

2017 Biology Keystone Review MODULES 1 and 2

Aligned to Holt Biology Textbook (Polar bear) 2004 Chapters 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 15, 16, 17

February 2017

Office of Curriculum, Instruction, and Assessment
Lubomyr Konrad (science@philasd.org)

Dear Teachers,

This is a review guide for the Keystone Biology Exam aligned to the 2004 Holt Biology Textbook. It is purposefully abbreviated so as to minimize paper use when copying. We encourage you to construct accompanying scaffolds or apply graphic organizers in order to assist students in reviewing the content. It is not the intention that this be used as the sole reference for Keystone Biology preparation.

This guide is issued in PDF and DOC.X so that it may be edited per your discretion. Many of the JPEGs embedded in the document can be enlarged in order to see the pictures more clearly.

Many thanks to Emily McGady, the author of this concise document.

Teacher Strategy Suggestion

Use the QAR questioning strategy (“Question Answer Relationship”). It engages students by prompting them to think: is the answer in the book, or, in their head (inference).

If you say, “This is an ‘in the book’ question,” or, “This is an ‘in the video’ question,” then students know to explicitly seek it in the book or listen for it. If you say, “This is an ‘in your head’ question,” then you prompt students to make inferences.

Create a habit of saying, “IN THE BOOK,” OR, “IN YOUR HEAD,” and students will learn when to go to the text and when to make inferences. After some time, you will be able to gradually release them so they can apply the strategy without your guidance.

2017 Biology Keystone Review – MODULES 1 and 2

Holt Biology Textbook (Polar bear) 2004

Chapters 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 15, 16, 17

Directions: On a sheet of paper, write any important information about each topic. Be sure to underline the term/concept and include definitions, explanations, and diagrams, that are relevant.

Remember, the more thorough your notes are, the better prepared you will be ☺

MODULE 1 – CELLS AND CELL PROCESSES

Chapter 1: Introduction to Biology: Biology and You

Scientific Method
 Independent and Dependent Variable
 Control and Experimental Group
 Observation, Prediction, Inference
 Hypothesis, Theory, Inference, Law
 Characteristics of Life: Cells, Reproduction (Asexual, Sexual)
 Metabolism, Homeostasis, Heredity, Genes, Mutation, Genome, Gene therapy, Evolution, species, Natural selection, Ecology

Chapter 2: Chemistry: Sections 1 and 2

Structure and Function of the Atom
 Elements, Compounds and Mixtures
 Ions, Ionic and Covalent Bonds
 Polar vs. Nonpolar
 Hydrogen Bond
 Properties of Water: Surface Tension, Adhesion, Cohesion, Capillary Action, high specific heat
 pH: acids and bases
 Solution

Chapter 2: Biochemistry: Section 3 and 4

Organic vs. Inorganic Compounds
 The Characteristics and Importance of Carbon
 Monomers vs. Polymers
 Dehydration Synthesis /Condensation Reaction vs. Hydrolysis
 Function, Elements, Monomers, Polymers, Structure (FEMPS) of Carbohydrates, Lipids, Proteins and Nucleic Acids
 Monosaccharides, Fatty Acids, Amino Acids and Nucleotides
 ATP: name and structure
 Enzymes: substrate, active site, product
 Catalysts, Activation energy
 Factors affecting enzymes: pH, temp, Exothermic and Endothermic Reactions

Chapter 3: Cell Structure

Parts of the Microscope
 Resolution and Magnification
 The Cell Theory
 Structure and Functions of the Cells
 Structure and Function of the Cell Membrane
 Prokaryote vs. Eukaryotes
 Unicellular vs. Multicellular
 Bacteria vs. Plants vs. Animals
 Protein Synthesis and Transport
 Cells-Tissues-Organs-Organ system

Chapter 4: Diffusion, Osmosis and Other Forms of Transport

Homeostasis
 Passive vs. Active Transport Diffusion vs. Osmosis
 Equilibrium vs. Concentration Gradient Hypertonic, Hypotonic, Isotonic
 Carrier/ transport proteins, vesicles
 Facilitated Diffusion, Active Transport & Sodium-Potassium Pump
 Endocytosis vs. Exocytosis

Chapter 5: Photosynthesis and Cellular Respiration

Autotrophs, Heterotrophs, Decomposers
 Food Chain, Food Web
 ATP
 Photosynthesis vs. Cellular Respiration: equations, reactants and products
 Chlorophyll, Chloroplast, Mitochondria
 Factors that Affect Photosynthesis
 Aerobic vs. Anaerobic Respiration
 Fermentation

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Chapters 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 15, 16, 17

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MODULE 2 – CONTINUITY AND UNITY OF LIFE

Chapter 6: Chromosomes, Cell Cycle and Mitosis

Chromosomes, Chromatids, Chromatin

Centromere

Diploid vs. Haploid

Zygote

Autosomes vs. Sex Chromosomes

Karyotype

The Cell Cycle

Mitosis: IPMAT vs. Cytokinesis

Spindle Fibers

Chapter 7: Meiosis and Sexual Reproduction

Gametes vs. Somatic cells

Mitosis vs. Meiosis

Asexual vs. Sexual Reproduction

Crossing Over

Independent Assortment

Binary Fission, Budding and Fragmentation

Chapter 8: Genetics

Dominant vs. Recessive

Phenotype vs. Genotype

Homozygous vs. Heterozygous

Mendel's Laws of Segregation

Independent Assortment

Dominance vs. Recessiveness

Test Cross and Punnet Squares

Monohybrid vs. Dihybrid

Sex-linked

Polygenic, Multiple allele

Complete dominance vs. Incomplete vs. Co-dominance

Chapter 9 and 10: DNA, RNA and Protein Synthesis

Double Helix vs. single strand (DNA vs. RNA)

Nucleotides (difference between DNA vs. RNA)

Deoxyribose vs. Ribose

DNA vs. RNA

mRNA, tRNA, rRNA

Codon vs. Anticodon

Amino Acids vs. Nucleotides

Ribosomes

Base-pairing Rules

Replication

RNA transcription

Protein Synthesis/Translation

Chapter 11: Gene Technology

Genetic engineering

Recombinant DNA

Restriction enzymes

Vector

Plasmid

Electrophoresis

Human Genome project

Vaccine

DNA Fingerprinting

Benefits vs. Risks in GE and GM foods

Chapter 13: Evolution

Evolution, Natural Selection

Adaptation

Reproductive Isolation

Evidence: DNA/Protein,

Embryonic, Fossils,

Vestigial & Homologous Structures,

Divergence, speciation, subspecies

Chapter 15, 16, 17: Ecology

Food- Chains, Webs & Pyramids

Organisms, Population,

Community, Ecosystem,

Biosphere

Biotic and Abiotic Factors

Predation, Mutualism,

Parasitism and Commensalism

Water, Carbon, Oxygen and

Nitrogen Cycle

How ecosystems respond to change

Limiting Factors on Populations

Scientific Method/Introduction to Chemistry Study Guide

To prepare for the test (and ultimately for keystones)

- Write down as much information as possible for each of the topics below on a separate piece of loose leaf. Then staple the sheet to this paper.
- Feel free to use the images below to further your understanding.
- Next, there is an additional assignment on the back side of this paper to complete online.

