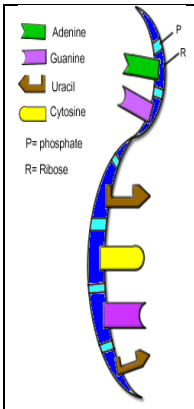
3RD QUARTER



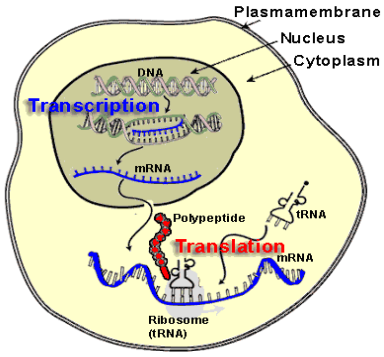
RNA (Rribonucleic Acid)
Difference from DNA
1. Single Strand not double
2. Ribose not Deoxyribose
3. Thymine replaced by Uracil

Remember:
mRNA codons
tRNA anticodons
codon table

Protein Synthesis (Gene Expression)-the process of translating an organism's genotype to phenotype. Genes code for sequences of amino acids that make up proteins.2 Phases:

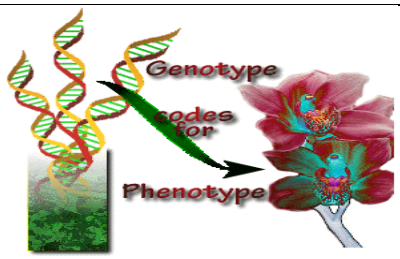
1. Transcription (nucleus)-information in a DNA molecule is copied to **RNA** (transcribe = copy)

2. Translation (cytoplasm/ribosomes)-mRNA is used to make a **protein (**nucleotides translated to **amino acid sequences**)



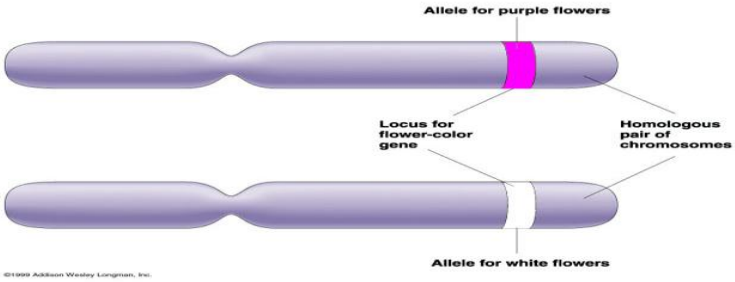
3.3 Explain how mutations in the DNA sequence of a gene may or may not result in phenotypic change in an organism. Explain how mutations in gametes may result in phenotypic changes in offspring.

Mutation-a random change in the sequence of the DNA (frameshift and point mutations)
Genotype-the genetic makeup of an organism as indicated by its set of alleles (ie: YY, Yy, or yy).
Phenotype-the observable characteristics of an organism or the outward expression of its traits.
Gamete-reproductive cells such as sperm or egg they are haploid cells that participate in fertilization by fusing with another haploid cell.
An individual's genetic makeup (genotype) can be translated into observable characteristics (phenotype) because their DNA provides a template for making proteins.



3.4 Distinguish among observed inheritance patterns caused by several types of genetic traits (dominant, recessive, incomplete dominance, codominant, sex-linked, polygenic, and multiple alleles).

Genes are sections of chromosomes that code for a trait.
Alleles are different forms of a gene.
Letters are used to represent alleles
P (purple flower-dominant)
p (white flower-recessive)
Dominant Allele-a form of a gene that is fully expressed when two different alleles are present.
vs.
Recessive Allele-a form of a gene that is not expressed when paired with a dominant allele.

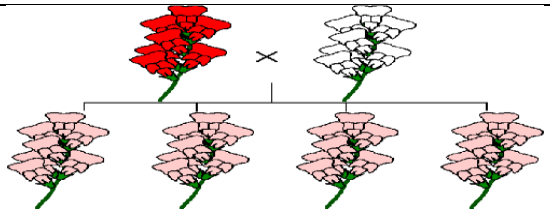


Homozygous-if the alleles for a particular gene in an individual are the same (ie: PP or pp)
Heterozygous-if the alleles for a particular gene in an individual are different (ie: Pp)

Incomplete Dominance-a condition in which a trait in an individual is intermediate between the phenotype of its two parents. Neither allele is fully expressed. Sickle Cell Anemia in humans is an example of incomplete dominance.

