IV. Protein Synthesis:

A. **DNA** (deoxyribonucleic acid) double stranded; contains the genetic code

*__Nucleotides__: A, G, C, & T

*__Chargaff's Rule__: A bonds with T and G bonds with C

B. **RNA** (ribonucleic acid) single stranded; involved in protein synthesis

*__Nucleotides__: A, G, C, & U

*__Chargaff's Rule__: A bonds with U and G bonds with C

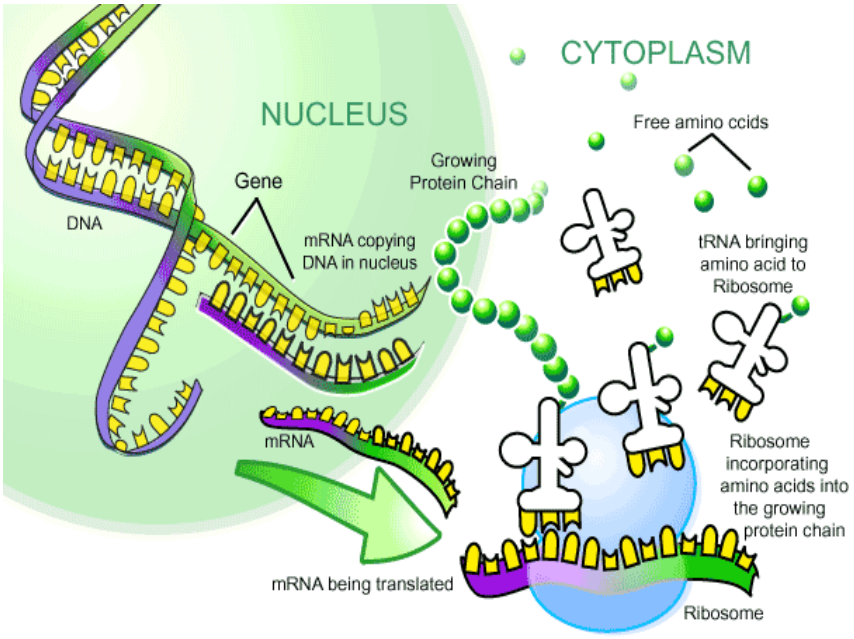
*__RNA 3 types__:

1. **mRNA**- (messenger) copies the directions for building a protein from the DNA (a.k.a., **transcription**)
2. **tRNA**- (transfer) transfers amino acids to ribosome for **translation** (-amino acids are put in the correct order according to the genetic code)
3. **rRNA** (ribosomal) ribosomes are made of this, sites of protein synthesis)

C. **Transcription**: mRNA copies the directions for building a protein from the DNA in the nucleus

The mRNA leaves the nucleus and goes to the ribosomes

D. **Translation**: the ribosome translates the codon "language" of the mRNA and makes sure the amino acids are put together in the correct order.



V. Mutations – a change in the genetic code (harmful, harmless, neutral)

1. **Gene mutations**- results from changes in one gene

Normal sequence: the-cat-ate-the-rat

A. **Substitution**: the-cat-ate-the-rat → the-**h**at-ate-the-rat (h subs for c)

*FYI: only one amino acid will be wrong. May not be a big deal.

B. **Insertion**: " " → the-c**h**a-tat-eth-era-t (h inserted)

C. **Deletion**: " " → the-ata-tet-her-at (c missing)

D. **Duplication**: " " → the-cc**c**a-tat-eth-era-t

*FYI: b, c & d can cause a "**frame shift**". Meaning, the reading frame for translating the genetic code during protein synthesis is off by one; so, every amino acid will be *wrong* from the point of the mutation. This can be a *serious* problem.

