

Invertebrate Zoology

Unit 1: Animal Development, History of Inv, Scientific Method, and Classification of Organisms

Objective 1: Explain the general properties of living things and systems

Students should be able to:

- 1) Identify and explain the requirements for something to be considered alive
- 2) Explain the 4 types of biomolecules (carbohydrates, proteins, lipids, and nucleic acids)
- 3) If given an object, such as fire, be able to explain why it is or is not considered to be alive.

How to study:

a) Read Pages: 4-11

b) Understand vocabulary terms:

-metabolism: The essential chemical processes of making and using energy to maintain life. It includes digestion, respiration, and the synthesis of molecules and structures.

-Physiology: The study of complex metabolic functions. Basically, the study of how our body works.

-genetic code: The correspondence between the sequence of bases in DNA and the sequence of amino acids in a protein.

-DNA: a very long, linear chain of subunits called nucleotides, each of which contains a sugar phosphate (deoxyribose phosphate) and one of four nitrogenous bases (adenine, cytosine, guanine, or thymine, abbreviated A, C, G, and T, respectively).

-Heredity: The passing of traits from parents to offspring.

-Variation: is the production of *differences* among the traits of different individuals.

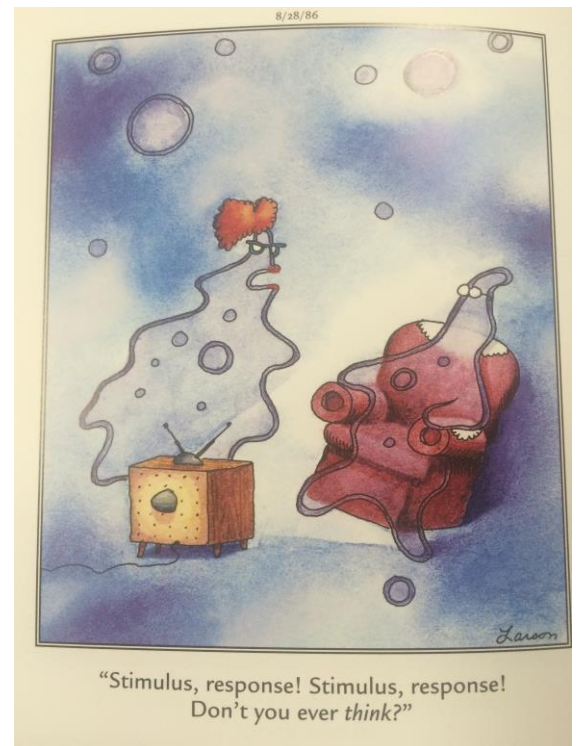
-Proteins: A large complex polymer composed of carbon, hydrogen, oxygen, nitrogen, and sometimes sulfur. They provide structure for tissues and organs and carry out cell metabolism.

-Enzyme: A protein that functions as a biological catalyst and accelerates the rate of a biochemical reaction by reducing the required activation energy of the reaction while remaining unchanged by the reaction.

-Lipids: Large biomolecules that are made of mostly carbon and hydrogen with small amount of oxygen. Fats, oils, waxes, and steroids are all lipids.

-Nucleic Acids: A complex biomolecule that stores cellular information in the form of a code. They are polymers made of smaller subunits called nucleotides. A nucleotide consists of a sugar deoxyribose, a phosphate group, and a nitrogenous base.

-Carbohydrates: A biomolecule composed of carbon, hydrogen, and oxygen with a ratio of about two hydrogen atoms and one oxygen atom for every carbon atom. They are types of sugars.



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-Monosaccharide: A monomer of a carbohydrate molecule, of known as a simple sugar like glucose or fructose, or ribose.