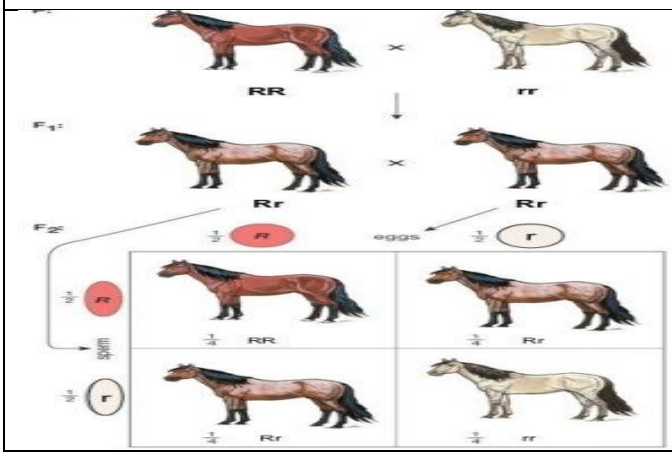
Snapdragons
RR-Red
Rr-Pink
rr-white

Sickle Cell Anemia
AA- Not affected
Aa-mildly affected
aa-Affected

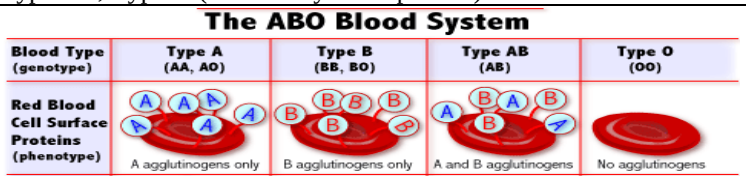


Codominance-a condition in which both alleles for a gene are expressed fully when present

Roan horses are born when a homozygous red horse mates with a homozygous white horse. The resulting offspring has both red and white hairs, which from a distance may look a bit pinkish.



Multiple Alleles-In humans blood type is determined by the different carbohydrates that coat the surface of red blood cells. Type A, Type B, Type AB, Type O (no carbohydrates present)

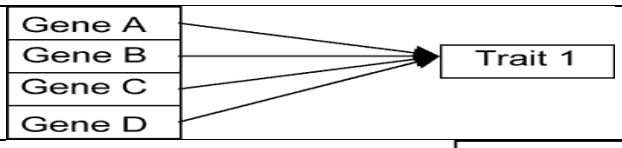


Human blood type genes are an example of a codominant trait with **multiple alleles**. Blood types are phenotypes that can be produced by three different alleles I^A, I^B, and i.

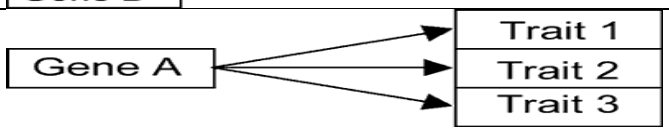
	I^A	I^B	i
I^A	I^AI^A	I^AI^B	I^Ai
I^B	I^AI^B	I^BI^B	I^Bi
i	I^Ai	I^Bi	ii

I^A & I^B-Dominant; i recessive

Polygenic Traits-are traits that are controlled by more than one gene. An example would be eye color, which is a combination of the tone, amount, and position of eye color.

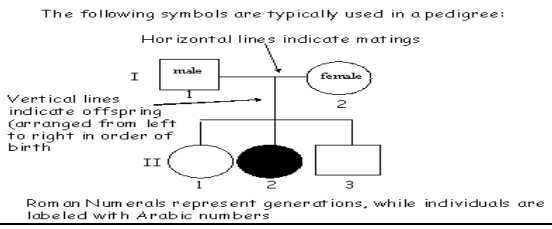


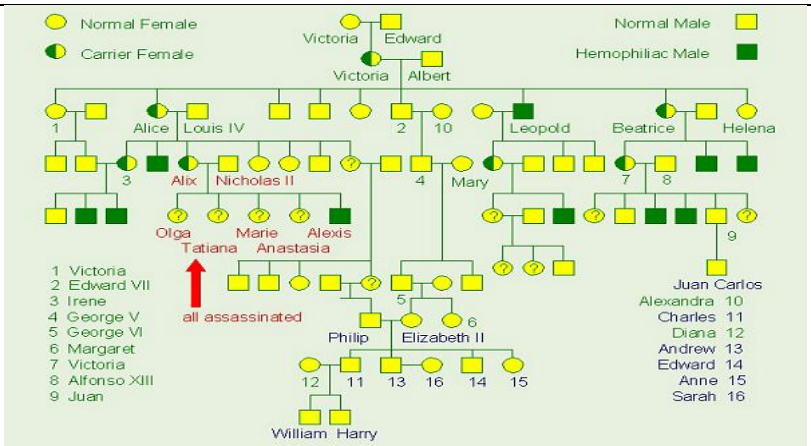
Pleiotropy-when a single gene affects more than one trait. Secondary affects of these genes can be either good or bad. Sickle cell anemia is an example.



