



# Stamford Public Schools

## Science Department

**District Final Examination**

**REVIEW**

**2013-2014**

**CP Biology**

Student Name: \_\_\_\_\_

School/Teacher: \_\_\_\_\_

Date: \_\_\_\_\_



Dear Biology Student,

The district-wide CP Biology Final Exam for the 2013-2014 school year will focus on the concepts covered in the yearlong biology course. You will have 90 minutes for this exam.

Enclosed is a list of the skills and concepts from your biology course. Next to each main topic is the number of problems that will appear on the Exam and also the way questions will be formatted (Constructed Response or Selected Response).

In addition to the concepts listed and the formatting of the questions, this packet also includes a sampling of the types of questions that will be on your CP Biology Final Exam.

Please see your science teacher if you feel additional practice is necessary.

Wishing you success on your exam,

Carrie Chiappetta,

Director School Improvement and

Professional Development—Secondary

## CP Biology Final Exam 2014

### *Blueprint and Study Guide*

60 selected response questions – 1 point each

5 constructed response questions – 14 points total

**74 points total**

Topic	# of selected response questions (1 pt per question)	# of constructed response questions	points assigned to constructed response to questions
<b>The Nature of Science: 6 points</b>	<b>6 total</b>	<b>0 total</b>	<b>0 points</b>
Experimental Procedure	5		
Microscopy	1		
<b>Population Ecology: 3 points</b>	<b>3 total</b>	<b>0 total</b>	<b>0 points</b>
General Content (Definitions, graphs, etc.)	2		
Human Population Growth	1		
<b>The Chemistry of Life: 4 points</b>	<b>4 total</b>	<b>0 total</b>	<b>0 points</b>
Monomers Build Polymers	2		
Acids v. Bases	1		
Importance of Water	1		
<b>Structure and Function of Cells: 12 points</b>	<b>8 total</b>	<b>1 total</b>	<b>4 points</b>
Organelle Function	4		
Plant v. Animal	2		
Eukaryotes v. Prokaryotes	2	1	4
<b>Respiration and Photosynthesis: 6 points</b>	<b>6 total</b>	<b>0 total</b>	<b>0 points</b>
General Purpose and Stages of Respiration	2		
General Purpose and Equation of Photosynthesis	2		
Aerobic v. Anaerobic Processes	1		
Fermentation	1		
<b>Diversity and Genetic Variation: 2 points</b>	<b>2 total</b>	<b>0 total</b>	<b>0 points</b>
DNA Functions	1		
DNA Structure and Base Pairing	1		
<b>Protein Synthesis: 3 points</b>	<b>1 total</b>	<b>1 total</b>	<b>2 points</b>
Transcription	1		
Translation		1	2
<b>Genetic Engineering: 3 points</b>	<b>0 total</b>	<b>1 total</b>	<b>3 points</b>
GM Foods		1	3
<b>Cell Division: 3 points</b>	<b>3 total</b>	<b>0 total</b>	<b>0 points</b>
Stages of Mitosis	1		
Cancer	1		
Results of Mitosis	1		
<b>Sexual Reproduction: 3 points</b>	<b>3 total</b>	<b>0 total</b>	<b>0 points</b>
Meiosis Stages	1		
Results of Meiosis	1		
Cells of Meiosis	1		
<b>Classical Genetics: 5 points</b>	<b>2 total</b>	<b>1 total</b>	<b>3 points</b>
Dominant v. Recessive	1	1	3
Alleles, Genes, and Chromosomes	1		
<b>The Theory of Evolution: 4 points</b>	<b>2 total</b>	<b>1 total</b>	<b>2 points</b>

Natural Selection	2	1	2
<b>Diversity of the Biosphere &amp; Classification: 7 points</b>	<b>7 total</b>	<b>0 total</b>	<b>0 points</b>
What is a species?	1		
General Characteristics of the Kingdoms	3		
Scientific Names	1		
Taxonomic Levels	1		
Dichotomous Keys	1		
<b>Viruses: 3 points</b>	<b>3 total</b>	<b>0 total</b>	<b>0 points</b>
Function and Structure	3		
<b>Bacteria: 4 points</b>	<b>4 total</b>	<b>0 total</b>	<b>0 points</b>
Zone of Inhibition	1		
Structure	1		
Bacteria & the Environment	1		
Disease Transmission	1		
<b>Protista, Fungi, and Plants: 6 points</b>	<b>6 total</b>	<b>0 total</b>	<b>0 points</b>
Fungal Structure	2		
Fungi and the Environment	1		
Amoeba Structure and Function	1		
General Naming of Protists	1		
Roots Functions	1		
<b>Introduction to Animals: 1 points</b>	<b>1 total</b>	<b>0 total</b>	<b>0 points</b>
Vertebrates v. Invertebrates	1		

### Scientific Method

Give an example of a "Statement of a Problem"

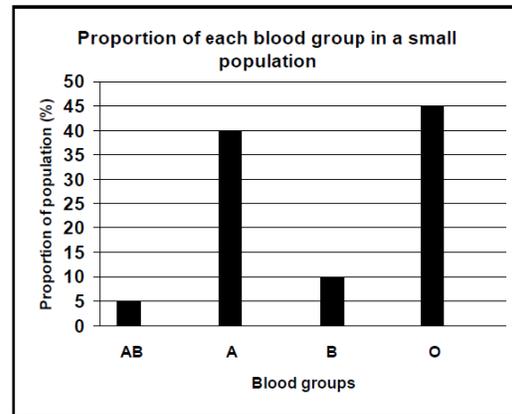
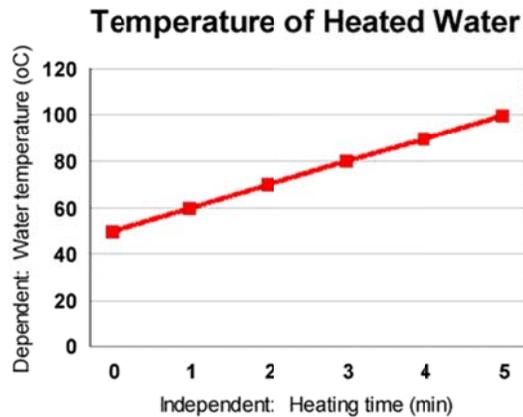
Identifying Variables

**Independent Variable** \_\_\_\_\_

**Dependent Variable** \_\_\_\_\_

**Control Group** \_\_\_\_\_

Reading and analyzing graphs



What is the water temperature after heating for 3 minutes?

