribosomes and what does each site hold?
87. To start making a protein or _____, a ribosome attaches to the _____ codon on the _____ transcript.
88. The start codon, AUG, pairs with what anticodon on a tRNA molecule?
89. What amino acid does the start codon always carry?
90. What type of bonds are the ones that attach amino acids to each other in a growing polypeptide?
91. _____ are linked to make proteins as a _____ moves along the mRNA transcript.
92. What ends translation?
93. Can more than one ribosome at a time translate an mRNA transcript? Explain.
94. What determines the primary structure of a protein?
95. What would the translation of these mRNA transcripts produce?
- UAA CAA GGA GCA UCC
 - UGA CCC GAU UUC AGC

Below is a molecule of DNA. Your job is to replicate the molecule.

ATG AAT CGC ATT AAT GGC GCT ATT TGC GTA GAG TAT ACT
ACC TAA

Using your new replicated strand, create a mRNA/codon.

Using your codon, create a anticodon.

Using your codon, determine your amino acid sequence. Write your codon in the box and use page 298 of your textbook to determine your amino acid name. ²⁴⁰

Conclusion Questions

1. Distinguish between transcription and translation.
2. What is the specific site for transcription and translation in a cell.
3. How many tRNA nucleotides from an anticodon attach to the mRNA codon?
4. Suppose you knew the makeup of specific proteins in a cell. How would you determine a particular DNA code the coded for them?
5. How would one change in the codon affect the formation of a protein?

Transcription – Translation and Mutation Practice Sheet

DNA 3' TACGCGATATGGCGCAGGATC...5' (template)
5' ATGCGCTATACCGCGTCCTAG...3'

What "protein" will the template side produce?

Change any base (letter) in the template DNA to produce a different sequence and report the "protein" (AA sequence).

Sequence:

Protein:

Insert or delete a base (letter) in the template DNA and report the "protein".

Sequence:

Protein:

Make one base change to the DNA that will create a shorter "protein" and report the "protein".

Sequence:

Protein:

Make a base (letter) change to the DNA that will create the same "protein".

Sequence: