

Name: \_\_\_\_\_ Period: \_\_\_\_\_

**Station 1. Analyze how biological traits are passed on to successive generations.**

- a. Distinguish between DNA and RNA.
- b. Explain the role of DNA in storing and transmitting cellular information.

	<u>DNA</u>	<u>RNA</u>
# of strands		
Monomers		
Major function		
Involved in what processes?		
4 Bases and the base pairing rules		
Location in cell		
Name of Sugar		
What it stands for		

What are the 3 parts of a nucleotide? \_\_\_\_\_  
 \_\_\_\_\_  
 Which part has the code for a protein? \_\_\_\_\_  
 \_\_\_\_\_

The genetic information that determines traits is contained in nucleic acids which are macromolecules. The 2 types of nucleic acids are DNA and RNA.

Make a sketch of DNA

What is the term used to describe the shape of DNA? \_\_\_\_\_  
 \_\_\_\_\_  
 What 2 parts form the “backbone”/ “sides of the ladder” of DNA? \_\_\_\_\_  
 \_\_\_\_\_  
 What’s the bond called between the nitrogen bases? \_\_\_\_\_  
 \_\_\_\_\_

What happens during DNA replication?  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 What are the base pairing rules during DNA replication? \_\_\_\_\_  
 \_\_\_\_\_  
 Each new molecule is identical to the original molecule of DNA.

What is a chromosome? \_\_\_\_\_  
 Traits are determined by small parts of chromosomes. The section of a chromosome that codes for a specific trait is called a **gene**. An organism’s traits depend on the kind and number of proteins in that organism. Remember proteins are macromolecule made up of amino acids. The main function of genes is to control the production of proteins. What organelle assembles proteins? \_\_\_\_\_ Where is this organelle found within a cell? \_\_\_\_\_

What is protein synthesis? \_\_\_\_\_

<u>Protein Synthesis</u>	<u>Transcription</u>	<u>Translation</u>
What happens during this stage?		
Where does this stage take place?		

How many chromosomes do humans have in their somatic cells? \_\_\_\_\_

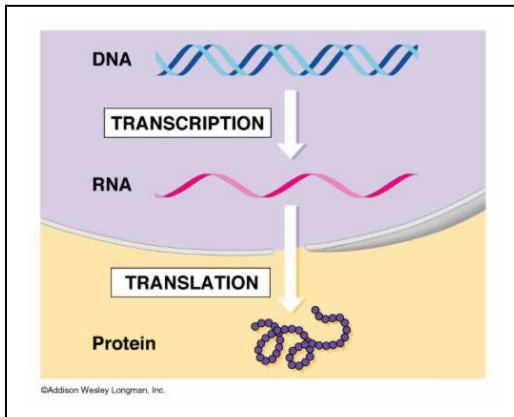
Gametes? \_\_\_\_\_

Define:

Diploid: \_\_\_\_\_

The instructions in DNA are in a code that depends on the arrangement of nucleotide \_\_\_\_\_. The nucleotides are arranged in triplets called \_\_\_\_\_. A **codon** is a group of 3 bases that codes for a specific amino acid. The code for making a protein is passed from the DNA to an \_\_\_\_\_ molecule during \_\_\_\_\_. The RNA that carries instructions from DNA in the nucleus to the ribosomes where it will be translated is called \_\_\_\_\_. Translation converts the information in the mRNA into a sequence of amino acids that make up a \_\_\_\_\_. In order to translate the code, mRNA codons must join with the correct anticodon on the tRNA. An \_\_\_\_\_ is a set of 3 nitrogenous bases on a tRNA molecule that is complementary to the codon on an mRNA molecule. Be able to use the codon wheel and chart. (Chapter 8.4 in your book)

