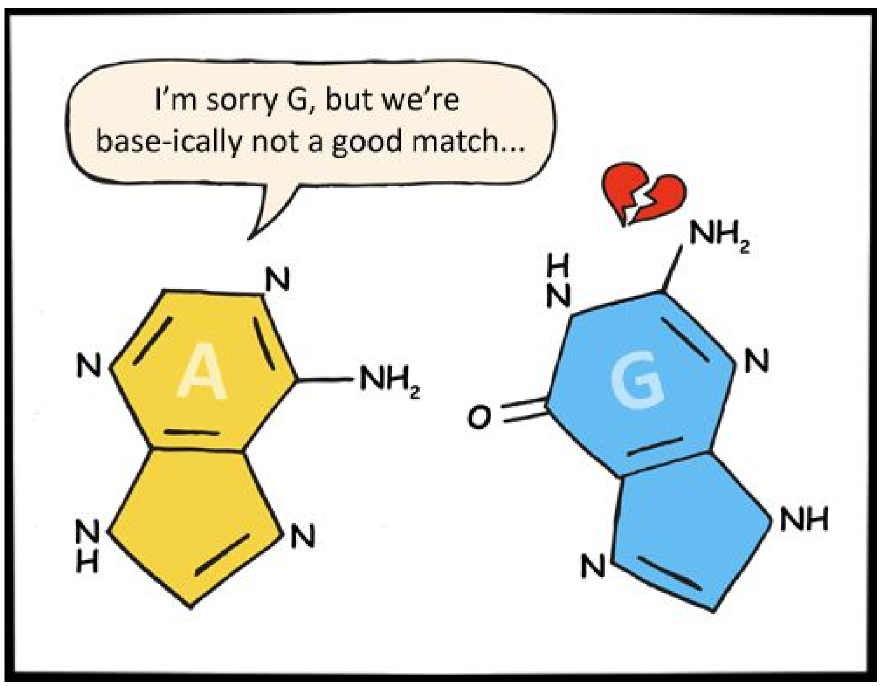
SCIENCE 10

UNIT 3: BIOLOGY

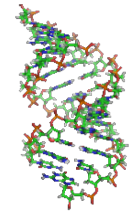


BOOK 1 DNA & INHERITANCE

NAME: ______________________ BLOCK: ______________

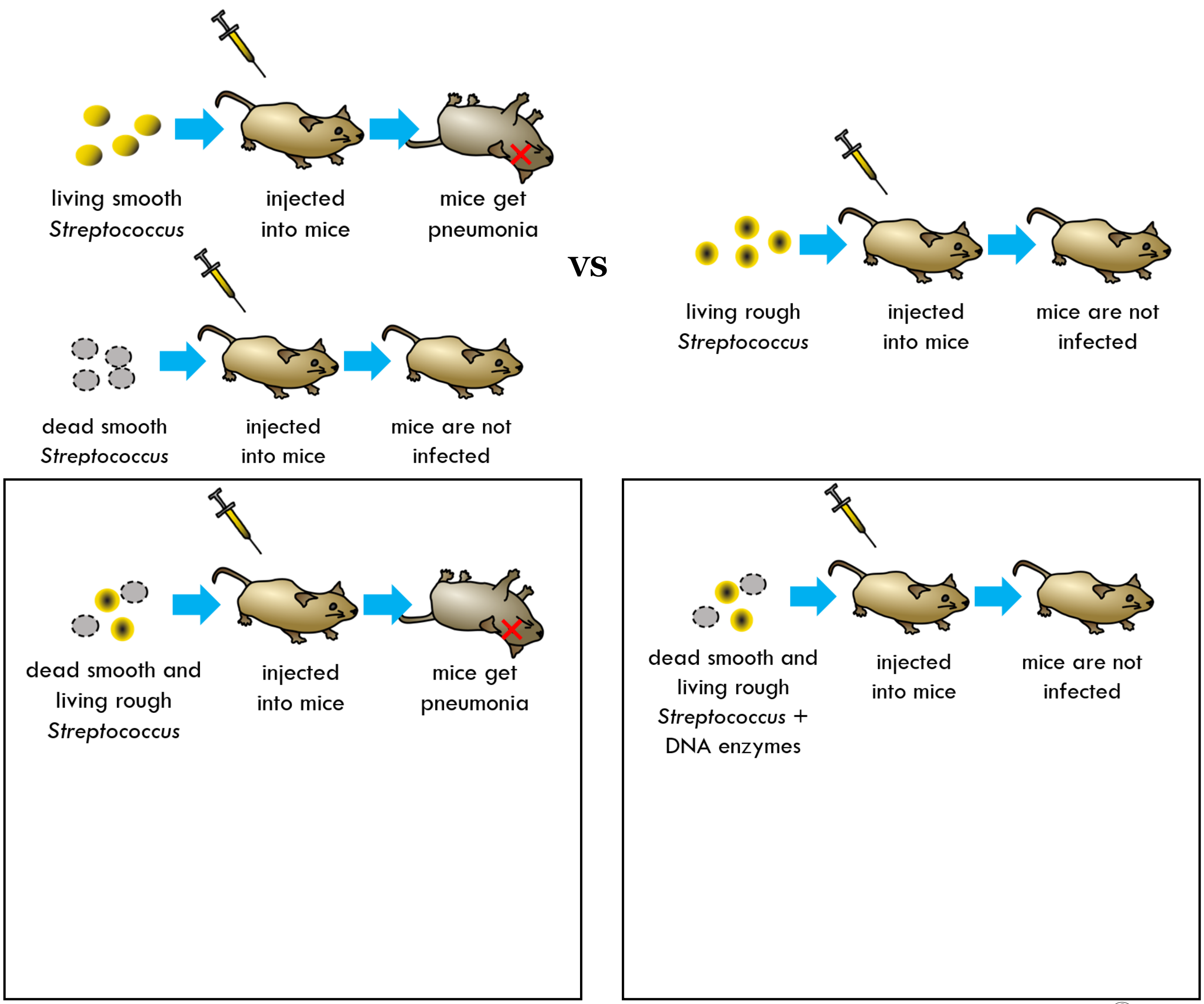
Lesson 1.1 – The Structure of DNA

History of DNA research

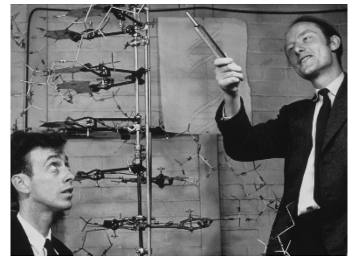


- ☐ DNA was discovered in _______ by a chemist (Johann Friedrich Miescher) studying ___________________ ________________________________