Which blood group is the highest in the population?

How long did the water need to reach 100 C?

Which blood group is only 5% of the population?

Conclusions and validity: Explain validity and credibility

You have just been given a bouquet of fresh cut flowers. Your friend tells you that the flowers will stay fresh for longer if you add sugar to the water in the vase. You decide to do an experiment to see if this is true.

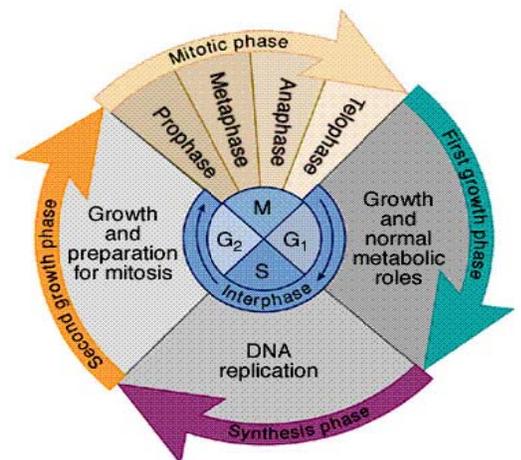
How would you do this experiment?

What is the hypothesis?

- What is the independent variable?
- What is the dependent variable?

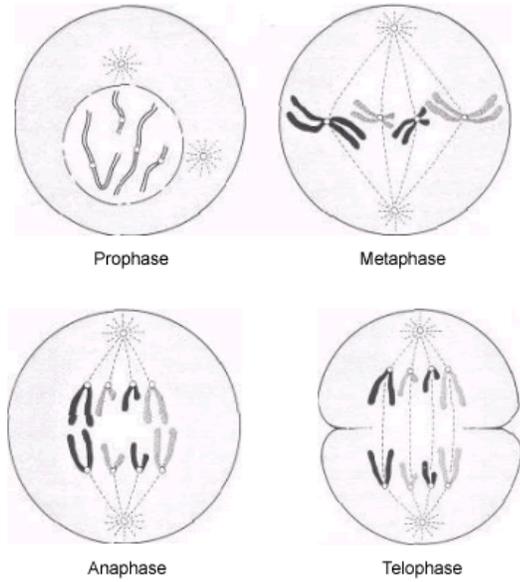
What is the control?

What kinds of data would you collect?



**Describe the Cell Cycle:**

- Interphase
- Prophase
- Metaphase
- Telophase
- Cytokinesis



What happens to chromosomes during mitosis?

Identify and describe the functions of the:

Centrioles

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Centromeres

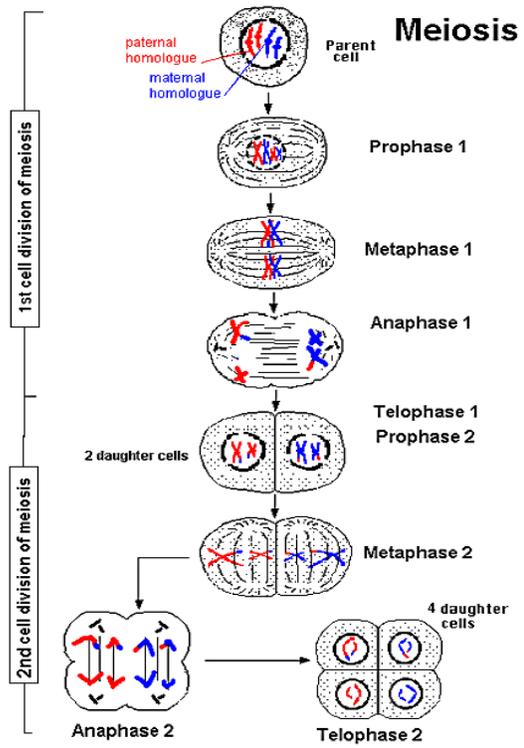
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Spindle Fibers

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Cancer: Explain how the cell cycle relates to cancer.

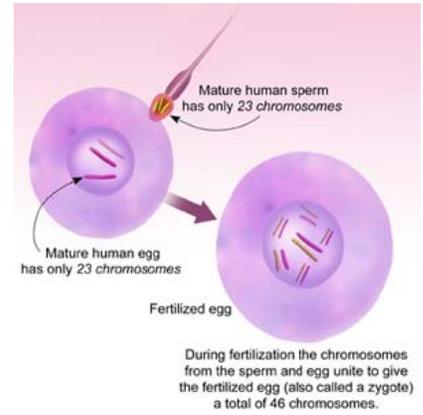
Order and describe the phases of **meiosis**:



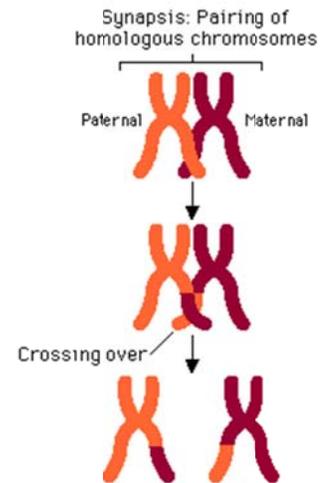
- What is the difference between:

- a. Haploid cell
- b. Diploid cell

- What are **gametes**?



- What is **crossing over**?