**Word Bank:** codon, transcription, bases, RNA, messenger, protein, anticodon

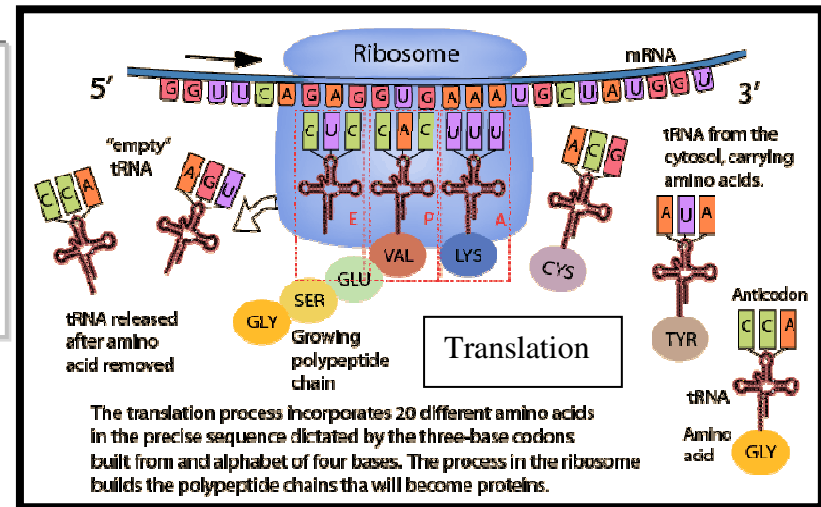


What are the 3 types of RNA and what do they do?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



The translation process incorporates 20 different amino acids in the precise sequence dictated by the three-base codons built from an alphabet of four bases. The process in the ribosome builds the polypeptide chains that will become proteins.

	U	C	A	G
U	UUU = phe UUC = phe UUA = leu UUG = leu	UCU = ser UCC = ser UCA = ser UCG = ser	UAU = tyr UAC = tyr UAA = stop UAG = stop	UGU = cys UGC = cys UGA = stop UGG = trp
C	CUU = leu CUC = leu CUA = leu CUG = leu	CCU = pro CCC = pro CCA = pro CCG = pro	CAU = his CAC = his CAA = gln CAG = gln	CGU = arg CGC = arg CGA = arg CGG = arg
A	AUU = ile AUC = ile AUA = ile AUG = met	ACU = thr ACC = thr ACA = thr ACG = thr	AAU = asn AAC = asn AAA = lys AAG = lys	AGU = ser AGC = ser AGA = arg AGG = arg
G	GUU = val GUC = val GUA = val GUG = val	GCU = ala GCC = ala GCA = ala GCG = ala	GAU = asp GAC = asp GAA = glu GAG = glu	GGU = gly GGC = gly GGA = gly GGG = gly

Use the following DNA strand to do the following:

AGT AGC TAG

Replicate the DNA: \_\_\_\_\_

Transcribe the DNA into mRNA: \_\_\_\_\_

Translate the mRNA into amino acids (remember to use the anticodon):

\_\_\_\_\_

**Station 2. Analyze how biological traits are passed on to successive generations.**

- c. Using Mendel's laws, explain the role of meiosis in reproductive variability.
- e. Compare the advantages of sexual reproduction and asexual reproduction in different situations.

The process of meiosis provides the opportunity for the shuffling of chromosomes. How is meiosis and sexual reproduction helpful for the survival of a species? \_\_\_\_\_

What is crossing over? How does this relate to the question to the left?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Know these

**Genetic terms**

- ◆ Allele
- ◆ Dihybrid
- ◆ Dominant
- ◆ Gene
- ◆ Genotype
- ◆ Heterozygous
- ◆ Homozygous
- ◆ Monohybrid
- ◆ Phenotype
- ◆ Recessive
- ◆ Trait

	<u>Sexual reproduction</u>	<u>Asexual reproduction</u>
# of parents		
Are the offspring different or the same as the parents?		
Which kingdoms use this method to reproduce?		
Advantages		
Disadvantages		

Who was Gregor Mendel? What did he study?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

What are the sources of genetic variation in organisms?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Define the following words:

1. Heterozygous: \_\_\_\_\_
2. Homozygous: \_\_\_\_\_
3. Genotype: \_\_\_\_\_
4. Phenotype: \_\_\_\_\_
5. Dominant allele: \_\_\_\_\_
6. Recessive allele: \_\_\_\_\_

In rabbits, black fur (B) is dominant over white fur (b). If one parent rabbit is heterozygous and the other parent rabbit is homozygous white, what is the probability of producing an offspring with white fur? (Use a Punnett square to determine your answer.)