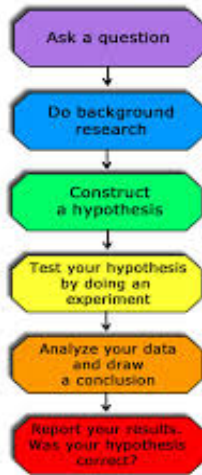
Chapter 1: Introduction to Biology: Biology and You (BIO A.1, BIO B.3, BIO B.4)

Scientific Method
 Independent and Dependent Variable
 Control and Experimental Group
 Observation, Prediction, Inference
 Hypothesis, Theory, Inference, Law
 Characteristics of Life: Cells, Reproduction (Asexual, Sexual)
 Metabolism, Homeostasis, Heredity, Genes, Mutation, Genome, Gene therapy, Evolution, species, Natural selection, Ecology

Chapter 2: Chemistry: Section 1 and 2 (BIO A.2)

Structure and Function of the Atom
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 Hydrogen Bond
 Properties of Water: Surface Tension, Adhesion, Cohesion, Capillary Action, high specific heat
 pH: acids and bases
 Solution

The Scientific Method

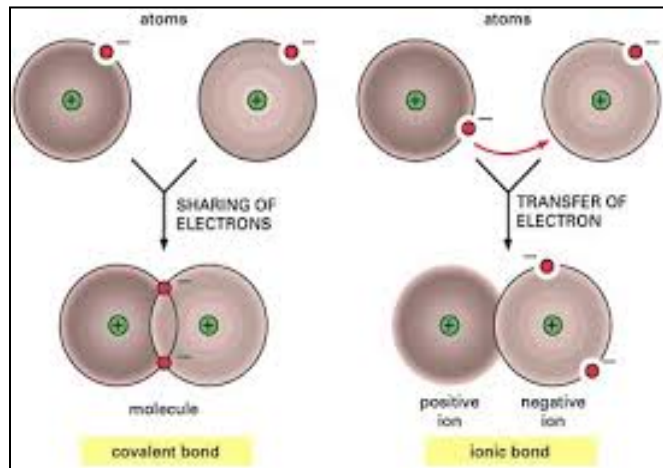
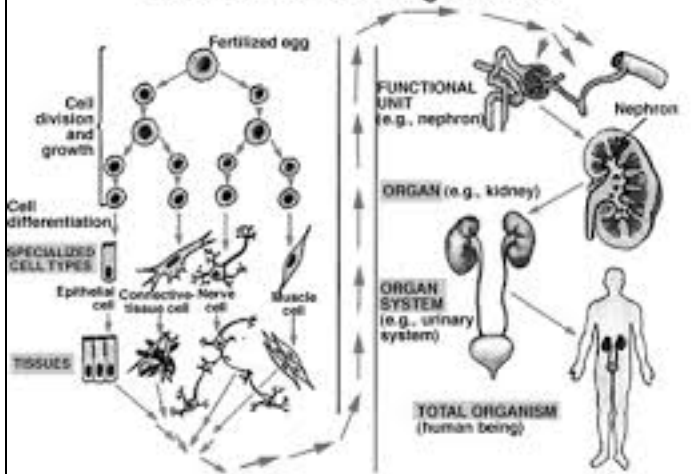


Life!!!!

All living things share some basic properties.

- ✓ Cellular Organization
- ✓ Reproduction
- ✓ Metabolism (Obtain and Use Energy)
- ✓ Homeostasis
- ✓ Heredity
- ✓ Responsiveness
- ✓ Growth and Development
- ✓ Adapt Through Evolution

Levels of Cellular Organization



Please watch the following [link](#) (see link below) and answer the questions:

1.

1. Which of the following statements accurately describe ice:

I. Ice is denser than water.

II. Hydrogen bonds hold ice molecules closer together than they do liquid water molecules.

III. Ice floats on water.

I

III

II and III

I, II and III

I

2.

3. Which of the following concepts help explain why water can travel up a narrow tube?

I. Cohesion

II. Adhesion

III. Specific Gravity

I and II

I, II and III

I

II

III

3.

2. Which of the following properties helps explain why a city near the Pacific Ocean experiences less dramatic changes in temperature during the day compared to a city farther inland?

I. Water forms hydrogen bonds.

II. Water has a low specific heat.

III. Water has high surface tension.

III

I and II

I and III

I

II

Biochemistry/Cell Characteristics Study Guide

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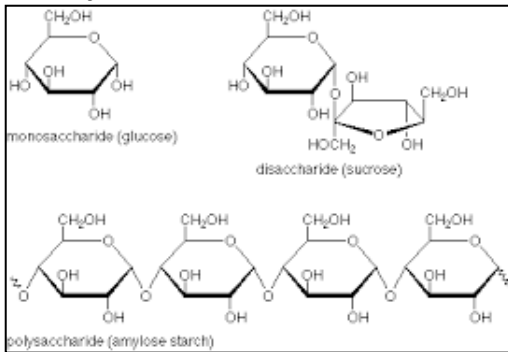
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Organic vs. Inorganic Compounds
 The characteristics and importance of carbon
 Monomers vs. Polymers
 Dehydration Synthesis /Condensation Reaction vs. Hydrolysis
 Function, Elements, Monomers, Polymers, Structure
 Monomers & Polymers of: Carbohydrates, Lipids, Proteins and Nucleic Acids
 Monosaccharides, Fatty Acids, Amino Acids and Nucleotides
 ATP: name and structure
 Enzymes: substrate, active site, product
 Catalysts, Activation energy
 Factors affecting enzymes: pH, temp,
 Exothermic and Endothermic Reactions

