

Biology EOC Review

Goal 2: Learner will develop an understanding of the physical, chemical and cellular basis of life.

Analyze the matter-energy relationships of living and non-living things:

1. What are the differences between **living and non-living things**: List the 8 characteristics of life: (Page 16)

<i>Made of Cells</i>	<i>Reproduce</i>	<i>Based upon a universal genetic code</i>	<i>Grow and develop</i>
<i>Obtain and use materials and energy</i>	<i>Respond to their environment</i>	<i>Maintain a stable internal environment</i>	<i>As a group, change over time</i>

2. What are the ways that living things get energy to live? *They have a way to break down materials called metabolism.*
3. What are some of the ways that living things use energy? *Chemosynthesis, Photosynthesis, Cell respiration*
4. What are some ways that cells maintain **homeostasis**? *Sweating, Panting, Shivering, Cell Membrane*
5. How do biological materials respond to **acids and bases**? (Pages 42-43) What is a **buffer**? *In Acids, H⁺ ions are made and in Bases OH⁻ ions are made. A buffer is a solution that prevents sharp changes in pH (about 7).*

The chemistry of living things. (Pages 45-47)

6. What element makes all things “organic?” **CARBON**

(Question 7) 2.01 Compare and contrast the structure and functions of the following organic molecules:

Macromolecules	Function	Subunits
Carbohydrates	<i>Short Term Energy</i>	<i>Glucose</i>
Proteins	<i>Makes up living tissues & organs, also used as enzymes.</i>	<i>Amino Acids</i>
Lipids	<i>Long Term Energy Storage, Protection, Insulation</i>	<i>Glycerol, 3 fatty acid chains</i>
Nucleic Acids	<i>Store Genetic Information</i>	<i>5-carbon sugar, Nitrogen base, Phosphate group.</i>

Specific Molecule	Function	Subunits
Starch	<i>A macromolecule of sugar used for short term or quick energy.</i>	<i>Glucose</i>
Cellulose	<i>A macromolecule of sugar used to make cell walls in plants.</i>	<i>Glucose</i>
Insulin	<i>A protein used in the breakdown of sugar made by the pancreas. Without it, causes Diabetes.</i>	<i>Amino Acids</i>
Glycogen	<i>Storage of excess sugar in the liver and used when glucose levels in the blood is low. (Secondary storage also called “Animal Starch.”)</i>	<i>Glucose</i>
Glucose	<i>A molecule used to create Glycogen, sugars needed by the brain for life functions.</i>	<i>Carbon, Oxygen, Hydrogen</i>
Enzymes	<i>Proteins used to lower activation energy to cause chemical reactions to occur.</i>	<i>Amino Acids</i>
Hemoglobin	<i>The protein used to bind to Oxygen to carry it in the red blood cells.</i>	<i>Amino Acids</i>
Fats	<i>Long term energy storage, protection and insulation</i>	<i>Fatty acid & 3 glycerol chains</i>
DNA	<i>Genetic code of Life used in replication & transcription.</i>	<i>T, A, G, C</i>
RNA	<i>Genetic code of Life used in transcription & translation.</i>	<i>U, A, G, C</i>

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8. Describe the following nutrient tests: What is used to test for them?

Nutrient	Type of Test	Positive Test	Example of...?
Starch	<i>Iodine</i>	<i>When present, goes from brown to red.</i>	<i>Pasta</i>
Lipids	<i>Paper Bag Test</i>	<i>When present, causes a greasy stain.</i>	<i>Chips, Butter</i>
Monosaccharides	<i>Benedicts</i>	<i>When heated turns from blue to orange.</i>	<i>Milk, fruit</i>
Protein	<i>Biurets</i>	<i>When present turns blue to purple.</i>	<i>Meats, some legumes</i>

2.02 Investigate and describe the structure and function of cells including cell organelles, cell specialization, and communication among cells within an organism.

Cell theory and Organelles. (Chapter 7)

9. What does the term “membrane bound organelles mean?” What cell type are they found in? “*Tiny organs*” with unique functions covered in a fatty membrane. They are found in Eukaryotic cells ONLY!
10. What are the three parts of cell theory? 1. All living things are composed of cells. 2. Cells are the basic units of all living things. 3. New cells are produced from preexisting cells.