What is the phenotypic ratio of the offspring?

\_\_\_\_\_

What is the genotypic ration of the offspring?

\_\_\_\_\_

**Station 3. Analyze how biological traits are passed on to successive generations.**

d. Describe the relationships between changes in DNA and potential appearance of new traits including

- Alterations during replication
- Insertions
- Deletions
- Substitutions
- Mutagenic factors that can alter DNA.
  - High energy radiation (x-rays and ultraviolet) and Chemical

f. Examine the use of DNA technology in forensics, medicine, and agriculture

Define the following: Law of dominance: \_\_\_\_\_

Law of segregation: \_\_\_\_\_

Law of independent assortment: \_\_\_\_\_

What is a mutagen? List three. \_\_\_\_\_

What is codominance? Give an example. \_\_\_\_\_

What is incomplete dominance? Give an example. \_\_\_\_\_

What is a mutation? \_\_\_\_\_

Are all mutations bad? Explain. \_\_\_\_\_

Explain the following types of gene mutations:

Explain how a point substitution is different from a frame-shift mutation. \_\_\_\_\_

Frame Shift Mutations:

- Deletion Mutation: \_\_\_\_\_

- Insertion Mutation: \_\_\_\_\_

Point Substitution:

- Base-pair substitution: \_\_\_\_\_

What is a somatic mutation? \_\_\_\_\_

What is germ mutation? \_\_\_\_\_

What kind of mutation can be passed on? How is it passed on? \_\_\_\_\_

What is genetic engineering? \_\_\_\_\_

What is recombinant DNA? \_\_\_\_\_

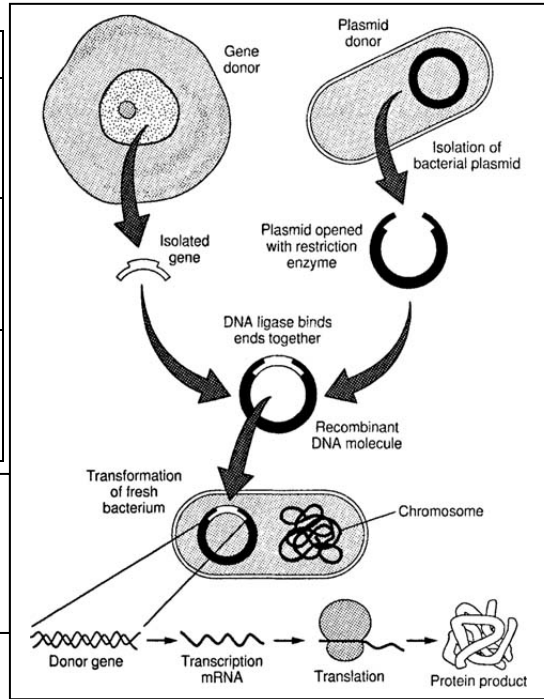
How is recombinant DNA used in genetic engineering? \_\_\_\_\_

What is a plasmid? \_\_\_\_\_

What is a transgenic organism? \_\_\_\_\_

How can (do) mutations help populations survive and adapt (evolve)?

	How is genetic engineering used in the following?
Medicine	
Agriculture	
Breeding	



What are the risks of genetic engineering? \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

