

RNA (Ribonucleic Acid)

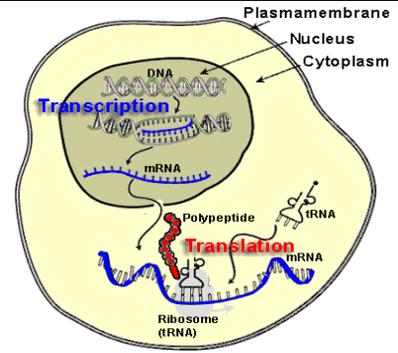
Difference from DNA

1. Single Strand not double
2. Ribose not Deoxyribose
3. Thymine replaced by Uracil

Remember:
mRNA codons
tRNA anticodons
codon table

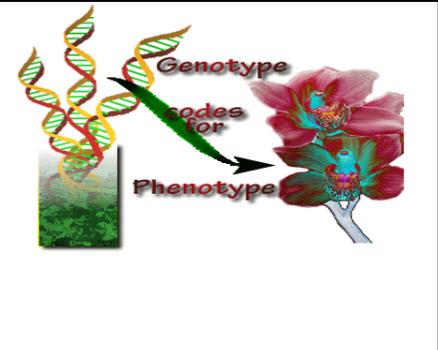
Protein Synthesis (Gene Expression)-the process of translating an organism's genotype to phenotype. Genes code for sequences of amino acids that make up proteins. 2 Phases:

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**)



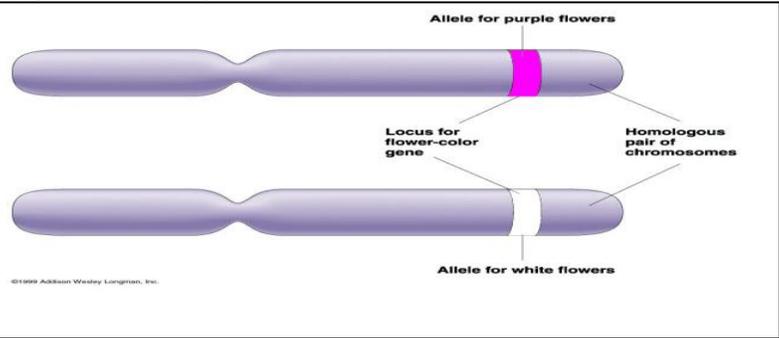
3.3 Explain how mutations in the DNA sequence of a gene may or may not result in phenotypic change in an organism. Explain how mutations in gametes may result in phenotypic changes in offspring.

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.



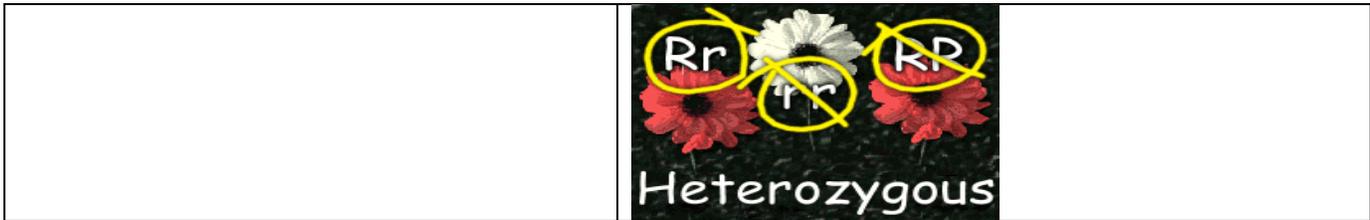
3.4 Distinguish among observed inheritance patterns caused by several types of genetic traits (dominant, recessive, incomplete dominance, codominant, sex-linked, polygenic, and multiple alleles).

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.



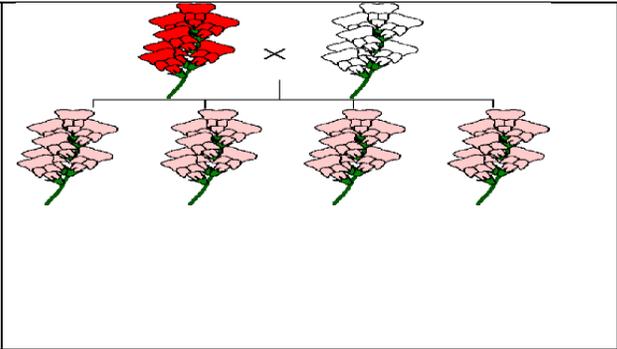
Homozygous-if the alleles for a particular gene in an individual are the same (ie: PP or pp)
Heterozygous-if the alleles for a particular gene in an individual are different (ie: Pp)