$C_6H_{12}O_6$

-Disaccharides: Two-sugar carbohydrate. Sucrose (table sugar) is a combination between glucose and fructose

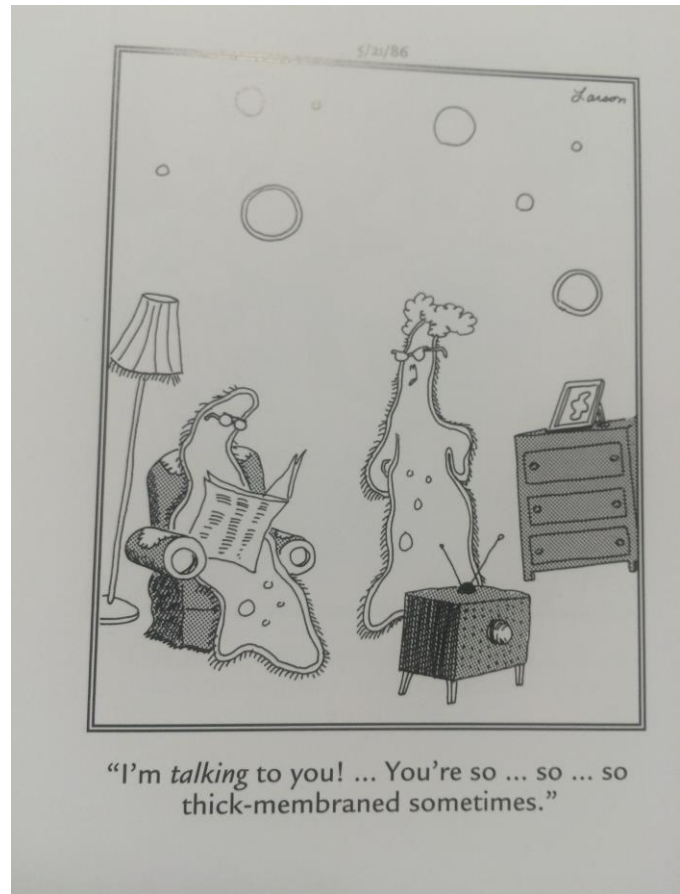
-Polysaccharides: Composed of many monosaccharide's subunits. Starch, glycogen, and cellulose are examples of polysaccharides. They serve as storage of energy for our cells.

Macromolecule: A large molecule (polymer) composed of many smaller organic molecules called monomers. There are four types of biological macromolecules: proteins, carbohydrates, lipids, and amino acids.

Ecology: The study of organismal interaction with an environment.

c) Complete, review, and understand the homework assignments on MyBigCampus: Assignment 1

d) Understand the following notes: Zoology and Life Notes



Objective 2: Differentiate between the characteristics of eukaryotic and prokaryotic cells (including cyanobacteria).

Students should be able to:

- 1) Explain the characteristics of eukaryotic and prokaryotic cells
- 2) Give examples of each type of cell
- 3) Explain how those cells function differently because of the different structures inside them.
- 4) Explain the evolutionary history of the types of cells.

How to study:

a) Read Pages: 10-11; 32-35

b) Understand vocabulary terms:

-Nucleus: The brain of the cell. It controls all the directions of the cell. Contains DNA which is the genetic or nuclear material.

-Prokaryotic cell (prokaryote): A single celled organism that lacks a membrane-bound nucleus and membrane-bound organelles and has a nucleoid region in the cytoplasm containing a single, circular molecule of DNA.

-Eukaryotic cell (eukaryote): A single-celled or multi-celled organism containing cells with a membrane-bound nucleus and usually other specialized membrane-bound organelles.