- ☐ In 1881, this new substance was named ____ after the ___________ (deoxyribose) found in the molecule and its acidic properties
- ☐ A series of experiments in the early 1990s showed that ____________________ ____, and allowed viruses to infect cells, indicating that it played a special role in living organisms

Avery MacLeod-McCarty Experiment (1944):

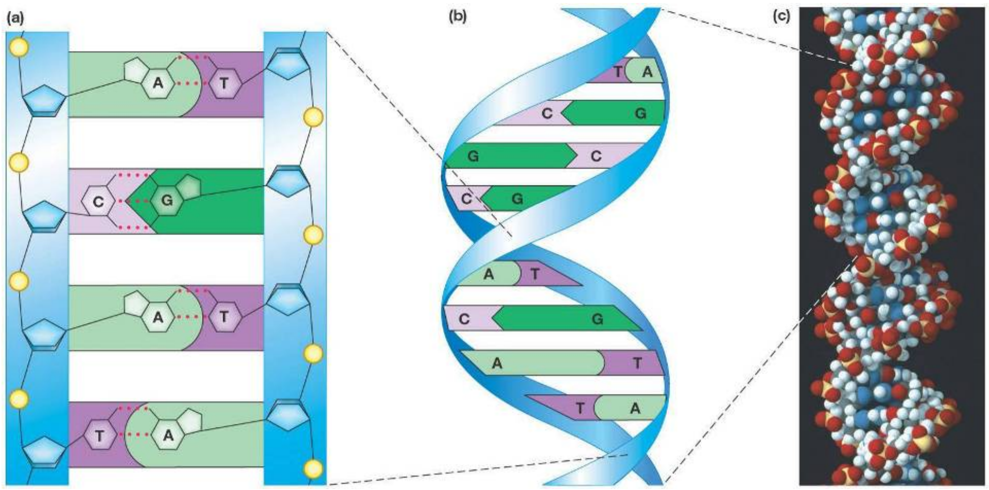


- ☐ In __________, the structure of the DNA molecule was finally discovered by ___________________________