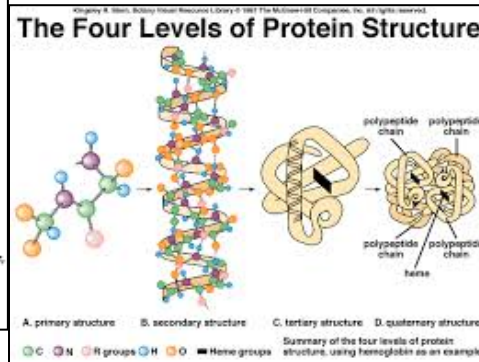
Chapter 3: Cell Structure

Parts of the Microscope
 Resolution and Magnification
 The Cell Theory
 Structure and Functions of the Cells
 Structure and Function of the Cell Membrane
 Prokaryote vs. Eukaryotes
 Unicellular vs. Multicellular
 Bacteria vs. Plants vs. Animals
 Protein Synthesis and Transport
 Cells-Tissues-Organs-Organ system

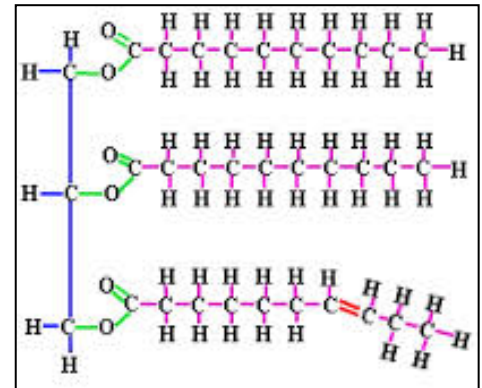
Carbohydrates:



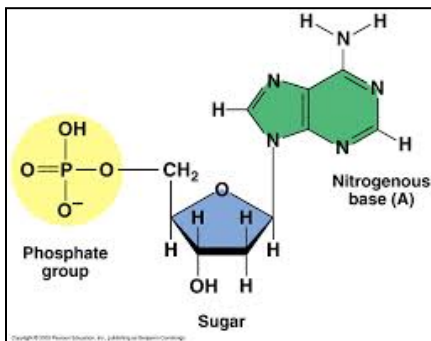
Proteins:



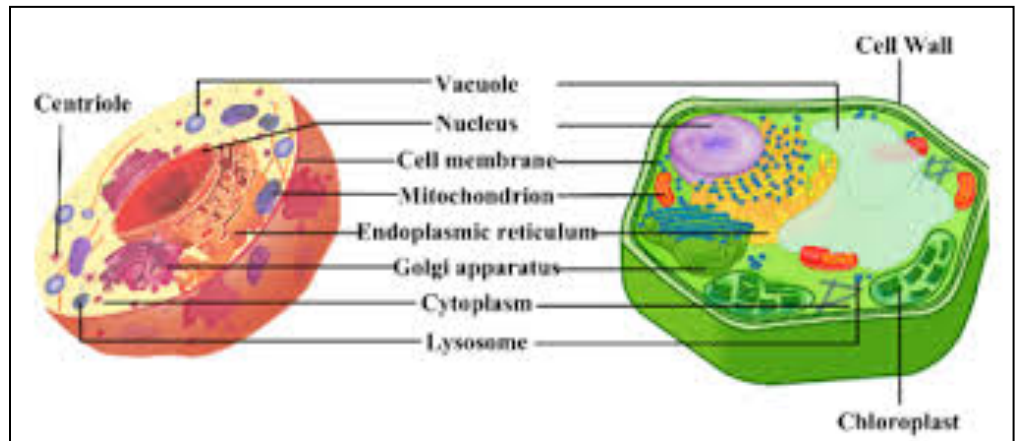
Lipid:



Nucleic Acid:



Animal v. Plant cell

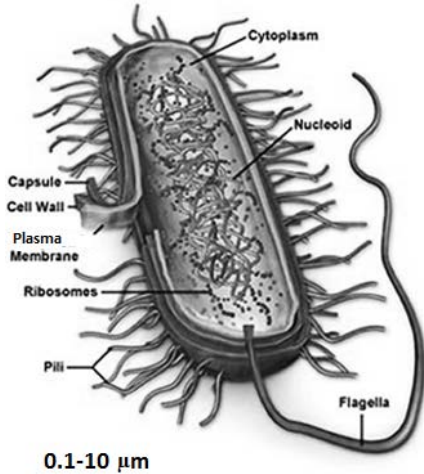


Cell Structure: Prokaryotes and Eukaryotes

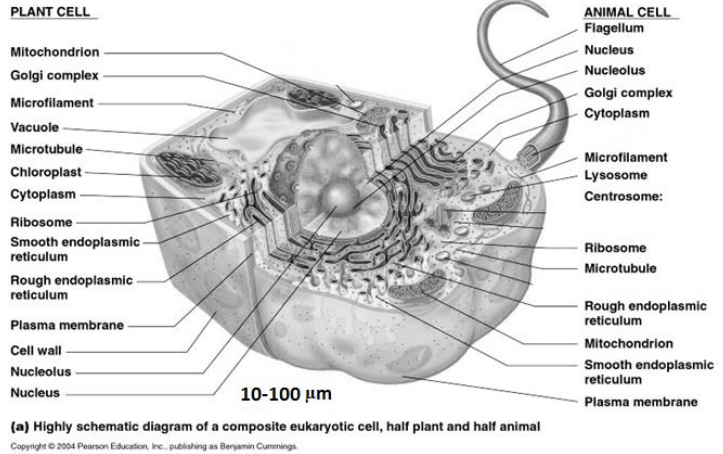
What's the Difference?

Look at the two drawings of prokaryotes and eukaryotes; discuss with your partner the similarities and differences between the two cells.

Prokaryote:



Eukaryote (note: this drawing shows half a plant cell and half an animal cell):



List the five parts that Prokaryotes and Eukaryotes both have:

1. _____
2. _____
3. _____
4. _____ (with just *Plant Eukaryotes*)
5. _____ (with just *Animal Eukaryotes*)

Do Prokaryotes have a nucleus? _____

Which is more complex, Eukaryotes or Prokaryotes? _____

Which is larger? _____

Why are cells named that way?

From Greek words...