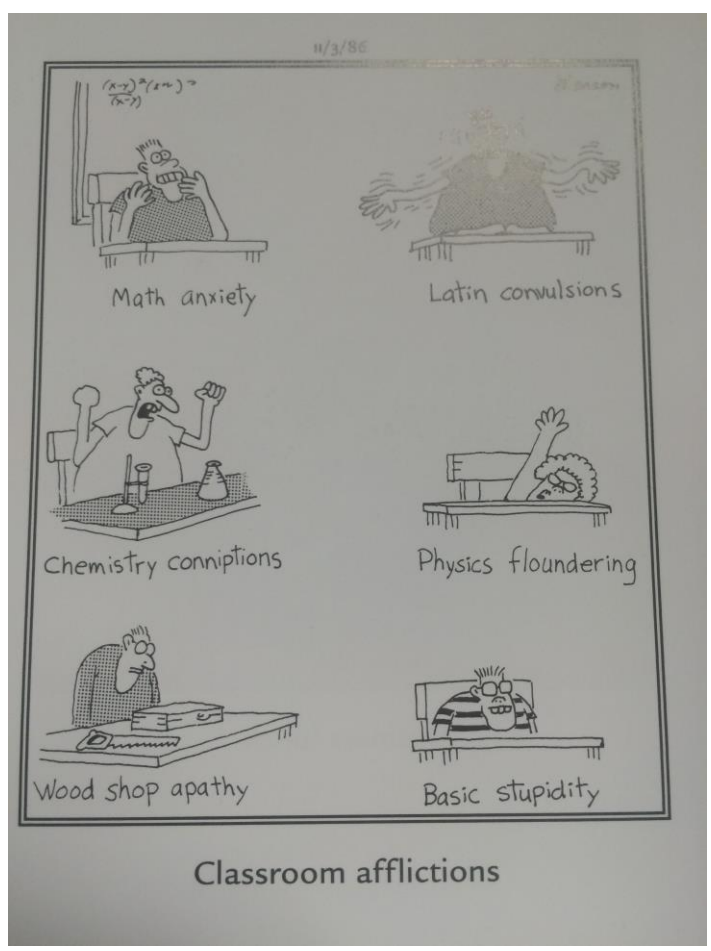
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- Ribosomes: Make proteins
- Cell membrane: Composed of a bilayer (two layers) of phospholipids. Also it has embedded in it proteins which help move particles in and out of the cell.
- Cell wall: composed of a dense carbohydrate called cellulose. It surrounds some cells and gives them protection and support. Found in plant cells and some bacteria. Not found in animal cells.
- Chloroplasts: The site of photosynthesis. They contain the pigment chlorophyll in disc like structures called thylakoids. Found in plant cells and some bacteria. Not found in animal cells.
- Organelle: Membrane-bound structures that perform specialized functions within a cell.

- c) Know these diagrams: Figure 1.10 Pg 11; Fig 2.19 Pg 33; Fig 2.20 Pg 34;
- d) Understand the following notes: Zoology and the Study of Life Notes
- e) Complete, review, and understand: MBC assignment 1

Objective 3: Describe the steps of the scientific method and the variables in an experiment



Students should be able to:

- 1) Describe the steps of the scientific method.
- 2) List the experimental controls.
- 3) Summarize methods used to communicate scientific data (graphs, charts, tables).
- 4) Construct and conduct a scientific experiment.
- 5) List the experimental variables (dependent and independent).

How to study:

- a) Read Pages: Pg 11-14
- b) Understand vocabulary terms:
 - Observation: The noticing of an event or problem and questioning what makes it do that.
 - Hypothesis: An explanation for a question or a problem that can be formally tested.

-Experiment: An investigation that tests a hypothesis by the process of collecting information under controlled conditions.

-Data: The information collected from an experiment

-Conclusion: The analysis and summary of the results of an experiment. It accepts or rejects the hypothesis. It can also suggest a new hypothesis.

-Scientific method: a set of steps to gather and answer questions.

-Theory: An explanation of a natural phenomenon that is supported by a large body of evidence

-Law: Generally accepted principles, which are known to be true.