The diagram below shows many proteins and other molecules embedded in a cell membrane. (Page 182)

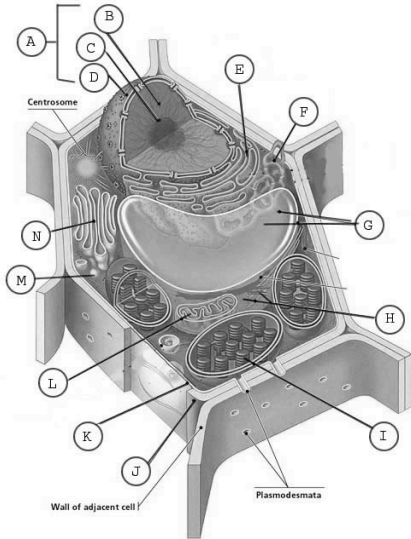
11. What is the function of the **cell membrane**?
It is a fluid-mosaic. It is a semi-permeable barrier that allows only certain molecules in & out of the cell.
12. What are some of the functions of these proteins and other molecules?
Some proteins on the surface are used for detecting materials, channel proteins let certain substances pass through. Cholesterol prevents the sticky phospholipids heads from sticking to one another. The hydrophilic areas attract water molecules and the hydrophobic areas repel water molecules.
13. Put the following steps for making a wet mount slide in order.
- Once the object is located, without moving the adjustment, change to medium power.
 - Put the tissue on the slide.
 - Switch to high power and bring the object into clear focus again.
 - Add a coverslip.
 - Place the slide on the stage of the microscope.
 - Add a drop of water.
 - Try to locate the object using low power and coarse adjustment.
 - Use fine adjustment to bring the object into clear focus.
- Order: B, F, D, E, G, A, C, H*
14. Why must you use stain to look at certain items under the microscope?
Because certain substances and organisms are clear and need stain in order to be visible under the microscope.
15. Draw how the letter “e” would look as view through a microscope? *Upside down and backwards.*
16. Put the following in order from smallest to largest:
Organ systems Cells Organs Tissues Key: 4 1 3 2
17. What structures produce hormones? What is the function of hormones? (Pages 634, 997) *They are slow acting chemical messengers released by the endocrine system. They are chemical substances that control growth, development and responses to the environment.*
18. How do hormones travel throughout a body? *Since many hormones are lipids, they pass through cell membranes.*

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19. What is a **feedback mechanism**? *A part of the stimulus & response system, it triggers a reaction in the body.*

20. Fill in this chart. Also give the letter or number of the part as seen in the diagrams below. (Page 176-183)

Cell Part and Letter	Structure Description	Function	Letter/Number
Nucleus	<i>Located near the center of the cell, it is large and surrounded by the ER.</i>	<i>Contains DNA or the molecule of heredity in the cell.</i>	<i>A / 6</i>
Plasma Membrane	<i>Surrounds the cell in animal cells, inner membrane of a plant cell.</i>	<i>Allows only certain molecules to pass through, the bouncer.</i>	<i>K / 4</i>
Cell wall	<i>Not found in animal cells, it surrounds the outside of plant cells.</i>	<i>Acts as a barrier to keep water in plant cells.</i>	<i>J / Not found</i>
Mitochondria	<i>Looks like a pea with wavy lines inside of it.</i>	<i>Acts as the energy production area of the cell. "Powerhouse."</i>	<i>L / 1</i>
Vacuoles	<i>A very large and empty area in a plant cell, are smaller in animal cells.</i>	<i>Used as storage for the cell for food, water, etc.</i>	<i>G / 3</i>
Chloroplasts	<i>Not found in Animal cells, they are circles with small stacks within them.</i>	<i>Used in the process of making energy (photosynthesis) for plants.</i>	<i>I / Not found</i>
Ribosomes	<i>Found as small dots located on the ER or in the cytoplasm.</i>	<i>Sites of proteins synthesis, they read RNA to assemble proteins.</i>	E / 13