EU means _____. PRO means _____. KARY means _____.

Eukaryote = _____; Prokaryote = _____.

All cells have _____, in eukaryotes it is stored in the _____.

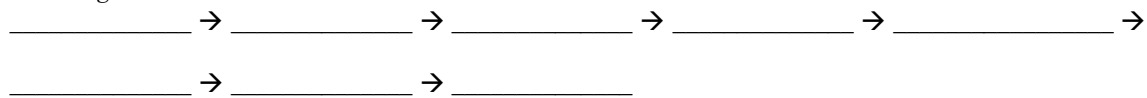
Prokaryotes don't have a nucleus, and it floats around in the cytoplasm in an area called a _____. Only eukaryotes have _____.

Test Yourself: Which type has....? Place a check or X in the table below if the statement is true for each cell type.

Statement	Prokaryotic	Eukaryotic
1. Have a nucleus		
2. Have membrane-bound organelles		
3. Contain genetic material (DNA)		
4. Can be single or multi-celled		
5. Can only be single-celled.		
6. Have a plasma membrane and cytoplasm		

Hierarchy (organization) of Life:

Starting from an atom...



Review from previous lecture:

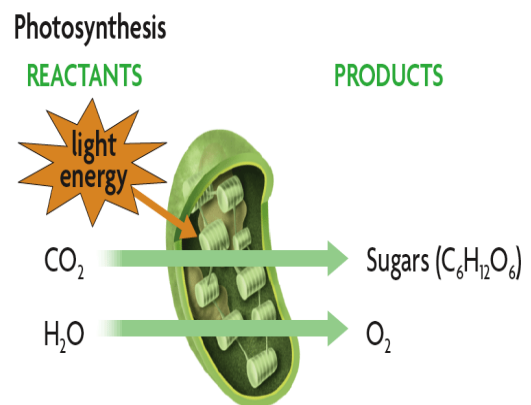
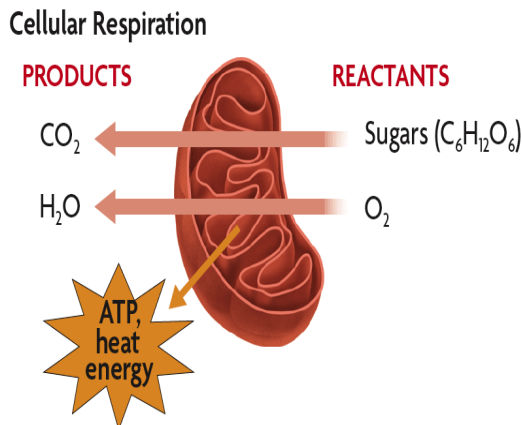
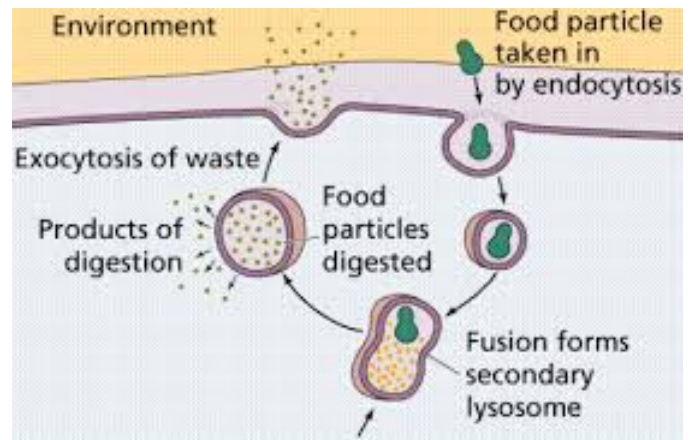
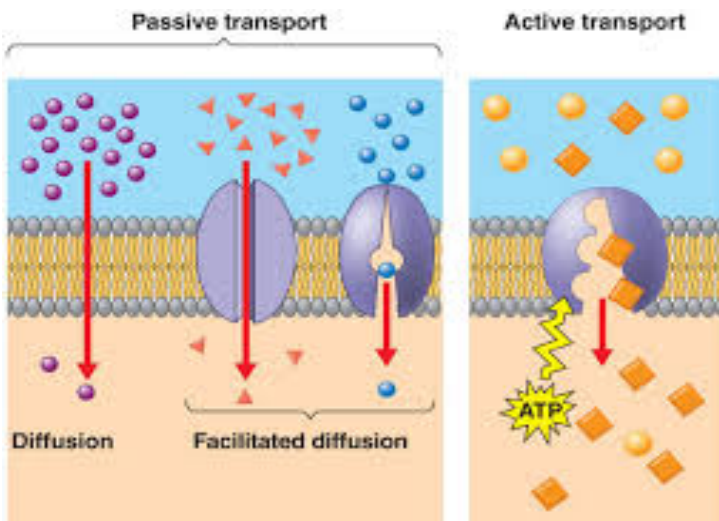
1. What are the two common types of microscopes and what are the differences between them?
2. What are the three tenets of the cell theory of life?
3. Who were the two important people that we talked about and what did they do?
4. Explain why cells are so small.

Cell (Membrane) Transport/Cell Respiration & Photosynthesis Study Guide

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<p>Chapter 4: Diffusion, Osmosis and Other Forms of Transport</p> <p>Homeostasis Passive vs. Active Transport Diffusion vs. Osmosis Equilibrium vs. Concentration Gradient Hypertonic, Hypotonic, Isotonic Carrier/ transport proteins, vesicles Facilitated Diffusion, Active Transport & Sodium-Potassium Pump Endocytosis vs. Exocytosis</p>	<p>Chapter 5: Photosynthesis and Cellular Respiration</p> <p>Autotrophs, Heterotrophs, Decomposers Food Chain, Food Web ATP Photosynthesis vs. Cellular Respiration: equations, reactants and products Chlorophyll, Chloroplast, Mitochondria Factors that Affect Photosynthesis Aerobic vs. Anaerobic Respiration Fermentation</p>
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Go to the following website: <http://tinyurl.com/sppumpgreenleaf> and complete the simulation then answer the questions below:

What is the purpose of pumping sodium and potassium across a membrane? The sodium potassium pump is a well understood example of active transport. Sodium and potassium ions are pumped in opposite directions across the membrane building up a chemical and electrical gradient for each. These gradients can be used to drive other transport processes. In nerve cells the pump is used to generate gradients of both sodium and potassium ions. These gradients are used to propagate electrical signals that travel along nerves. Therefore the action of nervous tissue requires ATP to generate resting potentials. Poisons that disable the pump prevent proper functioning of the nervous system.