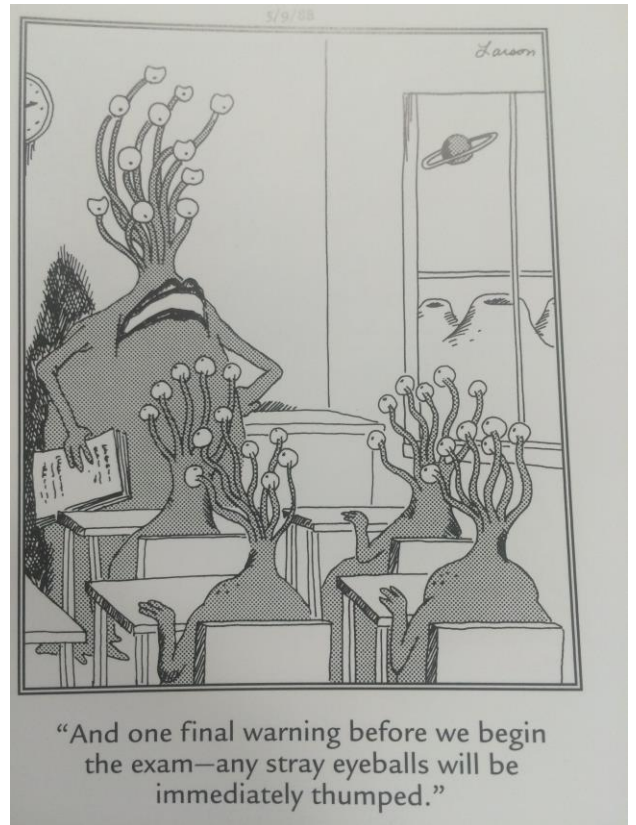
Controlled experiment: A set of standards to which you compare your results. It shows if the dependent variable did anything.

Dependent variable: The effect, which is supposed to happen because of the independent variable. It is what is measured. Example: Rain from clouds.

Independent variable: The variable being tested because it believed it will have an effect. Clouds

-Conclusion: The analysis and summary of the results of an experiment. It accepts or rejects the hypothesis. It can also suggest a new hypothesis.

-Hypothesis: An explanation for a question or a problem that can be formally tested.



c) Complete, review, and understand MBC Assignment 2 and 3.

d) Understand the following notes: Scientific Method Notes

Objective 4: Explain the steps from the fertilization of an egg to the development of a blastula.

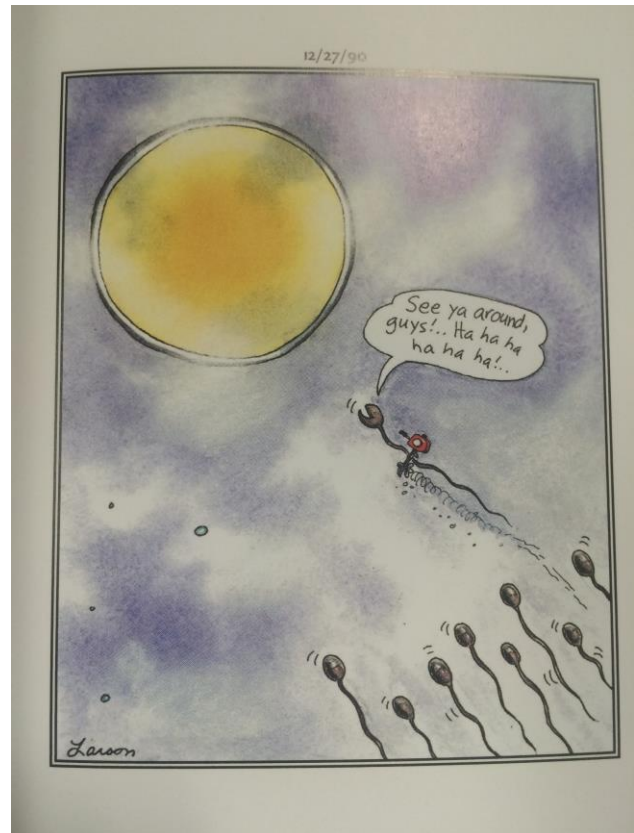
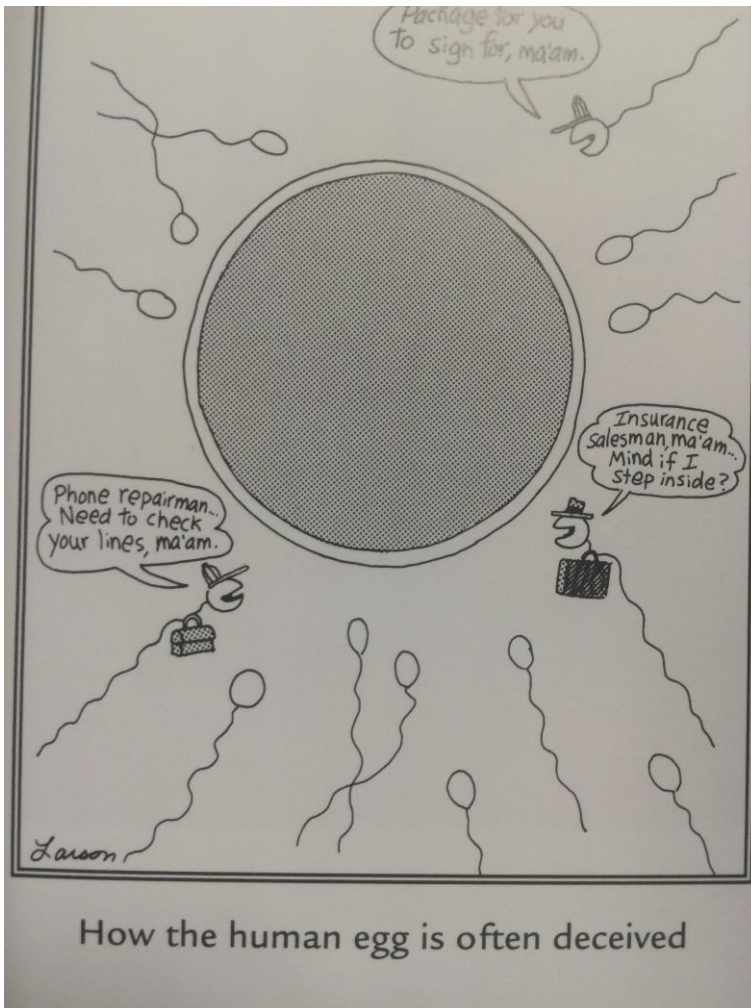
Students should be able to:

- 1) Explain the events which occur during fertilization to create a zygote.
- 2) Describe what prevents too many sperm from fertilizing an oocyte (egg).

How to study:

- a) Read Pages: (Chapter 8: 160-162)
- b) Understand Vocabulary Terms:

- Zygote: A fertilized egg (oocyte).
- Sperm: The male sex gamete



- Oocyte: The female sex gamete
- Gamete: The sex cell produced by an organism (sperm or egg).
- Fertilization: The union of male and female gametes to form a zygote.
- Polyspermy: The entrance of more than one sperm into an oocyte (egg).
- Fast block: The first sperm with the egg membrane is instantly followed by an electrical potential change in the egg membrane. This electrical potential change prevents additional sperm from fusing with the egg membrane.
- Cortical reaction: Following fast block, thousands of enzyme-rich cortical granules located just beneath the egg membrane, fuse with the membrane and their contents into the space between the egg membrane and the overlying vitelline envelope. The cortical reaction creates an osmotic gradient, causing water to rush into this

space, elevating the envelope and lifting away all sperm bound to it, except for the one sperm which has successfully fused with the egg membrane.

- Blastula: Hollow fluid filled ball of cells.

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-Blastomere: During cleavage the embryo divides repeatedly to convert the large, unwieldy cytoplasmic mass into a large cluster of small, maneuverable cells.

-Cleavage: The division of cells after the process of mitosis (cell replication).

c) Know these diagrams: Figure 8.4 Pg 161; Fig 8.6 Pg 162

d) Understand the following notes: Development of Embryos Notes

e) Complete, review, and understand MBC assignment 4.

Objective 5: Differentiate between protostome and deuterostome development.

Students should be able to:

- 1) Explain the symmetry of protostomes and deuterostomes.
- 2) Describe the type of cleavage for protostomes and deuterostomes
- 3) Explain how the openings are created and their location for protostomes and deuterostomes

How to study:

a) Read Pages: Pg 166-170

b) Understand vocabulary terms:

-Protostomes: have spiral determinate cleavage. In spiral cleavage, planes of cell division are diagonal to the vertical axis of the embryo. Mollusks, annelids, arthropods, and several other phyla represent one line called protostomes.

-Determinate cleavage rigidly casts the developmental fate of each embryonic cell very early.