Sex-linked (determined by a gene on the X chromosome) traits are usually seen only in males because males only have one X chromosome. **XX vs. XY**

Pedigree-a family history that shows how traits are inherited over several generations.



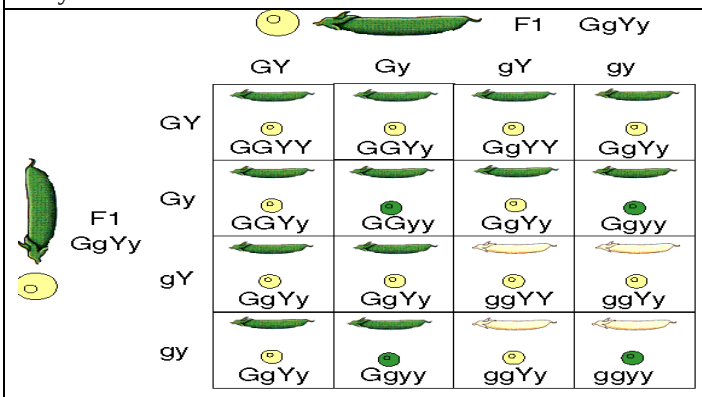


3.5 Describe how Mendel's laws of segregation and independent assortment can be observed through patterns of inheritance (such as dihybrid crosses).

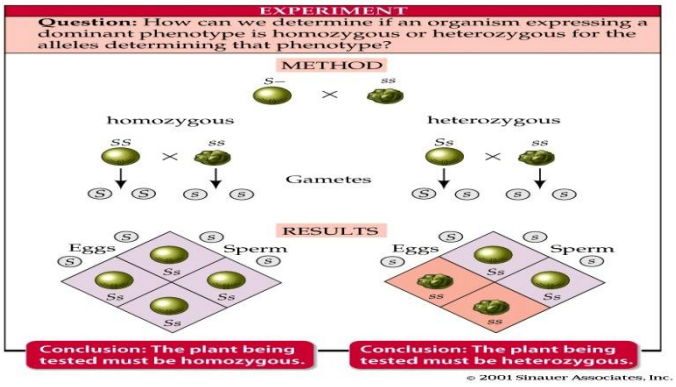
Laws of Heredity (Mendel's Laws)
1. Law of Segregation-the two alleles for a trait segregate (separate) when gametes are formed (during meiosis). Because of segregation ½ of an organisms gametes contain one gene from a homologous pair and ½ of the games contain the other gene.

2. Law of Independent Assortment-the alleles of different genes separate randomly and independently of one another during gamete formation. (ie: the alleles associated with the color, size, flower position etc. are not linked to one another)
3. Law of Dominance-if two alleles in a gene pair are different, then one allele (dominant) can control the trait and the other one can be hidden (recessive)

Dihybrid Cross-two contrasting traits- like flipping two independent coins
Dihybrid crosses follow the FOIL Rule

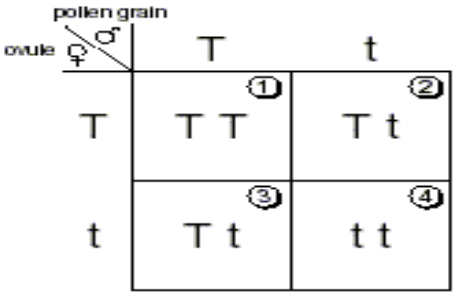


Test Cross-a cross of an individual whose phenotype is dominant (but whose genotype is unknown) with a homozygous recessive individual.