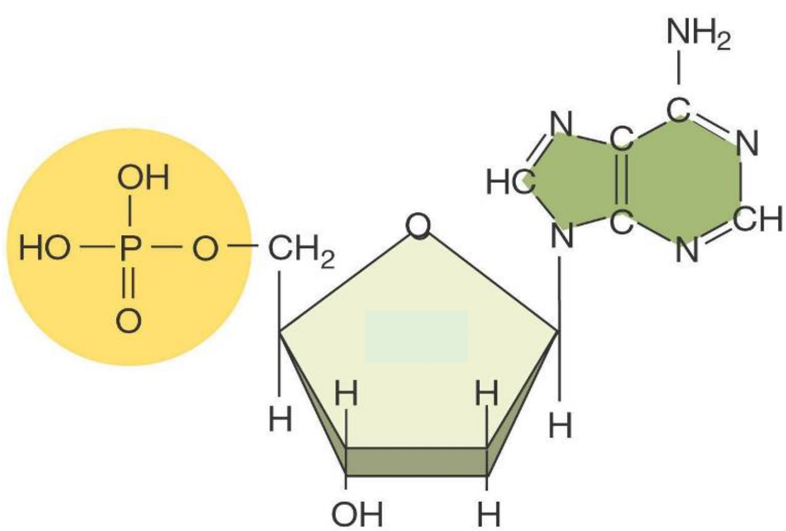
Structure of the DNA Molecule

- ☐ DNA is an ___________________________ molecule containing _____________________________ of atoms joined by chemical bonds
- ☐ It is a _______ of separate strands twisted together to form a '_______________,' however it is usually shown unwound to look like a ladder

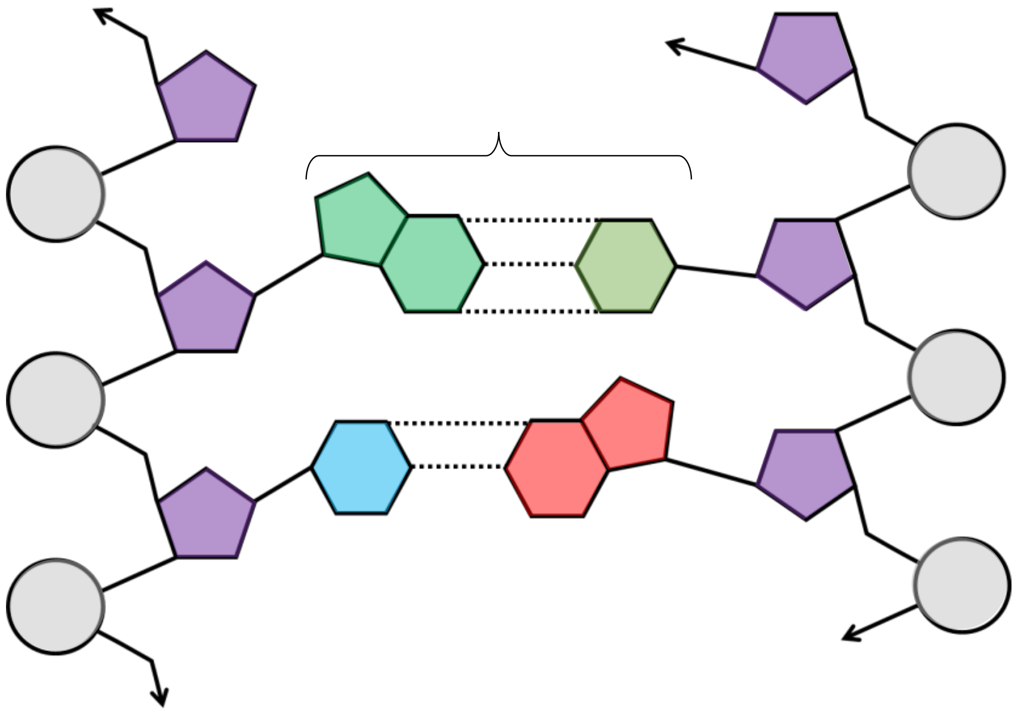


Uncoiled Diagram Double Helix Space-Filling Model

- ☐ Each DNA strand is made from _____________ molecular units called ___________________________
- ☐ A single nucleotide contains a ____ ____