-Deuterostomes have radial, indeterminate cleavage. Echinoderms, chordates and some other phyla represent deuterostomes.

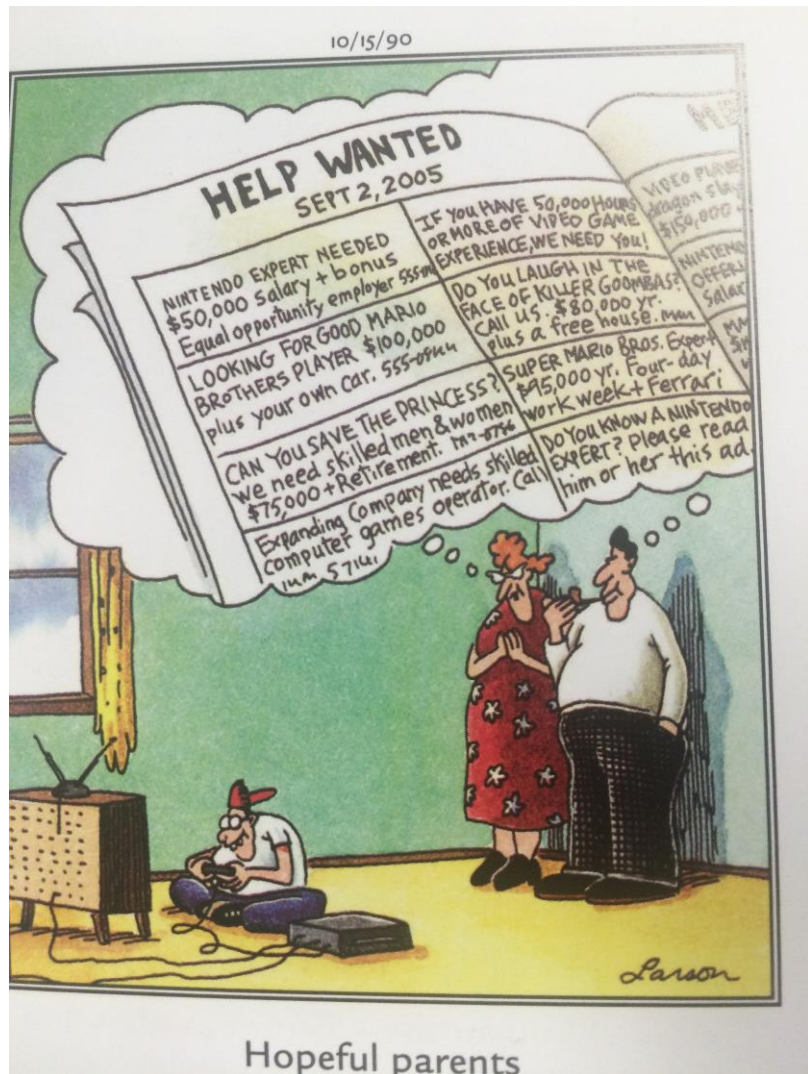
-Radial cleavage is where the planes are either parallel or perpendicular to the vertical axis of the egg.

-Indeterminate cleavage means that each cell produced by early cleavage divisions retains the capacity to develop into a complete embryo. (Twins e.g.)

c) Know these diagrams: Figure 8.10 (Pg 165)

d) Understand the following notes: Development of Invert Structures Notes

e) Complete, review, and understand: MBC assignment 4



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Objective 6: Differentiate the germ layers for protostome and deuterostomes.

Students should be able to:

- 1) Explain the three types of germ layers (ectoderm, endoderm, and mesoderm)
- 2) Describe what these germ layers develop into for complex organisms
- 3) Identify their location in the formation of a blastula and how they develop.

How to study:

a) Read Pages: 164-169

b) Understand vocabulary terms:

-Endoderm: the inner layer cells lining the gut. This layer develops into the digestive system.

-Ectoderm: The outer layer of cells surround the blastula. This layer develops into the skin and nervous system.