- Advantages of sexual reproduction:

- Compare and contrast: Mitosis & Meiosis

### Genetics:

- What are **traits** and how do they relate to **genes**?
- What are **alleles**?
- Explain the difference between **dominant** and **recessive** traits.
- Explain the difference between **genotype** and **phenotype**

- Explain the difference between **heterozygous** and **homozygous**

- Basic **Punnett Squares**:

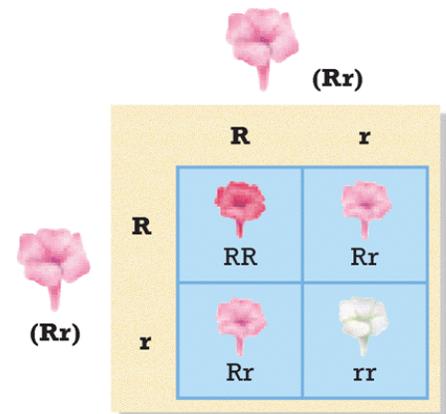
How is it possible for Claire to have blue eyes when both her parents have brown eyes?

Mom:


Dad:

- What is the **Law of Segregation**?

- What is the **Law of Independent Assortment**?



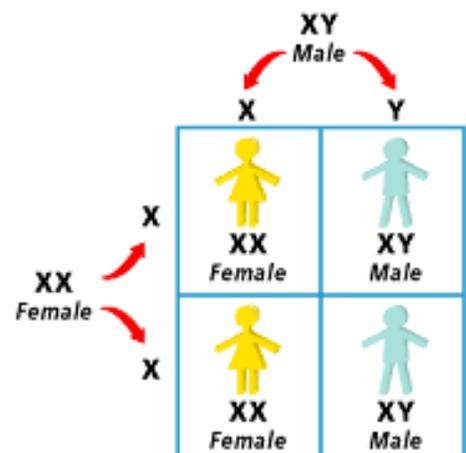
- Determination of Traits

- Explain: **Co-Dominance**

- Explain: **Incomplete Dominance**

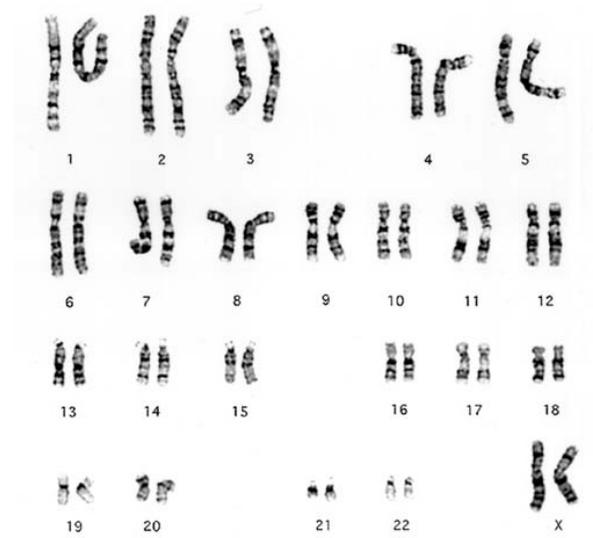
- **Sex-Linked (or X-linked)**

- Genetic Disorders - be familiar with how they are passed down to offspring



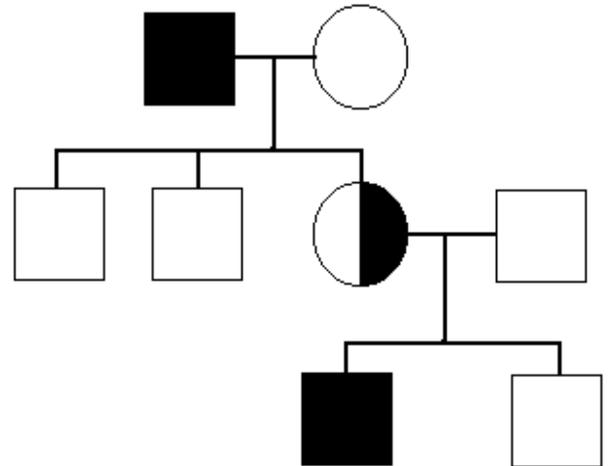
- What are sources of genetic variation?

- What are Karyotypes and how are they used?



Courtesy of Dr. K. Phelan, Greenwood Genetic Center.  
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- Pedigree Charts & Analysis



- CAPT Activity: Genetically Modified Foods & genetic engineering

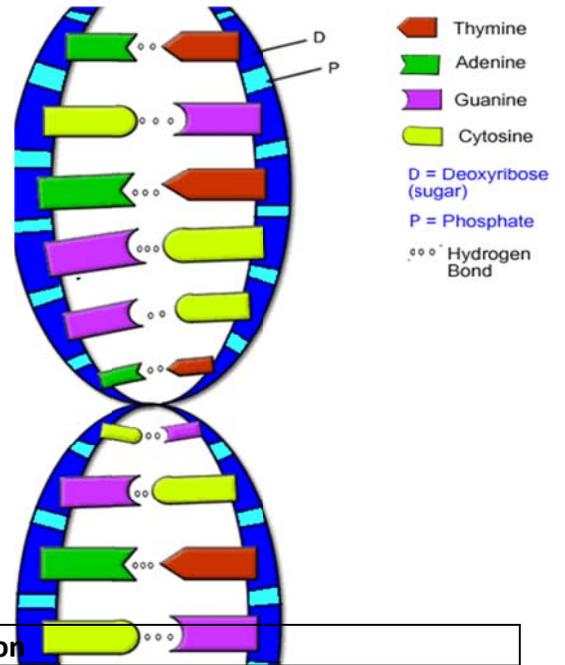
**GM Grains Pose No Health Risk**

*Researchers report that genetically modified (GM) grains fed to test mice have no negative impact on health. In two trials, the offspring of mice fed GM grain for three weeks showed a similar survival rate as the offspring of mice that were fed non-GM grain. The trials have been called as a victory for GM food producers. A spokesperson for the research group stated that “it is highly unlikely for any unintended side effects to occur as a result of human consumption of GM grains.”*

Provide (3) three reasons a consumer should question the conclusions presented in this news release.