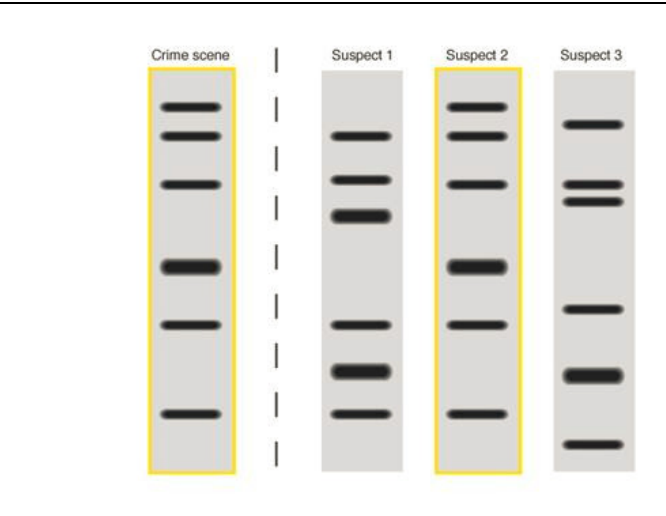
What is DNA Fingerprinting? \_\_\_\_\_  
 \_\_\_\_\_

What can DNA Fingerprinting be used for in forensics (a branch of law enforcement that uses scientific investigation and evidence to solve crimes)? Discuss at least 2 ways. \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

How can DNA be used to determine how closely related various organisms are? \_\_\_\_\_  
 \_\_\_\_\_

How can DNA be used to prove paternity (who the father is)? \_\_\_\_\_  
 \_\_\_\_\_

How is DNA separated in gel electrophoresis? \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



How do police know that suspect 2 is guilty?  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Review Questions**

1. A type of mutation that alters DNA by replacing one nucleotide with another is

- a. Crossing-Over
- b. Insertion
- c. Deletion
- d. Substitution

2. Which of the following DNA technologies is MOST likely to be used in forensics?

- a. Genetic Engineering
- b. Development of frost-resistant plants
- c. DNA fingerprinting

**Station 4 Derive the relationship between single-celled and multi-celled organisms and the increasing complexity of systems. Chapter 4**

a. Explain the cycling of energy through the processes of photosynthesis and respiration.

What is photosynthesis and what organelle does it occur in? \_\_\_\_\_

What types of organisms carry out photosynthesis? \_\_\_\_\_

What is the source of energy for photosynthesis? \_\_\_\_\_ What is another word for producer? \_\_\_\_\_

What is the equation for Photosynthesis?

What is the equation for cellular respiration?

How are photosynthesis and cellular respiration related? \_\_\_\_\_

What happens during the light-dependent reactions?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

What happens during the light-independent reactions also known as the Calvin cycle? \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Sketch a chloroplast.

What is stored in the bonds of glucose? \_\_\_\_\_

What are the reactants in photosynthesis? \_\_\_\_\_

What are the products of photosynthesis? \_\_\_\_\_

What are the reactants in cellular respiration? \_\_\_\_\_

What are the products of cellular respiration? \_\_\_\_\_

What is cellular respiration? \_\_\_\_\_

Why do organisms do cellular respiration? \_\_\_\_\_

What types of organisms perform cellular respiration? \_\_\_\_\_

What organelle performs cellular respiration? \_\_\_\_\_

What happens during glycolysis? \_\_\_\_\_

What happens during the Krebs cycle? \_\_\_\_\_

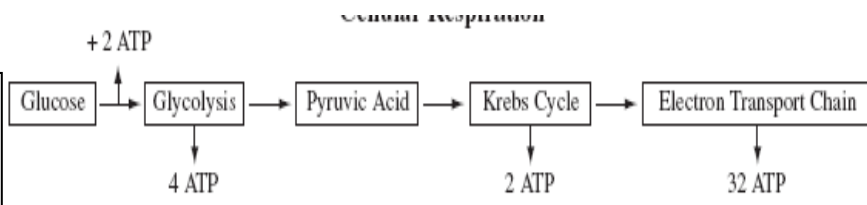
What is the electron transport chain? \_\_\_\_\_

Sketch a mitochondrion.