21. Which cell is the plant cell (left or right)? *The left cell.*

22. Which structures are found **only** in the plant cell?

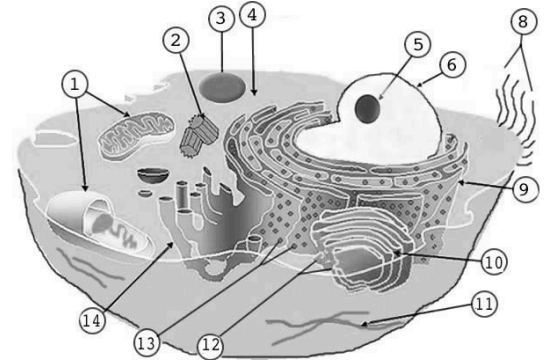
Cell wall, chloroplasts

23. Which structures are found **only** in the animal cell?

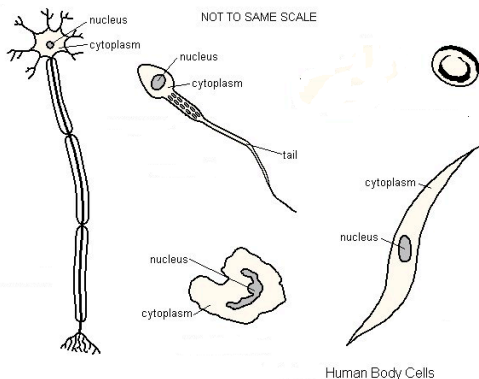
Centrioles (used in cell division)

Below are a variety of cells from the human body.

24. Label these cells. (*Red blood top right, sperm center top, WBC center bottom, muscle cell right bottom, nerve cell left.*)



25. Which cell is adapted for movement? What structure makes this movement possible? *Sperm, Flagella (tail)*



26. What organelle is very plentiful in these cells in order to provide the energy for movement? *Muscle cells, Mitochondria*

27. Which cell has no nucleus? What is the function of this cell? *Red blood cell, carries oxygen in the blood.*

28. Which cell is involved in the immune system? *WBC, center bottom*

29. Which cell helps in movement of bones? What happens in these cells to make that movement possible? *Muscle cells, mitochondria*

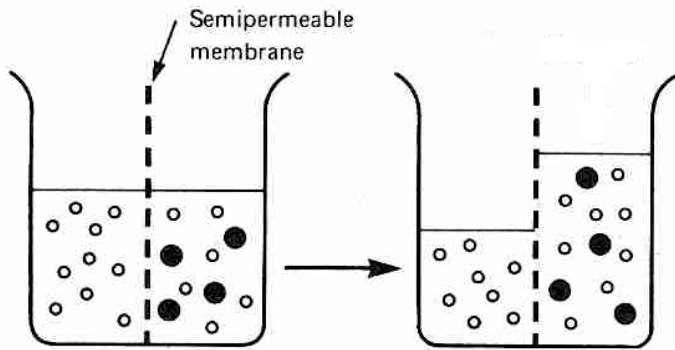
30. Which cell is adapted for transmitting messages? How do the messages get from one cell to the next? *Nerve cell, stretched out shape and neurotransmitters. Shape relates to function.*

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2.03 Investigate and analyze the cell as a living system including: maintenance of homeostasis, movement of materials into and out of cells, and energy use and release in biochemical reactions.

Chemical Bonding

31. What are **chemical bonds**? (Pages 38-39) What are the two major types?
Bonds that keep atoms together. Ionic bonds are transferred electrons between metals and non-metals and Covalent bonds are shared electrons between nonmetals.
32. Describe the relationship between **breaking and forming** bonds and the **release** or use of energy.
When a bond is broken, this releases energy. When bonds are formed, this uses energy.
33. What do the lines between chemical symbols represent? (Page 35) *+/- attraction due to electrons.*
34. Do all bonds have the same strength? Explain (Pages 38-39) *No, hydrogen bonds are the weakest with ionic bonds next. Covalent bonds are the strongest types of bonds.*
35. What are **valence electrons** and how are they involved in bonding?
They are the outermost electrons and are only used in bonding.



Explain what has happened in the diagram to the left.

36. Why did the large dark molecules NOT move to the left?
They are too large to pass through the semi-permeable membrane.
37. How is the semi-permeable membrane like a cell membrane?
Allows some substances through while keeps other out.
38. If the dark molecule is starch, where is the starch concentration greatest (left or right)? *Neither, Equal.*

39. If the white molecule is water, where is the water concentration greatest at first? *It is highest on the left.*
40. In osmosis, water moves from an area of higher concentration to an area of lower concentration. (higher/lower)
41. If the dark molecules could move, in what direction would they move? Why? *To the left, it is lower there.*
42. In diffusion, molecules move from an area of higher concentration to an area of lower concentration. (higher/lower)
43. What is **osmotic pressure**? *It is the balance between the intake and loss of water; prevents the cell from bursting.*
44. Which way **water** will move in each of the following situations:
 - a. Salt inside the cell 65% and outside the cell 40%. *Water will move inside the cell (lower.)*
 - b. Sugar inside the cell 27% and outside 80%. *Water will move outside the cell (lower.)*
45. What is **homeostasis**? *Maintaining a balance of chemicals, fluids, etc inside of a living organism.*
46. How do cells maintain homeostasis? *They use the cell membrane (cell wall in plants) as well as stimulus/response, buffers, hormones, cell organelles, and internal (positive and negative) feedback loops*