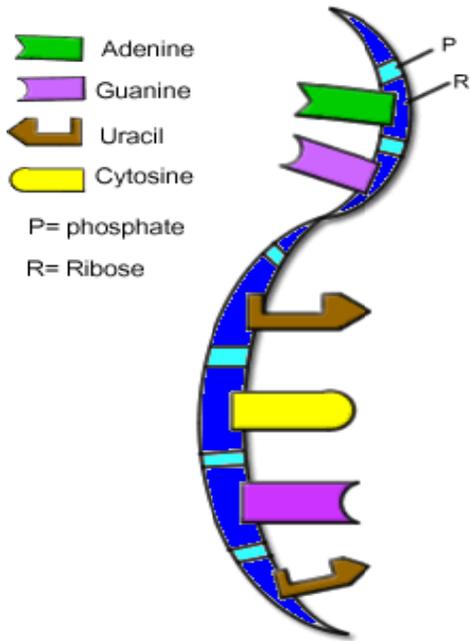
# DNA

- For what does DNA stand?
- What are the functions of DNA?
- Describe the structure of DNA

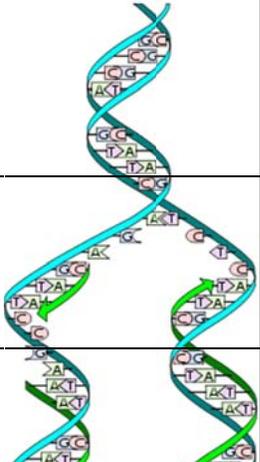
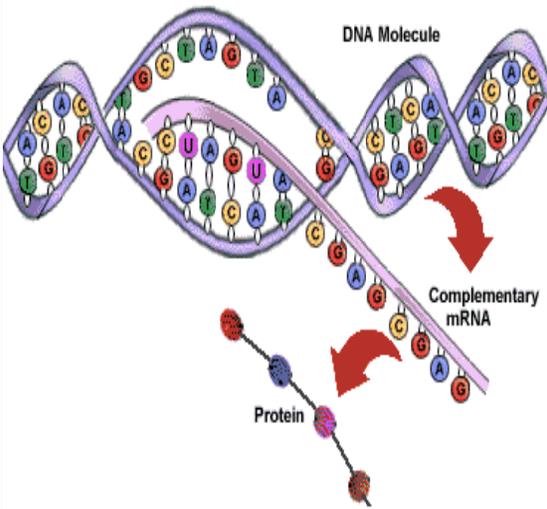
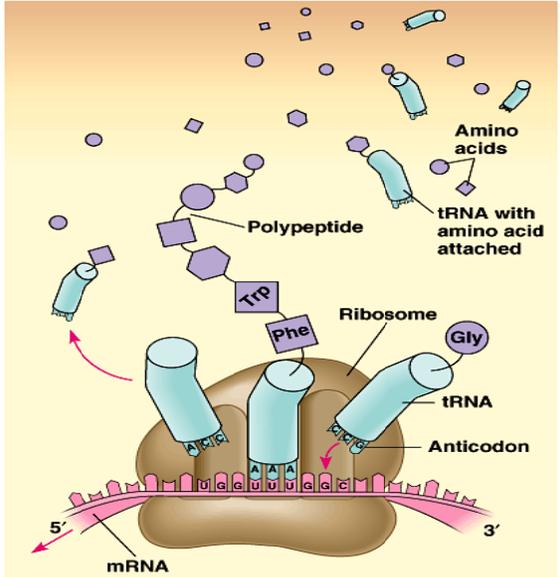


	<b>Transcription</b>		<b>Translation</b>
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- What molecule makes up the sides (backbone) of DNA?
- List the 4 nitrogen bases in DNA
- How do the nitrogen bases pair?



- Describe the structure of RNA
- What are the 4 nitrogen bases that make up RNA?
- What is the role of tRNA?
- What is the role of mRNA?

Function		
What occurs		
Where		
		 <p style="font-size: small;">Copyright © Pearson Education, Inc., publishing as Benjamin Cummings.</p>

**Describe the steps of DNA Replication**

Explain **Protein Synthesis**: (process of making proteins) **Transcription and Translation**

What is a **codon**?

On what RNA molecule are the **codon** found?

How many nitrogen bases make up a **codon**?

What is an **anti-codon**?

On what RNA molecule are the **anti-codon** found?

How many nitrogen bases make up an **anti-codon**?

How many **amino acids** are attached to a tRNA molecule?

How many different **amino acids** are there?

How many different **codons** are there?

What is a **polypeptide chain** and what does it make?

Use the codon chart to determine the **amino acid** sequence for:

**A U G G T G A A C T T A G A C**

**DNA:**

**mRNA:**

**Amino Acid Sequence:**

**G C U G C C A A U G U A G A C**

**DNA:**

**mRNA:**

**Amino Acid Sequence:**

	U	C	A	G	
<b>U</b>	Phe	Ser	Tyr	Cys	<b>U</b>
	Phe	Ser	Tyr	Cys	<b>C</b>
	Leu	Ser	STOP	STOP	<b>A</b>
	Leu	Ser	STOP	Trp	<b>G</b>
<b>C</b>	Leu	Pro	His	Arg	<b>U</b>
	Leu	Pro	His	Arg	<b>C</b>
	Leu	Pro	Gln	Arg	<b>A</b>
	Leu	Pro	Gln	Arg	<b>G</b>
<b>A</b>	Ile	Thr	Asn	Ser	<b>U</b>
	Ile	Thr	Asn	Ser	<b>C</b>
	Ile	Thr	Lys	Arg	<b>A</b>
	Met	Thr	Lys	Arg	<b>G</b>
<b>G</b>	Val	Ala	Asp	Gly	<b>U</b>
	Val	Ala	Asp	Gly	<b>C</b>
	Val	Ala	Glu	Gly	<b>A</b>
	Val	Ala	Glu	Gly	<b>G</b>

Evolution “Survival of the Fittest”

- What is **artificial selection**?
  
- What is **natural selection**?

**Changes in species over time**

Wolves that live in snowy climates often prey on rabbits. Some rabbits can move quickly across deep snow because they have large feet that don’t sink into the snow. Rabbits without this adaptation move more slowly across the snow.