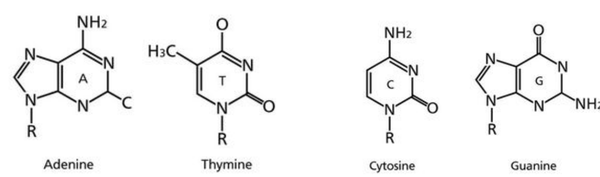
☐ The DNA strands are created when sugar and phosphate from ______________ ________________________________, forming the _______________



Complementary Base Pairing

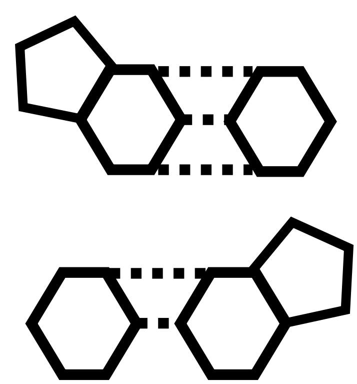
☐ There are four different bases in DNA:

1. _______________ **(A)**
2. _______________ **(T)**
3. _______________ **(C)**
4. _______________ **(G)**



☐ These bases _____________________ a specific base on the other strand:

- ____
- ____



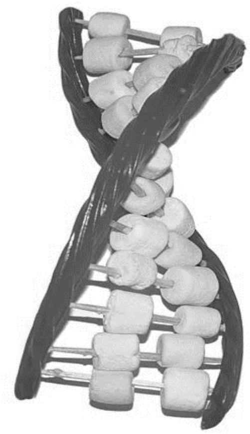
Ways to Remember this:

☐ This relationship is called ____

ACTIVITY: Make DNA with Twizzlers & Marshmallows

***You may not eat any of the supplies until the activity is FINISHED* (including the questions answered).**

1. **Get your Supplies:** Every group needs the following:
    - **2** twizzlers
    - **5** orange marshmallows
    - **5** pink marshmallows
    - **5** yellow marshmallows
    - **5** green marshmallows
    - **10** toothpicks



2. **Make the DNA:**
    - On one twizzler, evenly space out 10 toothpicks and push them into the twizzler
    - Using the legend on the right, push one marshmallow onto each toothpick (more than halfway down) to construct the following sequence: AGATCCGTAC
    - Using what you know about **complimentary base pairs**, add the correct colour of marshmallow to each toothpick, to form your base pair
    - Push your second twizzler onto the end of each toothpick that is sticking out
    - Twist your DNA molecule

Legend
Cytosine: Orange
Thymine: Pink
Adenine: Green
Guanine: Yellow

3. In your group, answer the following questions:
    a. Which two parts of the nucleotide does the twizzler represent?

    b. Which part of the nucleotide does the marshmallow represent?

    c. How are complementary base pairing rules shown in the DNA model?

    d. If there is 30% adenine in a strand of DNA, how much cytosine is present? *Show your work!*

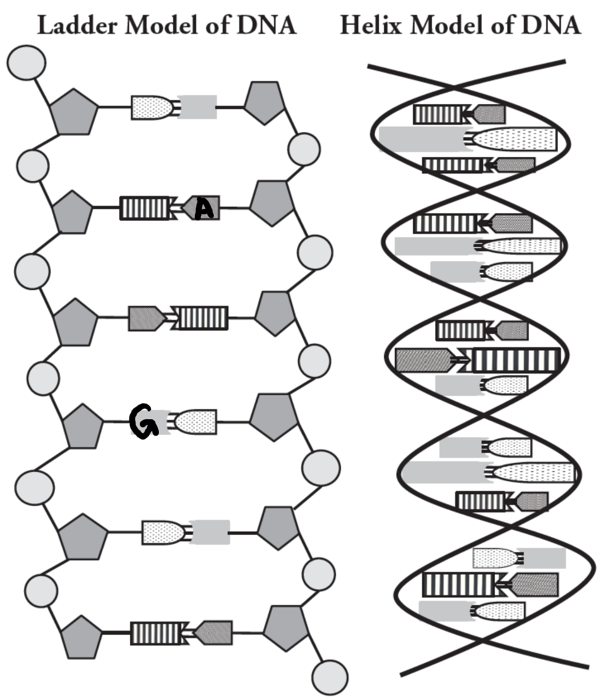
Assignment #1: Complete the following worksheet in the space provided below