2. **Chromosome mutations**- change in number or structure of chromosome
    A. **Nondisjunction**- homologous **chromosomes** (paired chromosomes) **fail to separate** properly during meiosis Ex) 1 sperm could have 24 total chromosomes instead of 23
    An **extra 21st chromosome** results in **Down Syndrome**
    B. **Deletion**: " " → the-the-rat
    C. **Duplication**: " " → the-cat-ate-the-rat-the-rat
    D. **Translocation**: a piece of 1 chromosome brakes off and attachs to another chromosome
    E. **Inversion**: " " → the-eht-eta-tac-tar (last 4 are flipped around backward)

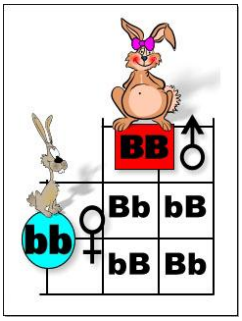
3. **Cancer**- uncontrolled cell growth

VI. Mendel, Genetics, and Heredity:

A. Vocabulary-

A. **Gene**: segment of DNA that codes for a particular trait (Ex. Widow's peak)
B. **Alleles**: ea. gene is made of 2 alleles, 1 from ea. parent (Ex. W or w)
C. **Traits**: **Dominant traits** mask or cover up **recessive traits**
D. **Genotype**: the gene make-up of a trait represented by a **letters** (1 from mom & 1 from dad)
    Ex. **Ww** is **heterozygous** for widow's peak (*hetero-* = different)
    Ex. **WW** is **homozygous dominant** (*homo-* = same and dominant = 2 capital letters)
    Ex. **ww** is **homozygous recessive** (*homo-* = same and recessive= 2 lowercase letters
E. **Phenotype**: the way an organism **looks** (Ex. Ww and WW has widow's peak; ww doesn't)
F. **Monohybrid cross**: deals with only **one** trait
G. **Dihybrid cross**: deals with **2** traits at a time, like seed color and seed texture

F.



G.

	RY	Ry	rY	ry
RY				
Ry				
rY				
ry				

Pea plants
R = round seed
r = wrinkled seed
Y = yellow seed
y = green seed

B. Different Kinds of Inheritance-

1. **Complete Dominance**: either you have the trait or you do not

T= tall t=short

Parent 1: Heterozygous for Tall
Parent 2: Heterozygous for Tall

Genotype: Phenotype:

2. **Sex-linked Inheritance**– certain genes are found only on the **X** chromosome, shows up more in males (passed to them from Mom) Ex. baldness

*FYI: All sex-linked traits are **recessive** (X^bY=bald male; XY=normal male)

Therefore, **men display the traits** more than females

Mothers pass the trait **to** their **sons** on their X chromosome

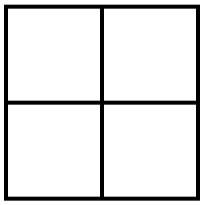
XX=normal female; $\mathbf{X^bX}$ = carrier female; $\mathbf{X^bX^b}$ bald female

XY=normal male; $\mathbf{X^bY}$ bald male

Mom: X^bX

Dad: X Y

Genotype: Phenotype:



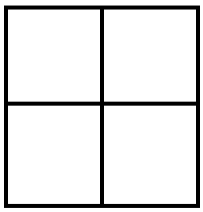
3. **Incomplete Dominance**: there is an intermediate between the dominant & recessive traits

RR = red flower Rr = pink flower rr = white flower

Parent 1: Rr = Heterozygous, pink

Parent 2: Rr = Heterozygous, pink

Genotype: Phenotype:



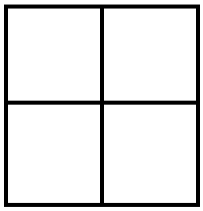
4. **Co-dominance**: Both dominant traits are expressed at the same time

RR = red horse R'R' = white horse RR' = "roan" (red and white hairs present)

Parent 1: red horse

Parent 2: white horse

Genotype: Phenotype:



VII. **Classification-**

A. **Taxonomy**- the study of classification; organization

1. There are **SIX** kingdoms- Archaebacteria, Eubacteria, Protista, Fungi, Plants, and Animals
2. All kingdoms are eukaryotic (true nucleus in cell) except Archaebacteria and Eubacteria