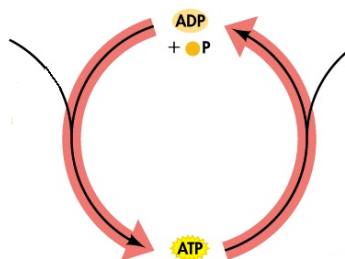
47. Comparison of active and passive transport

	PASSIVE TRANSPORT	ACTIVE TRANSPORT
Requires energy?	<i>NO</i>	<i>YES</i>
Low to high concentration or high to low concentration?	<i>High to Low</i>	<i>Low to High</i>
Examples	<i>Osmosis</i>	<i>Muscle pumps</i>

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Energy use and release in biochemical reactions.

48. Use the following diagram to show where energy is released and where energy is used. Also use arrows on the lines attached to the circles to indicate the direction of the energy.



49. How many phosphates? ATP? 3 ADP? 2 AMP? 1

50. What cellular process produces ATP?

ATP synthesis by ATP synthetase in the mitochondria

51. What is ATP energy used for? (Page 202) Give examples. *Making proteins, replicating DNA, cell responses, pumps working, muscle contraction, everything!*

2.05 Investigate and analyze the bioenergetic reactions.

52. What are the reactants and products for each of these? (Chapter 9)

Process	Reactant	Product	Example?
Photosynthesis	Water, Sunlight, Carbon Dioxide (CO ₂)	Sugar & Oxygen (O ₂)	Plants/Autotrophs/Producers
Cellular Respiration (Aerobic)	Sugar & Oxygen (O ₂)	Water, Carbon Dioxide (CO ₂), 36 ATP	Humans/Heterotrophs/ Consumers
Cellular Respiration (Anaerobic)	Sugar	Carbon Dioxide (CO ₂), 2ATP	Tired Muscles, yeast

53. Which reaction makes the most ATP? *Aerobic Respiration (Makes up to 36 ATP)*

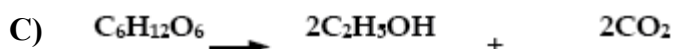
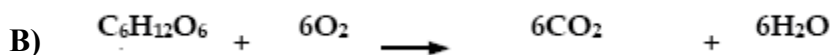
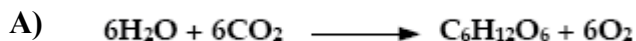
What gas is the final electron acceptor? *Oxygen*

54. How do factors such as pH, temperature, light and food availability affect these reactions?

Extremes may decrease the effectiveness of this reaction.

55. Label the following molecules in these equations

(water (H₂O), glucose (C₆H₁₂O₆) oxygen (O₂), carbon dioxide (CO₂), ethyl alcohol (C₂H₅OH))



56. Which of the above reactions is photosynthesis? A

57. Which of the above reactions is fermentation (anaerobic cellular respiration)? C

58. Which of the above reactions is cellular respiration (aerobic)? B

59. Which reaction(s) requires or stores energy? *All require some form of energy, A stores it.*

60. Which reaction(s) release energy (ATP)? *All release some form of energy, mostly B and C*

61. Which reaction releases the most energy? *B because it uses oxygen as the final electron acceptor.*

62. Which reaction requires chlorophyll? *A, chlorophyll traps light energy for photosynthesis.*

Which reaction requires light? *A, light begins the light dependent reaction for photosynthesis.*

63. Which organisms carry out process A? *Plants, Autotrophs and other Producers (Algae)*

64. Which organisms carry out process B? *Most Animals, Heterotrophs and Consumers*

65. Which organisms carry out process C? *Yeast and other anaerobic organisms.*

66. Which process uses chloroplasts in eukaryotes? *Process A only. (Plant Cells)*

67. Which process uses mitochondria in eukaryotes? *Processes A and B (Plant and Animal Cells)*

69. Compare and contrast: **Alcoholic Fermentation and Lactic Acid Fermentation.** (# ATP, where it occurs)

Alcoholic Fermentation occurs in yeast and releases alcohol as a byproduct whereas lactic acid fermentation occurs in tired muscle cells deprived of oxygen resources. Both produce only 2 ATP.