1. What do the letters of DNA stand for?

2. What are the three parts of a nucleotide?

3. Which nucleotide component contains nitrogen?

4. Name the four bases.



5. DNA is often drawn in a "ladder model." Locate this drawing above.
    a. Circle a single nucleotide on each side of the ladder model of DNA.
    b. Label a sugar molecule and a phosphate molecule on the ladder model.
    c. What part(s) of the nucleotides make up the rungs (steps) of the "ladder"?

    d. What part(s) of the nucleotides make up the sides (backbone) of the "ladder"?

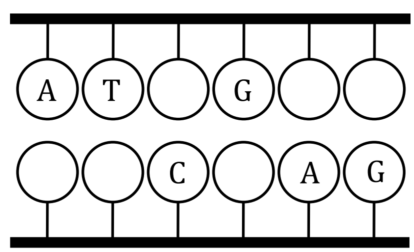
6. On the ladder model of DNA label each of the bases with the letter A, T, C or G (that are not already labeled).

7. When one nucleotide contains thymine, what type of base is the thymine attached to on the opposite nucleotide strand?

8. When one nucleotide contains cytosine, what type of base is the cytosine attached to on the opposite nucleotide strand?

9. The way in which the nitrogen-containing bases pair up across the DNA molecule follows a very specific set of rules known as **complementary base pairing.** Write a description of the base pairing rules.

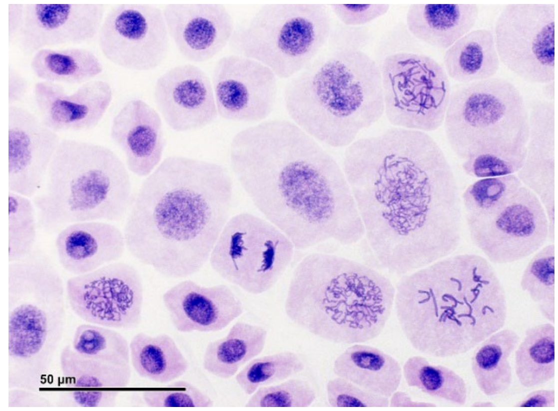
10. Fill in the missing bases on the DNA below according to complementary base pairing.



11. The proportions of the bases are consistent within a species; however they do vary between species. Using complementary base pairing, complete the following table to show the percentage of each type of base in the five different organisms.

Organism	**Percentage of each type of base**			
	Adenine	**Guanine**	**Cytosine**	**Thymine**
Human	31		19	
Cow	28	22		
Salmon			21	29
Wheat	27			
Yeast	31			

Lesson 1.2 – DNA Organization



Location of the DNA Within the Cell

- ☐ DNA is always found inside the cell's ____________
- ☐ The only exception to this is during cell division (___________), when the membrane of the nucleus dissolves, and the DNA is released into the cell

Chromosomes

- ☐ DNA in human cells is ________ a long continuous strand. It is broken up into ______ separate strands, which, when packed for cell division, are called ________________
- ☐ These form ________________ – normally the chromosomes in each pair are ________________, except for pair 23 (which are the sex chromosomes – XX or XY)