-Mesoderm: The middle layer of cells which lies between the ectoderm and the endoderm. This layer develops into the muscles, circulatory system, excretory system, and in some animals, the respiratory system. In protostomes, the mesoderm forms from cells that break away from the endoderm near the opening of the gastrula. In deuterostomes, the mesoderm forms from pouches of endoderm cells on the inside of the gastrula.

Gastrula: A structure made of two layers of cells with an opening at one end.

Blastula: A cell-covered, fluid filled, hollow ball of cells.

Coelom: a body cavity completely surrounded by mesoderm. It becomes a gut cavity for the digestive system.

c) Know these diagrams: Figure 8.9 Pg 164; Figure 8.10 Pg 165

d) Understand the following notes: Development of Invert structure notes

e) Complete, review, and understand: MBC assignment 4

Objective 7: Describe the various animal body plans including plans developed from mesoderm.

Students should be able to:

1) Describe the differences between asymmetry, spiral symmetry, radial symmetry, and bilateral symmetry.

2) Identify organisms which demonstrate each type of symmetry.

3) Explain the differences between coelomates, pseudocoelomates, and acoelomates. Give an example of each type.

How to study:

a) Read Pages: 164-170

b) Understand vocabulary terms:

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- Asymmetry: an organism that does not have organized structures which can be divided into equal halves. Example: Sponge
- Radial Symmetry: Organisms with radial symmetry can be divided along any plane, through a central axis, into roughly equal halves. Example: Jellyfish or Hydra
- Bilateral Symmetry: Organisms with bilateral symmetry can be divided down its length into similar right and left halves. They can only be divided along one plane. Example: Butterfly.
- Coelomate: An organism with a fluid filled body cavity completely surrounded by mesoderm. It becomes a gut cavity for the digestive system. They have a complete digestive system. Example: Earthworm.
- Pseudocoelomate: An organism with a fluid-filled body cavity partly lined with mesoderm. They develop an incomplete gut or incomplete digestive system. Example: Roundworm.
- Acoelomate: An organism with no gut cavity or digestive system. Example: Sponge or Flatworm.

c) Know these diagrams: Figure 8.9 Pg 164; Figure 8.10 Pg 165

d) Understand the following notes: Development of Invert structure notes

e) Complete, review, and understand: MBC assignment 4

Objective 8: Explain the various taxonomic groups and what they represent.

Students should be able to:

- Describe the various taxa for classifying organisms.
- Explain the meaning of a scientific name
- Describe how evolutionary relationships are determined
- Compare the six Kingdoms of organisms
- Explain how cladistics reveal phylogenetic relationships

1) Read Pgs: 443-459 (USE Chapter 17 from the Biology textbook) PDF is on MBC.

2) Vocabulary Terms to Know:

Taxonomy: the branch of biology that groups and names organisms based on their different characteristics.

Classification: the grouping of objects or information based on similarities.

Binomial nomenclature: two word naming system for organisms

Genus: a group of similar species. It is the first word in the two word naming system. The first letter is capitalized.

Species or specific epithet: the second word which sometimes describes a characteristic of the organism. The word is always lower case.

Taxa (taxon is singular): The classification system of organisms: they include domain, kingdom, phylum, class, order, family, genus, species (specific epithet).

Cladistics: The use of cladograms to show evolutionary relationships. A cladogram uses the derived traits of a modern species and show traits from ancestral species.