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2.04 Investigate & describe the structure & function of enzymes & explain their importance in biological systems.

70. What is the function of enzymes in cells? (Or, what is a **catalyst**?) (Pages 51-55)

Enzymes speed up chemical reactions in cells by lowering the activation energy needed to begin the reaction.

71. Explain the importance of shape to enzyme function. "Work like *locks and keys*."

72. Explain what determines the shape of an enzyme. It depends on the sequence of *amino acids*.

73. Explain why enzymes are specific. (That is, one enzyme per type of reaction.)

Since they work like locks and keys only one enzyme can catalyze one type of substrate(s).

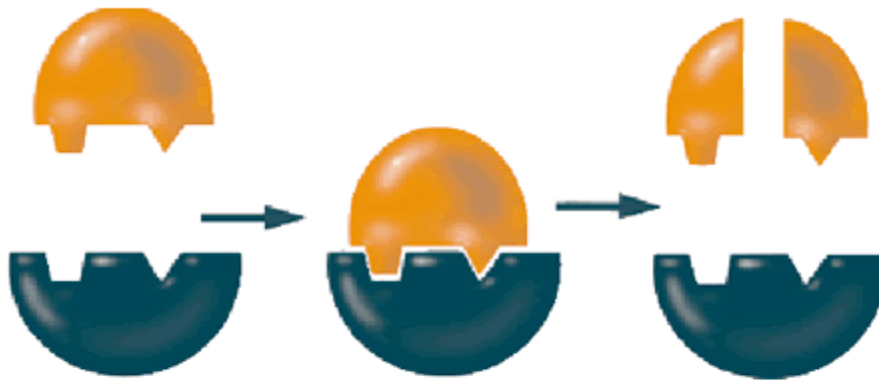
74. Explain why enzymes can be reused over and over again.

Since enzymes are never used up by the reaction, they go out and search for the same type of substrate(s) to catalyze again.

75. How do extreme pH and temperature extremes affect enzymes? (What is **denature**?)

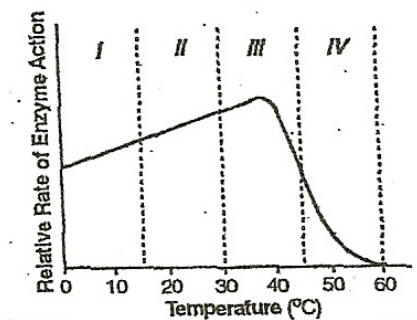
Extreme temperature and/or pH can cause enzymes to denature and no longer function. Denature means that an enzyme literally falls apart (breaks down their bonds) and they cannot be put back together again unless made anew by a ribosome and a piece of mRNA specific for that particular enzyme.

76. Label the picture of the following enzymatic reaction: *Substrate, Product(s), Enzyme-substrate complex, Enzyme*



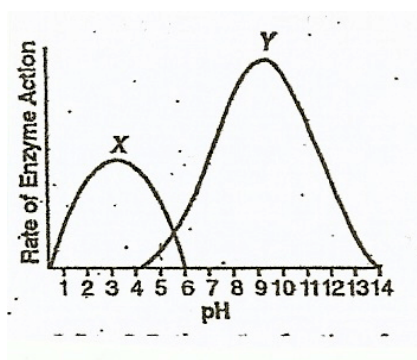
Substrate is far left top, Products far right top, enzyme substrate complex is center, enzyme (blue) is same below.

All (save for a few) enzymes end in what suffix? *-ase* What are some examples of enzymes? *Lactase, Sucrase, Fructose, ATP synthetase*



77. At what temperature is the best for this enzyme to work? *About 40 C*
How can you tell? *It is where the graph peaks for enzyme reaction (III)*

78. At which numeral (I, II, III, or IV) does this particular start to denature? *IV*
How can you tell? *The enzyme begins to denature at the end of III where the graph falls and finally drops off (fully denatures) at IV.*



79. Which enzyme (X or Y) would be used in acidic conditions? *X*
How can you tell? *Because the enzyme works best at pH below 7. Y has no peaks whatsoever in the 0-6 range. It works best in basic conditions.*

80. What pH is the best for activity for X? *3-4* Y? *8-11*
How can you tell? *It is where the graph peaks for their activity.*