Diagram of Chromosome Pairs

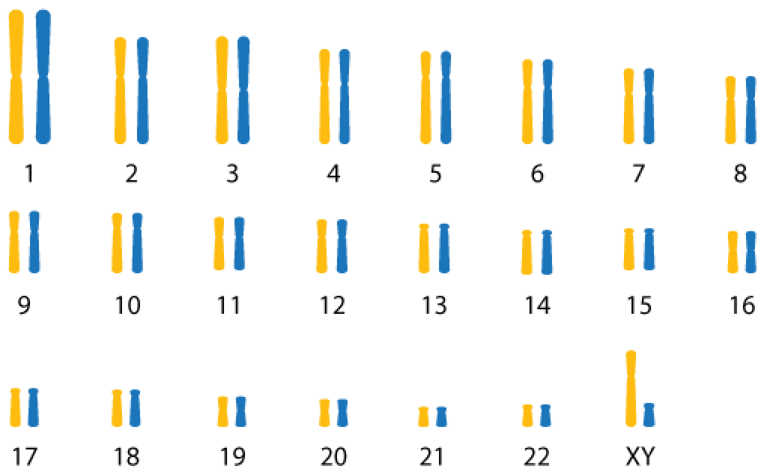
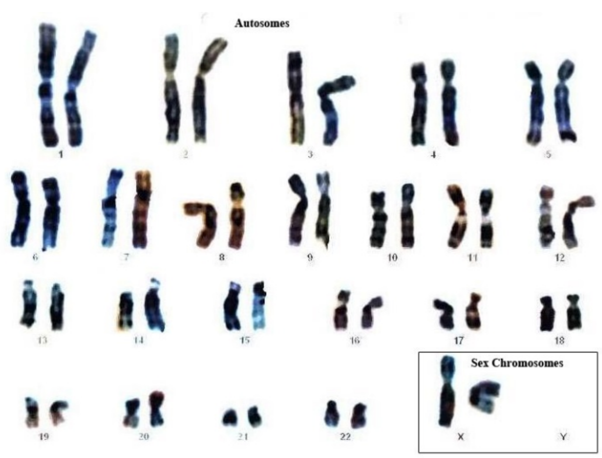
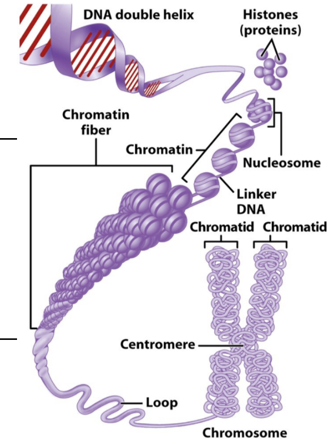
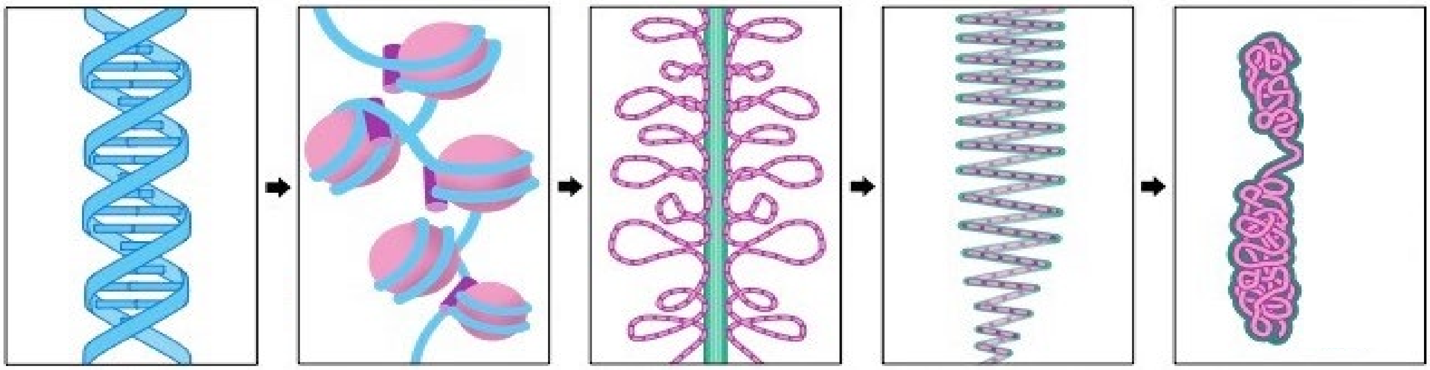


Image of Human Chromosomes



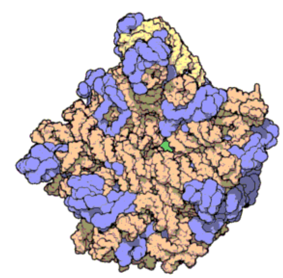
- ☐ In order to form chromosomes, ______________________________________
  1. ______________________________ is wound around special proteins (________________________)
  2. This is then looped onto a protein 'scaffold' (____________________)
  3. This is then twisted into a coil (____________________________________
  4. This is then looped and packed into a ______________________________