Explain how **natural selection** might cause the rabbit population to change over time.

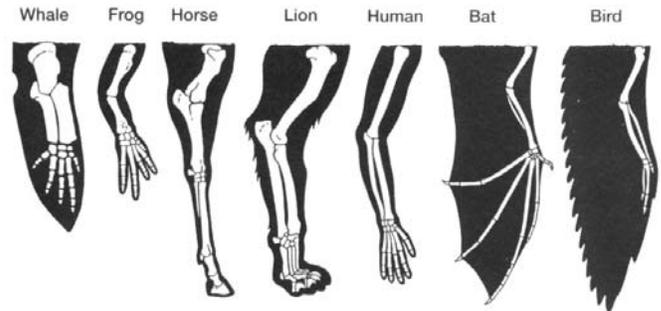
**Desert Survival**

What adaptations might a lizard have for surviving in the desert? Explain how the adaptations help the lizard to survive.

Why is **genetic variation** essential for evolution?

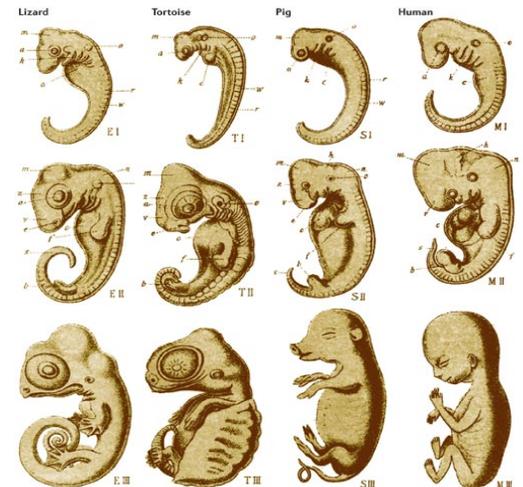
Evidence of Evolution

- Compare **homologous, analogous & vestigial structures**



### Embryology:

Describe how similarities in embryos of different species can show possible evolutionary patterns



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### Amino acids reveal evolution

#### Cytochrome c Evolution

Organism	Number of amino acid differences from humans
 Chimpanzee	0
 Rhesus monkey	1
 Rabbit	9
 Cow	10
 Pigeon	12
 Bullfrog	20
 Fruit fly	24
 Wheat germ	37
 Yeast	42

### DNA evidence:

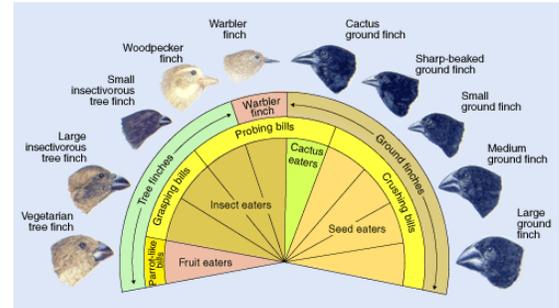
Describe how DNA sequences can in different species can show possible evolutionary patterns.

Explain how **speciation** occurs in different ways.

- Geographic Isolation
- Reproductive Isolation
- Gradualism

- Punctuated Equilibrium
- Genetic Equilibrium
- Parallel Evolution

What is **adaptive radiation**?



### Origin of Life (Miller & Urey)

The atmosphere of early earth was made up of water, methane, ammonia, and carbon dioxide  
 The first life arose from simple chemicals

- What are **cyanobacteria**? Explain their significance/importance.

### Classification

- What is **taxonomy**?
- What is **binomial nomenclature**:
- What are **dichotomous keys** and for what are they used?

Explain the differences between:

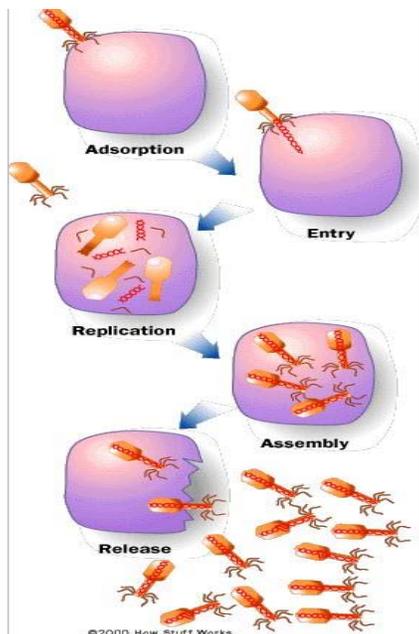
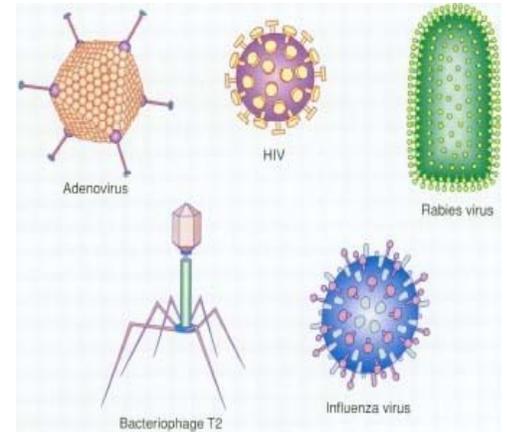
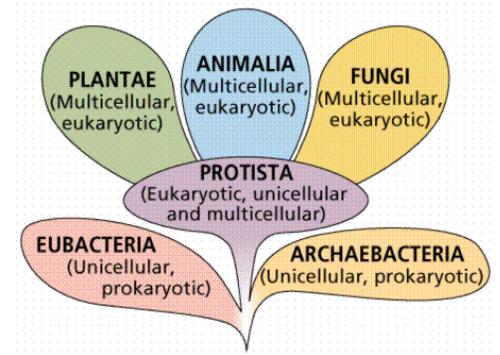
- **Eukaryotes**
- **Prokaryotes**

Explain the differences between:

- **Heterotrophs**
- **Autotrophs**

**Virus:** Why is a virus considered non-living?

- Describe the structure of a **virus**



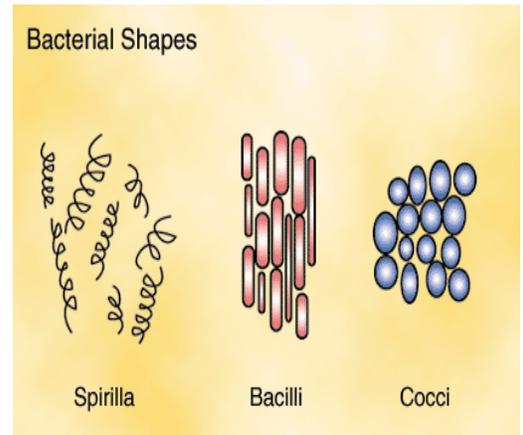
How does a virus reproduce?