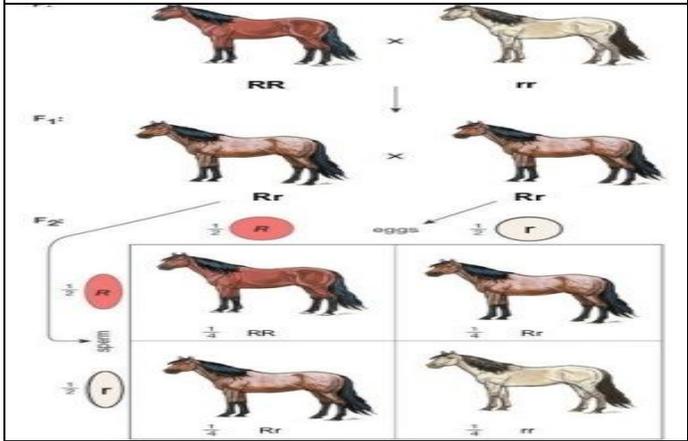
Incomplete Dominance-a condition in which a trait in an individual is intermediate between the phenotype of its two parents. Neither allele is fully expressed. Sickle Cell Anemia in humans is an example of incomplete dominance.

Snapdragons RR-Red Rr-Pink rr-white		Sickle Cell Anemia AA- Not affected Aa-mildly affected aa-Affected
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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)

The ABO Blood System

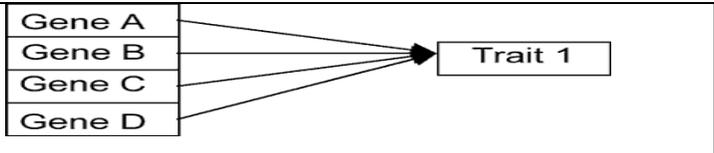
Blood Type (genotype)	Type A (AA, AO)	Type B (BB, BO)	Type AB (AB)	Type O (OO)
Red Blood Cell Surface Proteins (phenotype)				

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 .

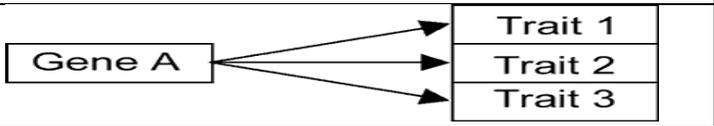
	I^A	I^B	i
I^A	$I^A I^A$	$I^A I^B$	$I^A i$
I^B	$I^A I^B$	$I^B I^B$	$I^B i$
i	$I^A i$	$I^B i$	ii

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.

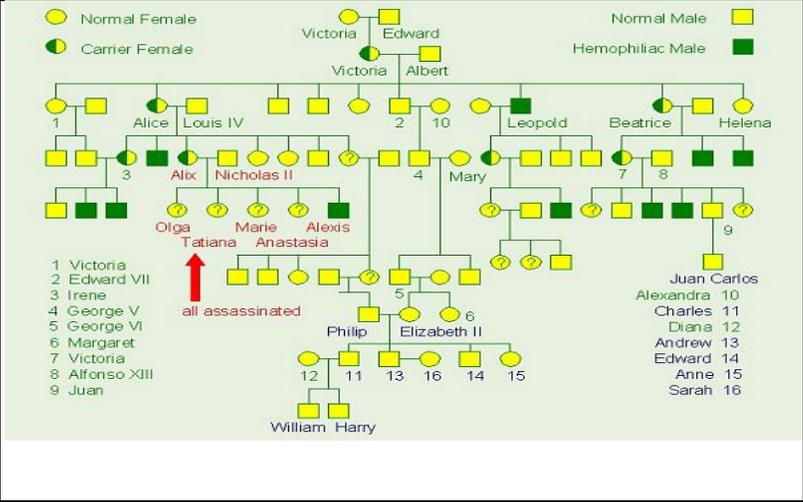
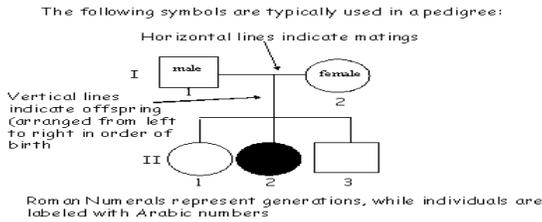


Pleiotropy-when a single gene affects more than one trait. Secondary affects of these genes can be either good or bad. Sickle cell anemia is an example.