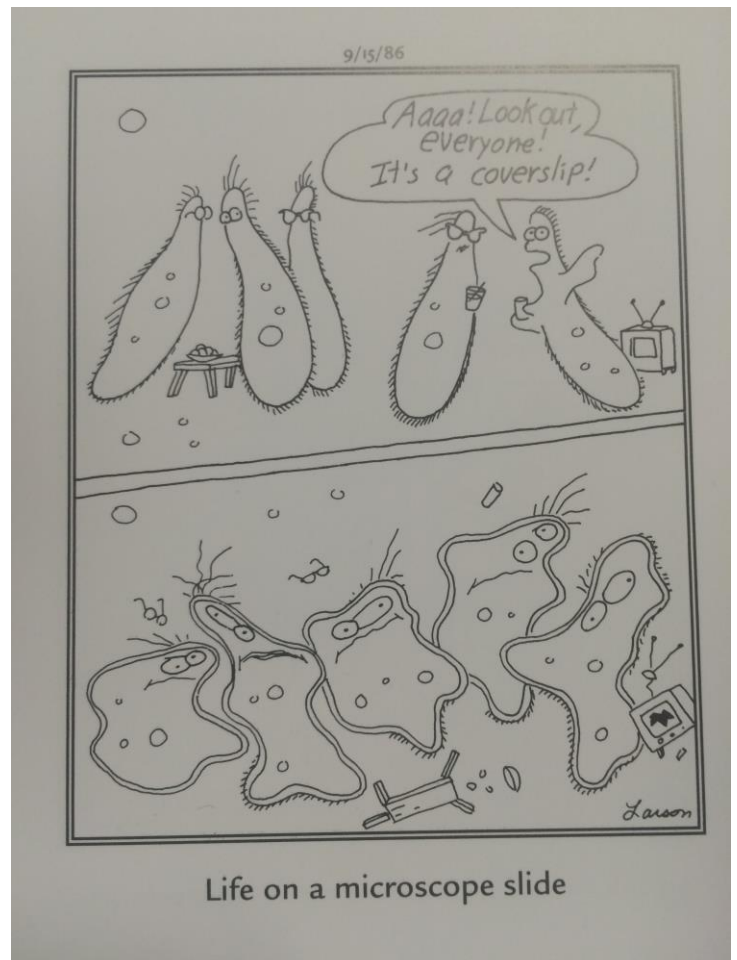
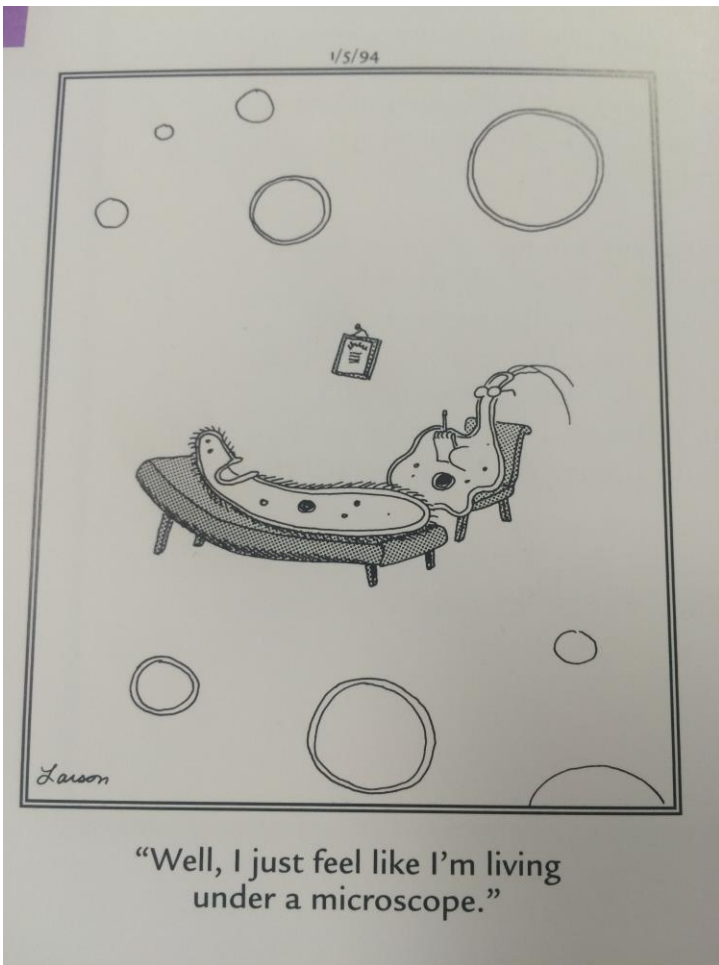
Phylogeny: The evolutionary history of a species.

c) Know these diagrams: Figure 1.14 Pg 17

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d) Understand the following notes: Classification and Taxonomy Notes



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