How do viruses impact humans?

Explain the characteristics of the following Prokaryotes:

- **Archaea (Archaeobacteria):**

- **Bacteria (Eubacteria):**
- Structure & Function: What are the 3 main shapes of Bacteria?
- Give examples how **Bacteria** can be helpful versus harmful

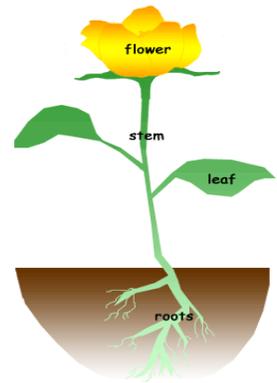


Protists are eukaryotic and mostly unicellular.

Protist	Autotroph or Heterotroph	How do they move	Draw A Picture
Amoeba			
Paramecium			
Euglena			
Green Algae			

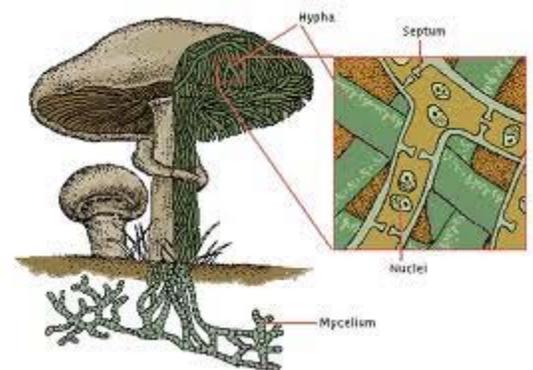
**Plants** are living and are **Eukaryotic, Autotrophic** and **Multicellular**

- What are the main structures and their key functions in **plants**?
- How do plants obtain food/energy?
- How do **plants** reproduce?



**Fungi** are eukaryotic, heterotrophic and multicellular

- What is the main function of **fungi** on the earth?
- Describe the unique the way **fungi** digest their food.
- Describe the main structures of **fungi**



**Animals** are eukaryotic, heterotrophic and multicellular

Explain the differences between:

- Vertebrate
- Invertebrate

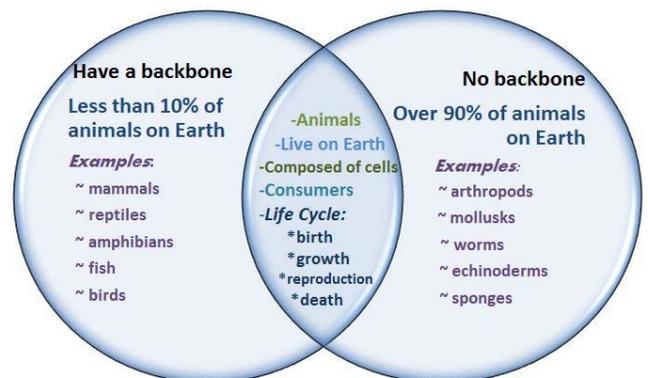
Explain the differences between:

- Endoskeleton
- Exoskeleton

## Animals

### Vertebrates

### Invertebrates

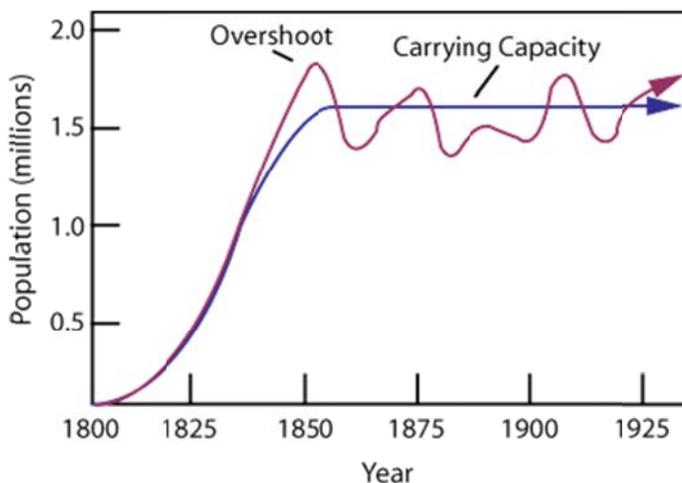


## Principals of population growth

Describe the factors that affect population growth

Factor	Description	Increase or Decrease population
Birth Rate		
Death Rate		
Immigration		
Emigration		

- Explain **Carrying capacity** and how this process impacts a population.



- What kind of graph “curve” is this?
- What causes populations to reach carrying capacity?
- What causes a population to go past or overshoot carrying capacity?
- What causes a population to return or go below carrying capacity?

### CAPT Human Population Activity

- Be able to analyze graphs pertaining to human populations.
- Using a population graph determine if a country is developed or undeveloped.

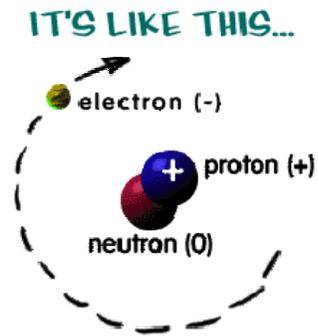
What are **adaptations**?

- Give examples of adaptations for both animals and plants.
- Explain human impact on the environment & give some examples.