Anaerobic respiration begins with glycolysis. If no oxygen is present, glycolysis is followed by fermentation. What is anaerobic respiration? \_\_\_\_\_

What is lactic acid fermentation? \_\_\_\_\_

What is alcohol fermentation? \_\_\_\_\_



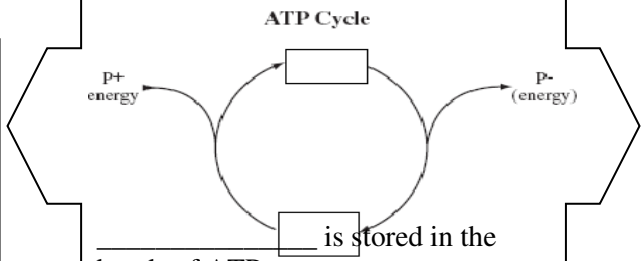
Above are the steps of \_\_\_\_\_

Which process makes more ATP molecules and thus provides more energy? Cellular respiration or fermentation

What is the difference between anaerobic and aerobic?  
 \_\_\_\_\_  
 \_\_\_\_\_

Chemical energy is stored in the bonds that hold carbohydrates and other organic compounds together. Cells release this energy through respiration. Organisms then use this energy to carry out a variety of activities. When energy is needed in the cell, chemical energy is converted from storage molecules, such as sugar, into adenosine triphosphate, or ATP. ATP then delivers the energy to the places in the cell that need it. ATP is a nucleic acid with 3 phosphate groups in a chain. The phosphate tail of the ATP molecule holds the usable energy. To release the stored energy, the bonds between the phosphates in ATP must be broken. When a phosphate is removed, a molecule with 2 phosphates is left called adenosine diphosphate, or ADP. ADP can be recombined with a free phosphate to form a new molecule of ATP. Combining ADP with free phosphates is called phosphorylation. ATP is like a rechargeable battery. A rechargeable battery may start out filled with chemical energy. As the battery is used, it gives up the energy. The depleted battery is then recharged so it can be used again. ATP is like the recharged battery and ADP is the lower-energy form like the used up battery.

Energy is release when \_\_\_\_\_ is converted into \_\_\_\_\_.



\_\_\_\_\_ is stored in the bonds of ATP.

**\*\*Fill in the boxes in the picture above with: ATP, ADP**

Word Bank: ATP, Energy, ADP

**Station 5 Derive the relationship between single-celled and multi-celled organisms and the increasing complexity of systems. Chapter 17-20, 23**

- b. Compare how structures and function vary between the six kingdoms (archaeobacteria, eubacteria, protists, fungi, plants, and animals).
- c. Examine the evolutionary basis of modern classification systems.

	<u>Archaeobacteria (aka the extreme bacteria)</u>	<u>Eubacteria (aka true bacteria)</u>	<u>Protista (aka the Hodgepodge/mixed group)</u>	<u>Fungi</u>	<u>Plantae</u>	<u>Animalia</u>
Domain						
Prokaryotic or eukaryotic						
Uni or multicellular						
Heterotrophic or Autotrophic						
Cell wall? If so, what is the cell wall made of?						
Other distinguishing characteristics	Where do they live?		Why are they the mixed group?			

What is taxonomy? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

How did Carolus Linnaeus classify organisms? \_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Dumb (Most broad taxon)	What are the 3?
King	What are the 6?
Philip	
Came	
Over	
For	
Good	Used in the scientific name.
Soup (Most specific)	Used in the scientific name.



Linnaeus created the system for naming organisms that is still used today. This system is called binomial nomenclature, because it gives each organism a two-part name.

What is the first part of the scientific/binomial name? \_\_\_\_\_

What is the second part of the scientific/binomial name? \_\_\_\_\_

Which word is capitalized? \_\_\_\_\_

Both words italicized in writing.

What language is used for the scientific/binomial name? \_\_\_\_\_

What are the advantages of using scientific names over common names? \_\_\_\_\_

\_\_\_\_\_

Which of the following is written correctly?