1.

The sodium-potassium pump functions to pump

- A) sodium ions out of the cell and potassium ions into the cell.
- B) sodium ions into the cell and potassium ions out of the cell.
- C) sodium and potassium ions into the cell.
- D) sodium and potassium ions out of the cell.
- E) sodium and potassium ions in both directions across the cell membrane.

2.

What is the source of energy used to power the sodium-potassium pump?

- A) breakdown of ATP
- B) formation of ATP
- C) transport of ATP by the pump
- D) breakdown of GTP
- E) transport of GTP by the pump

3.

During one cycle, the sodium-potassium pump binds and moves.

- A) 1 Na⁺ and 2 K⁺.
- B) 2 Na⁺ and 2 K⁺.
- C) 2 Na⁺ and 3 K⁺.
- D) 3 Na⁺ and 2 K⁺.
- E) 3 Na⁺ and 3 K⁺.

4.

The sodium-potassium pump is a trans-membrane protein.

- A) True
- B) False

5.

The binding and release of sodium or potassium ions are due to conformational changes in the protein.

- A) True
- B) False

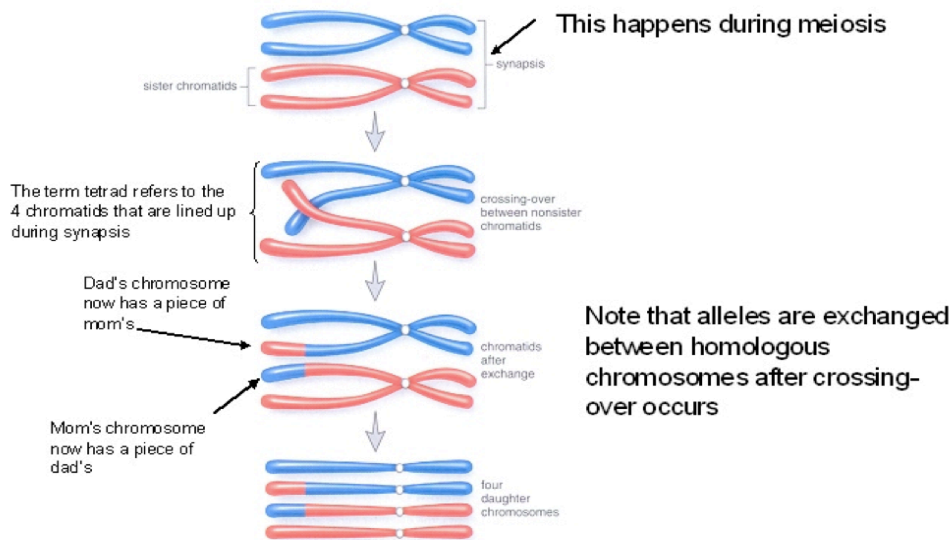
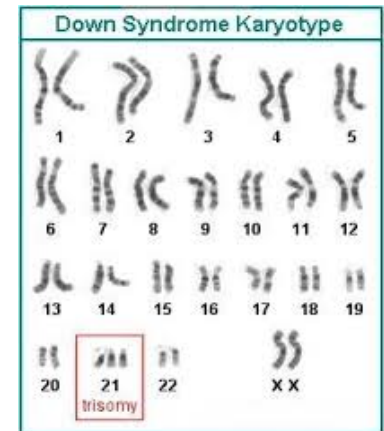
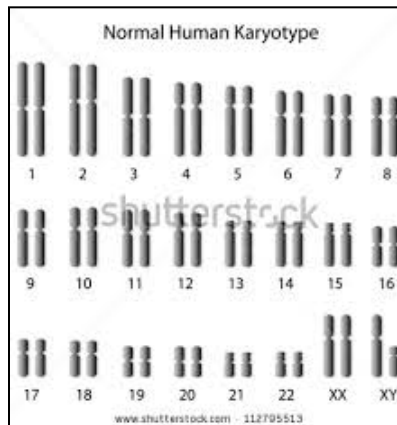
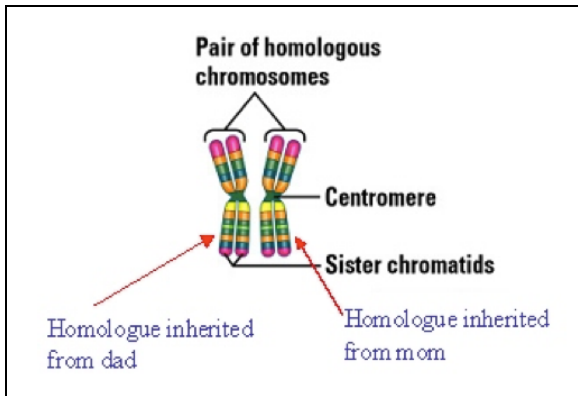
Mitosis/Meiosis Study Guide

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<p>Chapter 6: Chromosomes, Cell Cycle and Mitosis Chromosomes, Chromatids, Chromatin Centromere Diploid vs. Haploid Zygote (fertilized egg) Autosomes vs. Sex Chromosomes Karyotype The Cell Cycle Mitosis: IPMAT Cytokinesis Spindle Fibers</p>	<p>Chapter 7: Meiosis and Sexual Reproduction Gametes Mitosis vs. Meiosis Asexual vs. Sexual Reproduction Crossing Over Independent Assortment Binary Fission, Budding and Fragmentation</p>
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Chromosome Features ▽



Go to the following website: <http://tinyurl.com/crossingovergreenleaf> and complete the simulation then answer the questions below:

Biology

Chapter 11: Sexual Reproduction and Meiosis

Meiosis with Crossing Over

Survey

How are genes on the same chromosome inherited? An important fundamental of genetics is the idea of independent assortment. This states that genes are inherited independently of one another. Imagine an individual has two different alleles (versions of a gene) for eye color (blue and brown) and two different alleles for hair color (blonde and black). If a gamete produced by that individual contains the blue eye color allele it has an equally good chance of containing the blonde or the black hair color allele. This can be true even if both genes are on the same chromosome. Chromosomes segregate during Meiosis I and you might expect that all genes on a chromosome would be inherited as a unit. However, during prophase I homologous chromosomes pair up and become attached to one another. At this time, crossing over moves sections of DNA between homologous chromosomes and allows for independent assortment.