## Biochemistry (Chemistry of Life)

Describe the structure of an atom:

- Electron:
- Proton:
- Neutron:

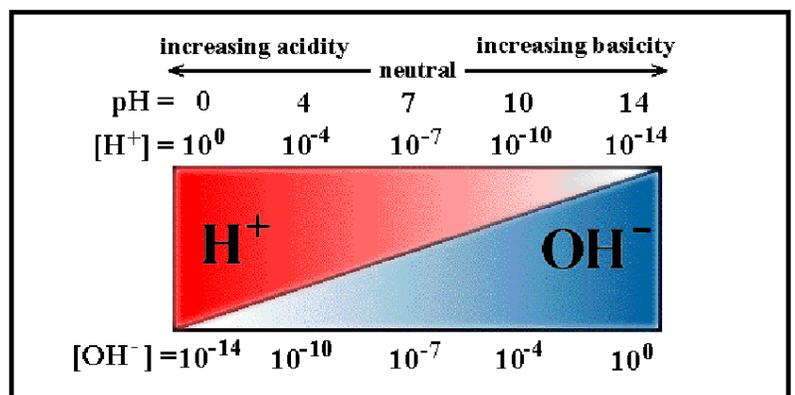


Explain the differences between elements and compounds:

- Element:
- Compound:

### pH: Acids, Bases and Neutral

- Describe Acid:
- Describe Neutral:



- Describe Base:

What does pH measure?

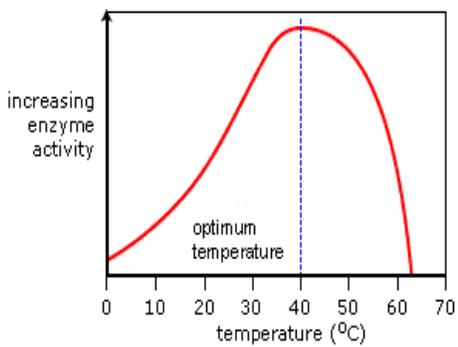
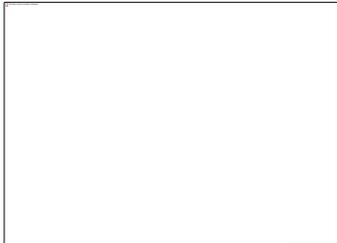
Enzymes

What is the function of an enzyme?

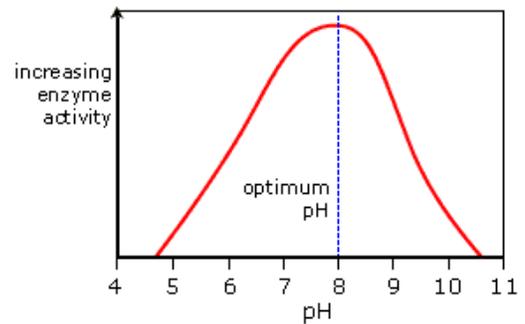
Explain the structure of enzymes:

- “Lock & Key:”
- Active Site:
- Substrate:
- Product:

3. What affects the ability of **enzymes** to perform at their best?



“Optimum”: **Temperature**



“Optimum”: **pH**

How do you recognize the name of an **enzyme**?

Macromolecules: Complete the table below to compare the structure, function, types & corresponding foods:

<u>Macromolecule</u>	<u>Function</u>	<u>Types</u>	<u>Foods</u>	<u>Structure</u>
Carbohydrate (Simple)				
Carbohydrate (Complex)				
Lipids (OIL)				
Lipids (FAT)				
Proteins				
Nucleic Acids				

What is the most important simple carbohydrate for life and why?

What is the most important element for life and why?

What are the 4 main elements of all living organisms? What is the acronym to remember this?

Microscope: Draw what the letter **e** looks like under the microscope. \_\_\_\_\_

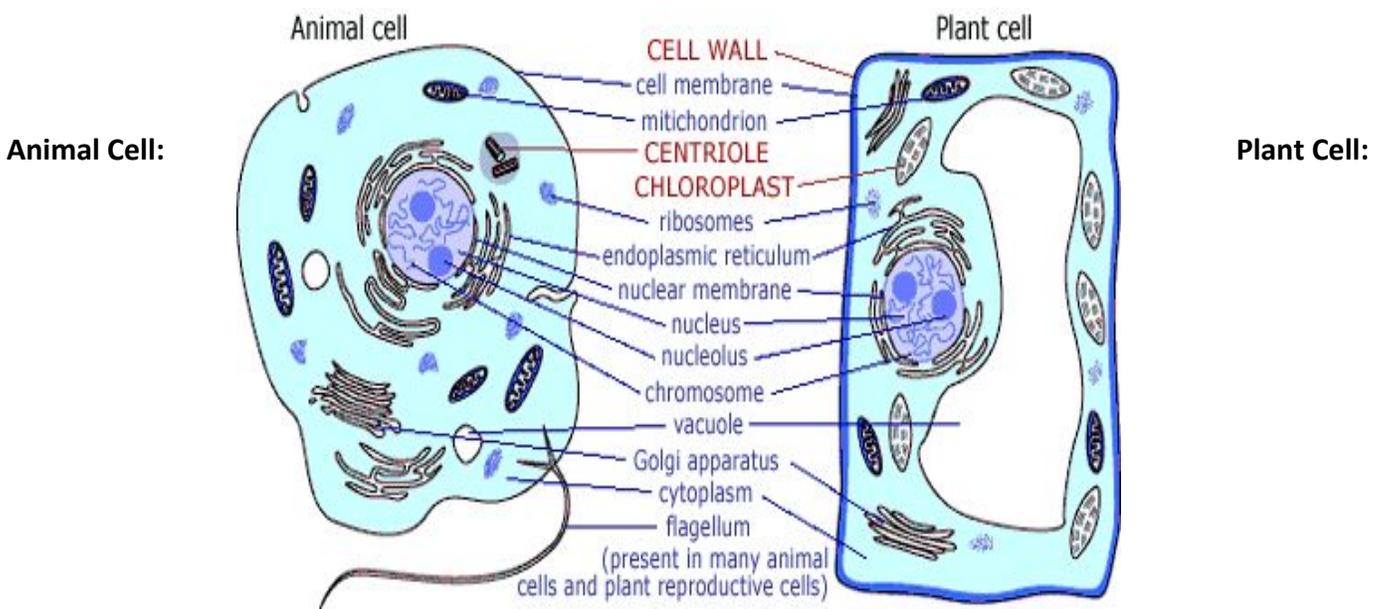
Explain the three parts of the Cell Theory:

- 1.
- 2.
- 3.