*Quercus rubra* Quercus rubra

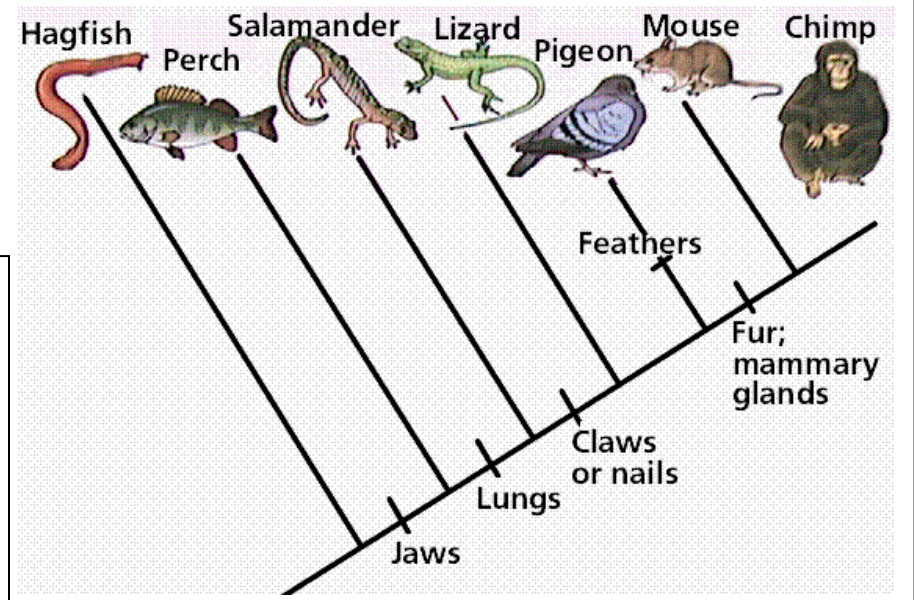
quercus rubra Quercus Rubra

How are organisms classified? \_\_\_\_\_

What is phylogeny? \_\_\_\_\_

What do scientists now look at in DNA to figure out how closely related different organisms are? \_\_\_\_\_

A **cladogram** is a tree-like diagram that shows evolutionary relationships. Each branch shows where a new group of organisms, called a clade, emerged from an existing group. The cladograms below shows the emergence of the 6 kingdoms. Eubacteria are classified in their own kingdom due to differences in their RNA and the presence of peptidoglycan in their cell walls. Scientists think Protista was the first kingdom of eukaryotic organisms. A cladogram is like a timeline that shows when traits or organisms first appeared on the evolutionary time line.



**Warm-Up Review:**

1. A cladogram shows:

- A. Which kingdom is the most diverse
- B. How to name a species
- C. Change over time
- D. Evolutionary relationships

2. From earliest to most recent, which is the correct order of evolution?

- A. Protista, Animalia, Archaeobacteria
- B. Animalia, Archaeobacteria, Protista
- C. Archaeobacteria, Protista, Animalia
- D. Animalia, Protista, Archaeobacteria

What organisms do not have lungs? \_\_\_\_\_

\_\_\_\_\_ How do you know? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Station 6. Derive the relationship between single-celled and multi-celled organisms and the increasing complexity of systems Chapter 18.1-18.3**

d. Compare and contrast viruses with living organisms.

What is the basic structure of a virus? Make and label a sketch.

Why are viruses considered nonliving particles? Give four reasons.

1- \_\_\_\_\_

2- \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

Why is HIV called a retrovirus? \_\_\_\_\_

What is a prion? \_\_\_\_\_

Explain how a virus replicates using the lytic cycle & the lysogenic cycle.

**LYTIC CYCLE**

**LYSOGENIC CYCLE**

In which cycle can the virus remain dormant until triggered? \_\_\_\_\_

What is a bacteriophage? \_\_\_\_\_

Why are viruses hard to cure? \_\_\_\_\_

Do antibiotics help cure a virus? \_\_\_\_\_ If you take antibiotics for a virus, what are you helping to cause? \_\_\_\_\_

A virus that causes little or no harm to the host is said to be benign. An example of a benign virus is the common cold.

**1. Why are viruses not considered living things?**

- A. They are not made of cells.
- B. They do not contain hereditary material.
- C. They cannot make their own nutrients.
- D. They can only be seen with an electron microscope.

**2. What determines the shape of a virus?**

- A. its DNA
- B. its RNA
- C. the presence of an envelope
- D. the proteins in its capsid