View the animation, then complete the quiz to test your knowledge of the concept.

1.

A crossover in meiosis is an exchange of genetic material between

- A) sister chromatids of the same chromosome.
- B) sister chromatids of homologous chromosomes.
- C) sister chromatids of non-homologous chromosomes.
- D) non-sister chromatids of homologous chromosomes.
- E) non-sister chromatids of non-homologous chromosomes.

2.

A tetrad is made up of

- A) four non-homologous chromosomes.
- B) four non-homologous chromatids.
- C) four homologous pairs of chromosomes.
- D) two homologous pairs of chromosomes.
- E) two homologous chromosomes, each consisting of two chromatids.

3.

Which of the following statements about crossing over is TRUE?

- A) It occurs only in males.
- B) It occurs only in some chromosomes.
- C) It occurs only between genes that are heterozygous.
- D) It results in reduced genetic variation among gametes.
- E) None of the above

4.

Crossing-over occurs during prophase I of meiosis.

- A) True
- B) False

5.

Crossing-over allows the reassortment of linked genes.

- A) True
- B) False

B.2 - Genetics/DNA/Genetic Technology Study Guide

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Chapter 8: Genetics

- 1,2. Dominant vs. Recessive
- 3,4. Phenotype vs. Genotype
- 5,6. Homozygous vs. Heterozygous
- 7. Mendel's Laws of Segregation,
- 8. Independent Assortment
- 9,10. Dominance and Recessiveness
- 11. Test Cross/Punnet Squares:
- 12-14. Monohybrid, Dihybrid, Sex-linked,
- 15,16. Polygenic, Multiple allele
- 17-19. Complete, Incomplete & Co-dominance

Chapter 9 and 10: DNA, RNA and Protein Synthesis

- 20. Double Helix
- 21. Nucleotide
- 22,23. Deoxyribose vs. Ribose
- 24. DNA vs. RNA
- 25-27. mRNA, tRNA, rRNA
- 28,29. Codon vs. Anticodon
- 30. Amino Acids

Chapter 9 and 10: DNA, RNA and Protein Synthesis DNA (continued)

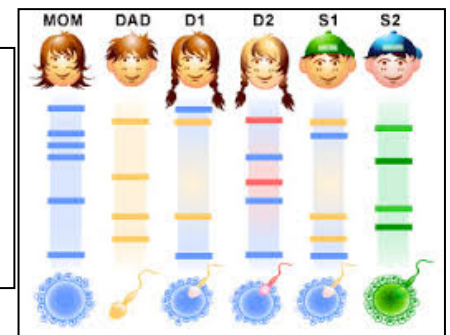
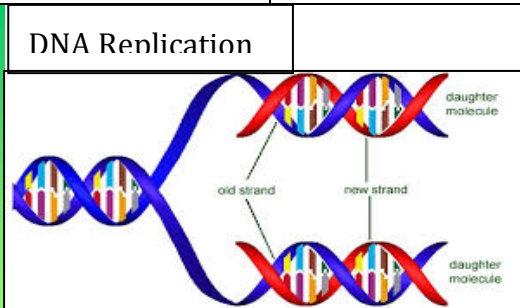
- 31. Ribosomes
- 32. Base-pairing Rules
- 33. replication
- 34. RNA transcription
- 35,36. Protein Synthesis/Translation

Chapter 11: Gene Technology

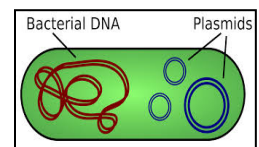
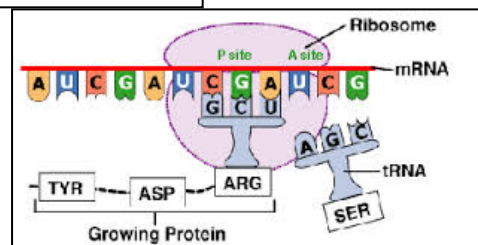
- 37. Genetic engineering
- 38. Recombinant DNA
- 39. Restriction enzymes
- 40. Vector
- 41. Plasmid
- 42. Electrophoresis
- 43. Human Genome project
- 44. Vaccine
- 45. DNA Fingerprinting
- 46. Benefits and Risks in GE and GM foods

Types of Inheritance

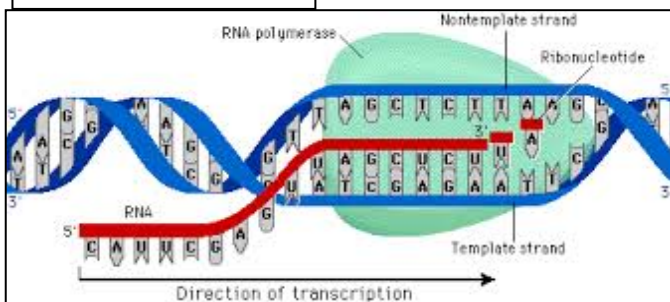
- 1. Complete dominance**
- One allele completely masks the other
- 2. Incomplete dominance**
- One allele doesn't completely mask the other - result is somewhere in-between
- 3. Codominance**
- Neither allele completely masks the other - result is a little of each
- 4. Multiple alleles**
- More than one allele for a trait
- 5. Polygenic traits**
- More than two genes control a trait
- 6. Sex-linked genes**
- The gene is located on the X chromosome



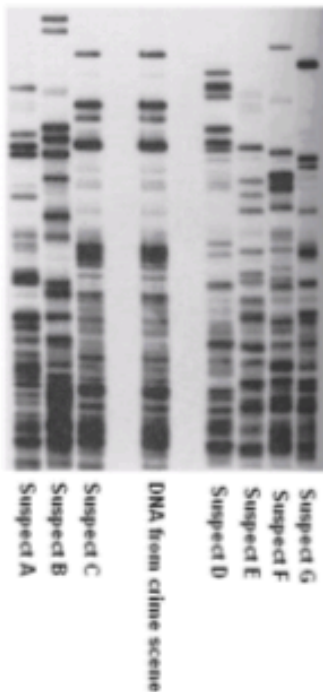
DNA Translation



DNA Transcription



1. What exactly is DNA fingerprinting and how does it work?



2. You are a forensic scientist and you are given a sample of DNA from the crime scene and a sample from 7 different suspects. You create a DNA fingerprint and here is a picture of the gel you get back. Which of these suspects do you think committed the crime? How can you tell? Is this enough evidence to convict the suspect of this crime?