3.6 Use a Punnett Square to determine the probabilities for genotype and phenotype combinations in monohybrid crosses.

Punnett Square-diagrams that predict the expected outcomes of a genetic cross by considering all possible combinations of gametes in the cross. Punnett squares show probabilities not the actual results of crosses between organisms.
Monohybrid Cross-a cross involving 1 set of contrasting traits.
Genotypic Ratio:
Homozygous Dominant: Heterozygous Dominant: Homozygous Recessive
VS
Phenotypic Ratio:
Dominant: Recessive



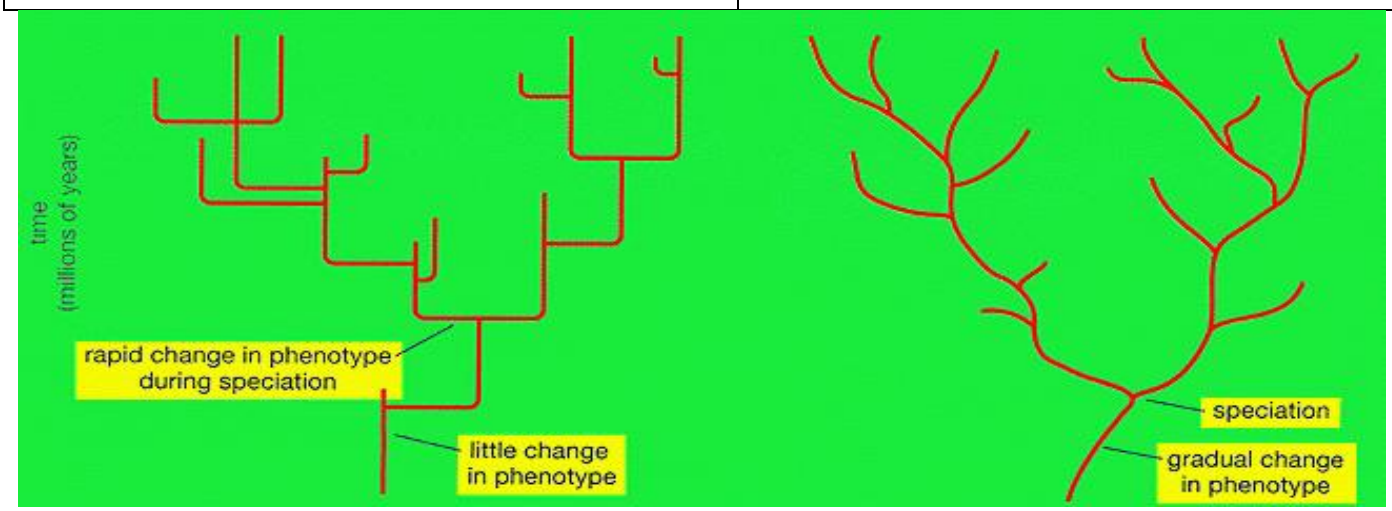
5. Evolution and Biodiversity

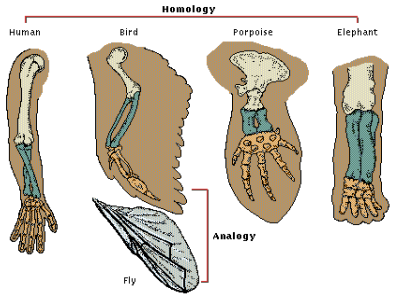
Broad Concept: Evolution is the result of genetic changes that occur in constantly changing environments. Over many generations, changes in the genetic make-up of populations may affect biodiversity through speciation and extinction.

5.1 Explain how evolution is demonstrated by evidence from the fossil record, comparative anatomy, genetics, molecular biology, and examples of natural selection.

Evolution-changes in populations over long periods of time. Evolution represents the change in a gene pool over time.

Punctuated Equilibrium-long periods of genetic stability are interrupted by periods of rapid genetic change	**Gradualism-**new species evolve as the genomes of two populations differentiate over enormous spans of time



Homologous Structures-similar traits in different species because of a common ancestor. Homologous Structures show evidence of a common ancestor. **Analogous Structures-**a structure that is similar in function, but not inherited from a common ancestor. Analogous Structures are evidence of independent evolution. Other Records of Evolution		**Proteins-**scientists look for similar amino acid sequences to determine shared ancestry. ie: the more common the shared ancestry the more amino acid sequences will be the same **Nucleic Acids-**scientists can directly estimate the number of changes that have taken place in a gene since divergence from a common ancestor. **Fossil Record-**evidence from the fossil record can be used to show evolutionary relationships by comparing homologous and analogous structures and locations of fossil finds.

Comparative Embryology-comparison of the embryonic forms of various living organisms	**Vestigial Structures-**a structure that is unused but is homologous with structures in other species-thereby suggesting a common ancestry