Complete the table below:

	Organelle	Function	Plant – P Animal – A Both – B
1	Nucleus		
2	Cell Membrane		
3	Cell Wall		
4	Cytoplasm		
5	Endoplasmic Reticulum		
6	Ribosome		
7	Vacuole		
8	Lysosome		
9	Golgi Apparatus/Bodies		
10	Mitochondria		
11	Chloroplast		

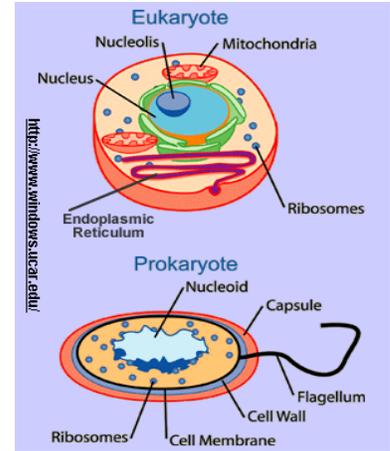
What are the differences between plant and animal cells?



What are the differences between a **eukaryotic cell** and a **prokaryotic cell**?

○ **Eukaryotic Cell:**

○ **Prokaryotic Cell:**

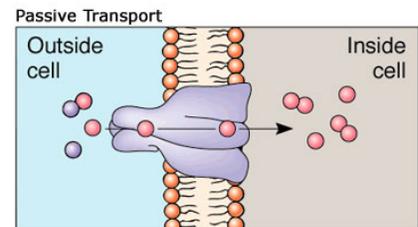


Describe the Function and Structure of the **plasma membrane (phospholipid bilayer)**

Cell membrane transport:

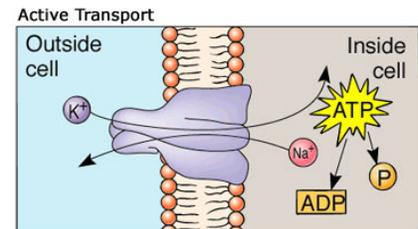
Explain the differences between **active** and **passive transport**

Passive transport:



Active transport:

Explain the differences between **passive diffusion** and **facilitated diffusion**,



• Passive Diffusion:

• Facilitated Diffusion:

• What is osmosis?

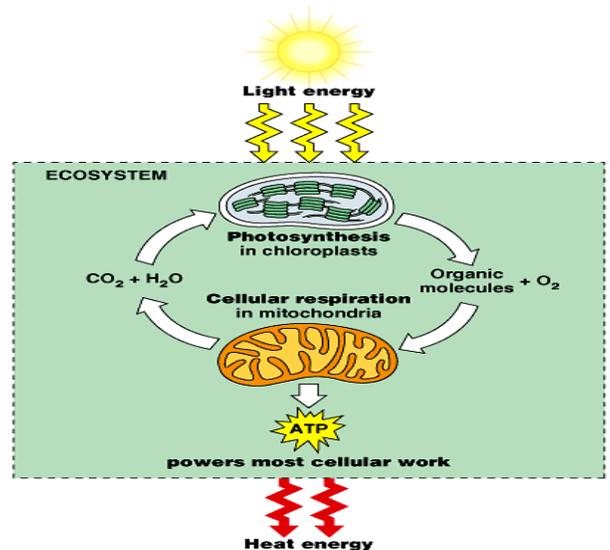
**Photosynthesis and Cellular Respiration:**

Explain the energy flow for life:

What is the basic chemical formula for:

• Photosynthesis

• Cellular Respiration



Explain how photosynthesis and cellular respiration are interdependent.

What is the difference between **chlorophyll** and **chloroplast**?

What is the role of **ATP** and what is its importance to cell?

How do forming and breaking **ATP bonds** relate to energy use?

Where/When is the most **ATP** made?

Explain the difference between **aerobic** and **anaerobic** respiration:

- Aerobic
- Anaerobic

Explain the difference between **fermentation** and **respiration**:

- Fermentation
- Respiration

## CP Biology Final Exam Key Vocabulary List

8 Levels of Classification	Compound Light Microscope	Heterotroph	Phylum
Adaptation	Conclusion	Hybrid	Plant Cell
Aerobic Respiration	Control	Hypothesis	Population
Alleles	Control Variable	Immigration Rate	Prokaryote
Amino Acid	Darwin's Finches	Independent Variable	Protein
Amoeba	Death Rate	Invertebrates	Pseudopod
Anaerobic	Dichotomous Key	Karyotype	Recessive Genes
Antibiotics	Diploid	Kingdom	Ribosome
ATP	DNA	Meiosis	Root
Autotroph	DNA Base-Pairing Rule	Migration	Scientific Experiment
Bacillus	Domain	Mitochondria	Scientific Method
Bacteria	Dominant Genes	Mitosis	Scientific Names
Bacteriophage	Emigration Rate	Monosaccharides	Speciation
Birth Rate	Enzymes	Mortality Rate	Species
Cancer Cells	Eukaryote	Multicellular	Spirillum
Carbohydrates	Evolution	Mushroom	Steroids
Cell Wall	Family	Natural Selection	Theory
Cellular Respiration	Fermentation	Nucleotides	Transcription
Cellulose	Fertilization	Nucleus	Unicellular
Chloroplasts	Fungus	Observation	Vacuole
Chromosomes	Gametes	Order	Vertebrates
Class	Genetically Modified Foods	Organelle	Virus
Coccus	Genus	pH of Acids	Water
Co-Dominant Genes	Glucose	pH of Bases	X Chromosome
Codon	Haploid	Photosynthesis	Y Chromosome