3. Is DNA fingerprinting evidence always reliable? What are some problems with using DNA evidence in crimes?-

Evolution/Ecology Study Guide

To prepare for the Keystones :

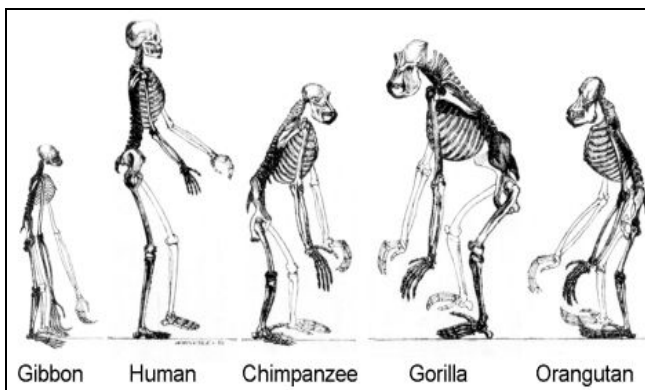
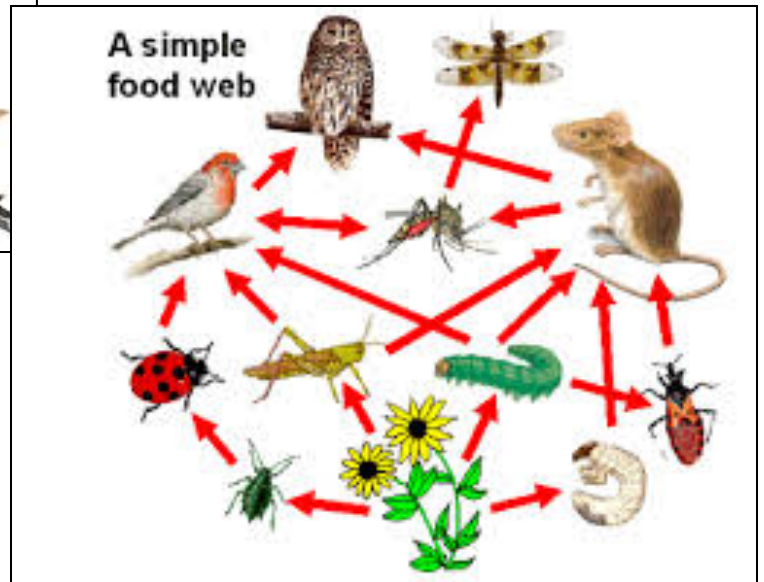
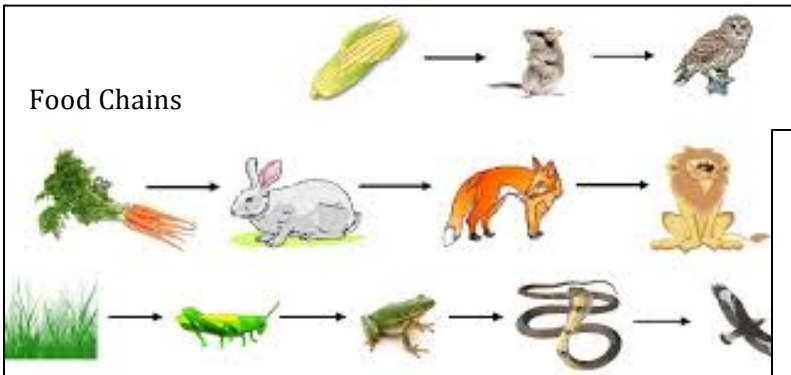
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Chapter 13: Evolution

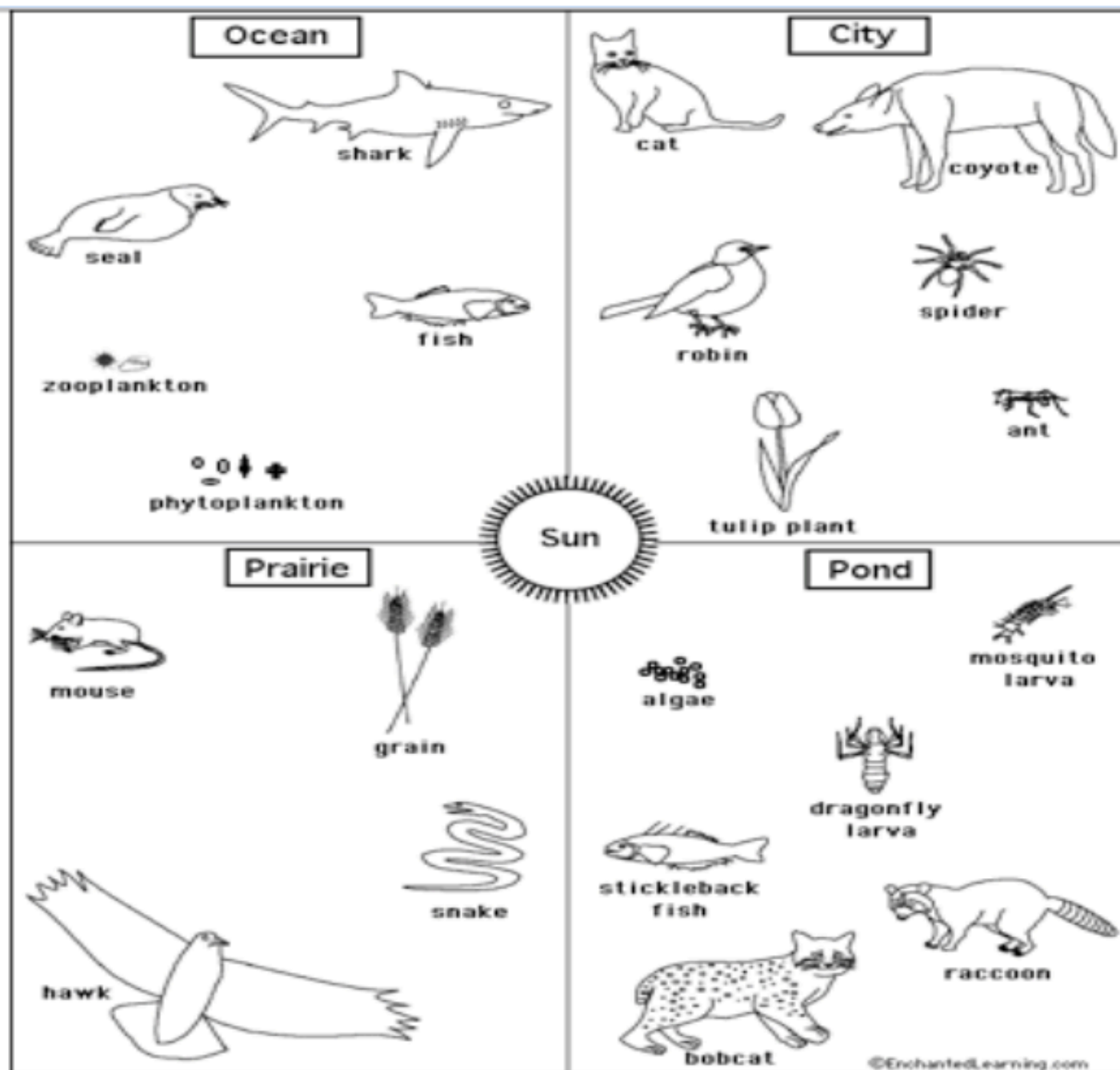
- 1,2. Evolution, Natural Selection
3. Adaptation
4. Reproductive Isolation
5. Evidence: DNA/Protein,
- 6,7. Embryonic, Fossils,
- 8, 9. Vestigial & Homologous Structures,
- 10-12. Divergence, speciation, subspecies