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)

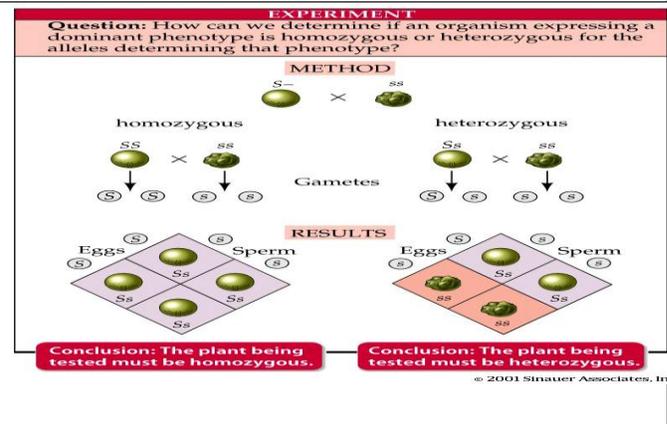
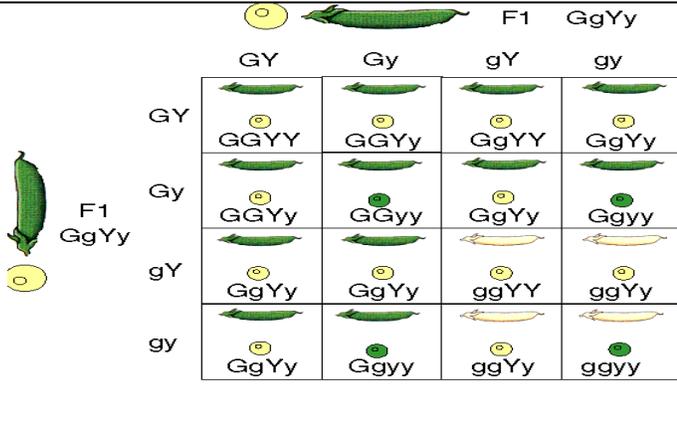
1. Law of Segregation-the two alleles for a trait segregate (separate) when gametes are formed (during meiosis). Because of segregation 1/2 of an organisms gametes contain one gene from a homologous pair and 1/2 of the games contain the other gene.

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

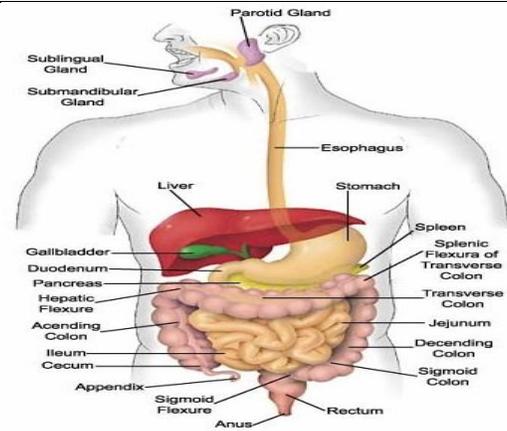
		pollen grain	
		♂	
ovule ♀	T	TT ①	Tt ②
	t	Tt ③	tt ④

4. Anatomy and Physiology

Broad Concept: There is a relationship between the organization of cells into tissues, and tissues into organs. The structure and function of organs determine their relationships within body systems of an organism. Homeostasis allows the body to perform its normal functions.

4.1 Explain generally how the digestive system (mouth, pharynx, esophagus, stomach, small and large intestines, rectum) converts macromolecules from food into smaller molecules that can be used by cells for energy and for repair and growth.

- Mouth:** Mechanical digestion (chewing) and chemical digestion (saliva). Carbohydrate digestion begins with amylase in saliva.
- Pharynx and esophagus:** Bolus down pharynx (epiglottis closes entrance to the trachea) by muscular contractions called peristalsis.
- Stomach:** Mechanical Digestion (stomach walls contract to churn food.) Chemical digestion (hydrochloric acid and the enzyme pepsin-which begins breakdown of proteins). Chyme a soft pulp of food is produced and released into the small intestine.
- Small Intestine:** (7 meters long with narrow diameter) Divided into three structural parts: duodenum, jejunum, and the ileum. Digestion of fats begins while digestion of carbohydrates and proteins are completed. The small intestine is also where nutrients are absorbed.
- Large Intestine:** (1.5 meters long with large diameter) Water and water-soluble vitamins are absorbed from Rectum-the final portion of the large intestine where feces is stored until it is eliminated through the anus.



4.2 Explain how the circulatory system (heart, arteries, veins, capillaries, red blood cells) transports nutrients and oxygen to cells and removes cell wastes. Describe how the kidneys and the liver are closely associated with the circulatory system as they perform the excretory function of removing waste from the blood. Recognize that kidneys remove nitrogenous wastes, and the liver removes many toxic compounds from blood

- Pulmonary Circuit:** (blood b/w heart and lungs)
 - Systemic Circuit:** (blood b/w heart and body)
- Human Blood Vessels:** transport blood throughout the body
- Arteries→Arterioles:** carry blood away from the heart. High Pressure due to pumping of heart.
 - Capillaries:** Most of the gases, nutrients, and wastes in the blood are exchanged with body cells by diffusion through the capillary walls.
 - Veins→Venules:** carry blood to the heart (Low Pressure)