Chapter 15, 16, 17: Ecology

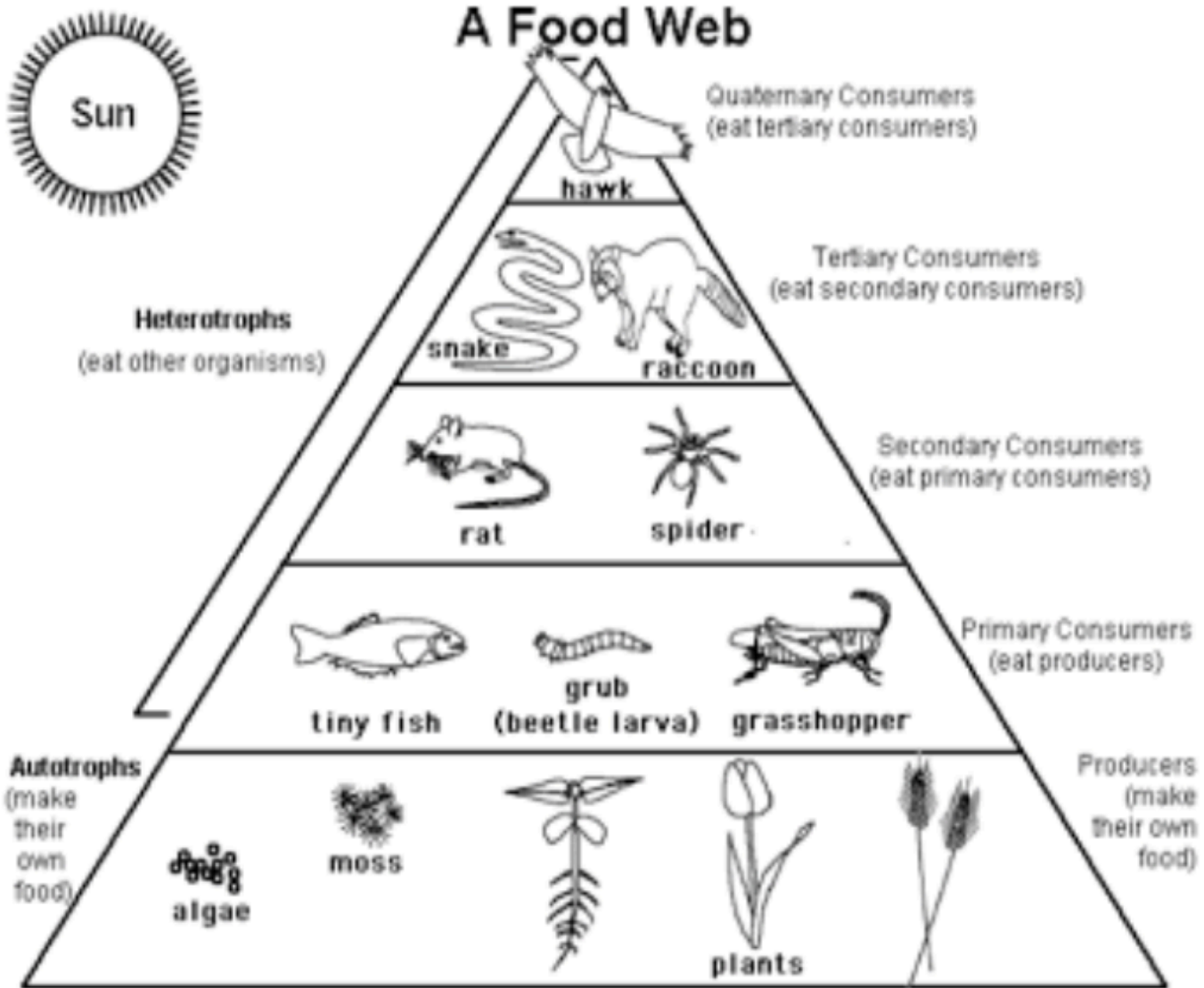
- 13-15. Food- Chains, Webs & Pyramids
- 16,17. Organisms, Population,
- 18-19. Community, Ecosystem,
20. Biosphere
- 21,22. Biotic and Abiotic Factors
- 23,24. Predation, Mutualism,
- 25,26. Parasitism and Commensalism
- 27,28. Water, Carbon, Oxygen and
29. Nitrogen Cycle
30. How ecosystems respond to change
31. Limiting Factors on Populations



The food web and food chain below go together as an exercise.



Practice identifying relationships in **food webs**-Please draw lines indicating the flow or energy for each habitat above. Then looking at the **energy pyramid** to your right, answer the questions below the image.



1. There are many more _____ than there are primary consumers.
2. _____ eat other organisms.
3. _____ make their own food so they are also called _____.
4. Where does the energy come from for all organisms in a food chain or web?
5. Use algae and water plants as the producers and create a food web with 8 consumers.