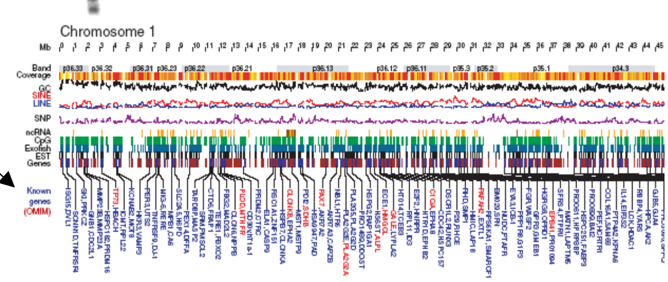


Genes

- ☐ Living cells contain thousands of complex molecules called ________________, which perform all the important jobs inside the cell
- ☐ DNA sequences of hundreds to thousands of base pairs that contain the 'instructions' for making a protein are called ______________



These are all genes!

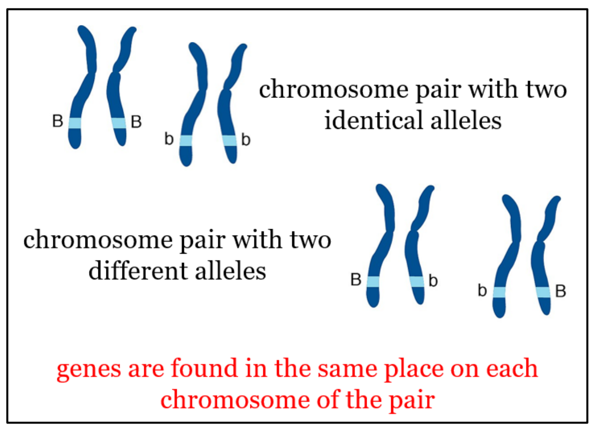


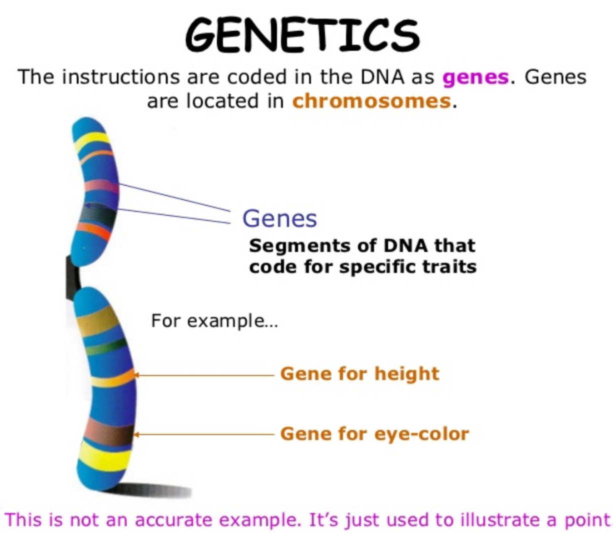
☐ Human DNA contains about ___________ genes spread across the 23 chromosomes

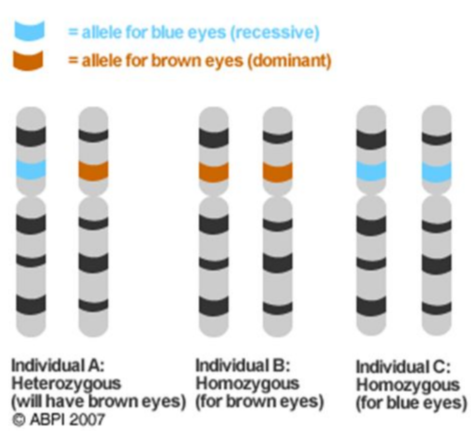
Number of Genes in Organisms	
Carsonella ruddii (bacterium)	180
Streptococcus pneumoniae (bacterium)	2,300
Escherichia coli (bacterium)	4,400
Saccharomyces cerevisiae (yeast)	5,800
Drosophila melanogaster (fruit fly)	13,700
Caenorhabditis elegans (nematode)	19,000
Strongylocentrotus purpuratus (urchin)	23,300
Homo sapiens (human)	27,000
Mus musculus (mouse)	29,000
Oryza sativa (rice)	50,000

☐ Every chromosomes has the ___________ ________________________________ as its partner, but the genes on each chromosome can have a slightly _________________ base sequences

☐ Different versions of the same gene are called _______________: because their sequences are different, they create _________________________________







Gene: Place on chromosome and determines certain trait

Allele: variation of that trait

Ex:

Gene: Eye color
Located on 5th gene from the top
Alleles: Brown, Blue, Green, Gray

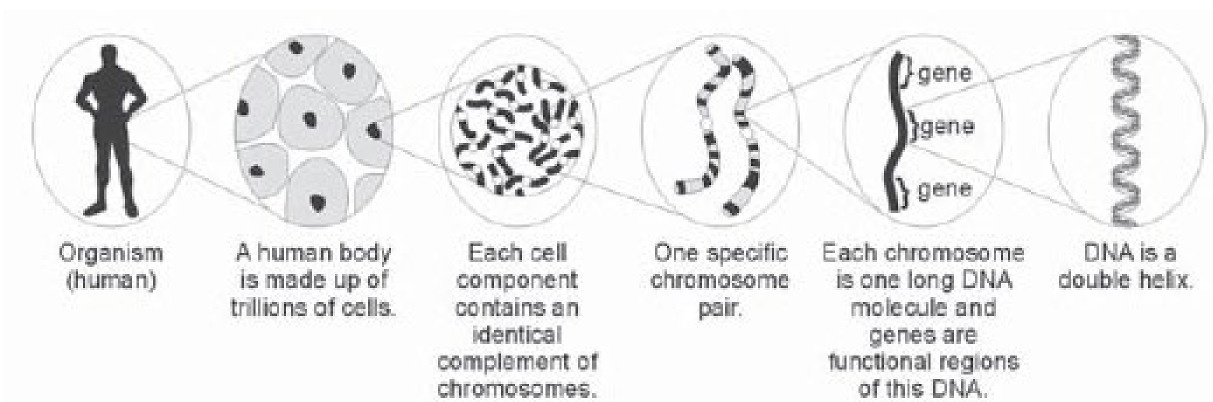
Alleles are different versions of the same gene: gene TYR has an allele which creates a protein that cannot form pigment

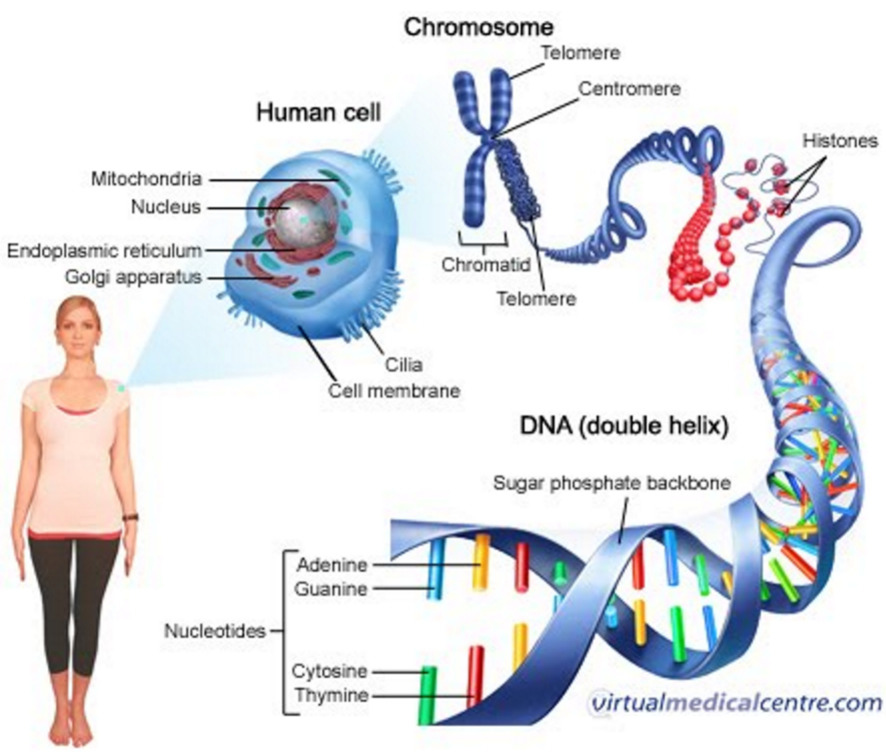
Different eye colour alleles in *Drosophila*

DNA Function & Replication

- ☐ Genes are 'read' inside the _______________, but proteins are built ________________ the nucleus in the cell itself
- ☐ This cannot occur while DNA is packed tightly into chromosomes, so normally the DNA is _______________________ for reading

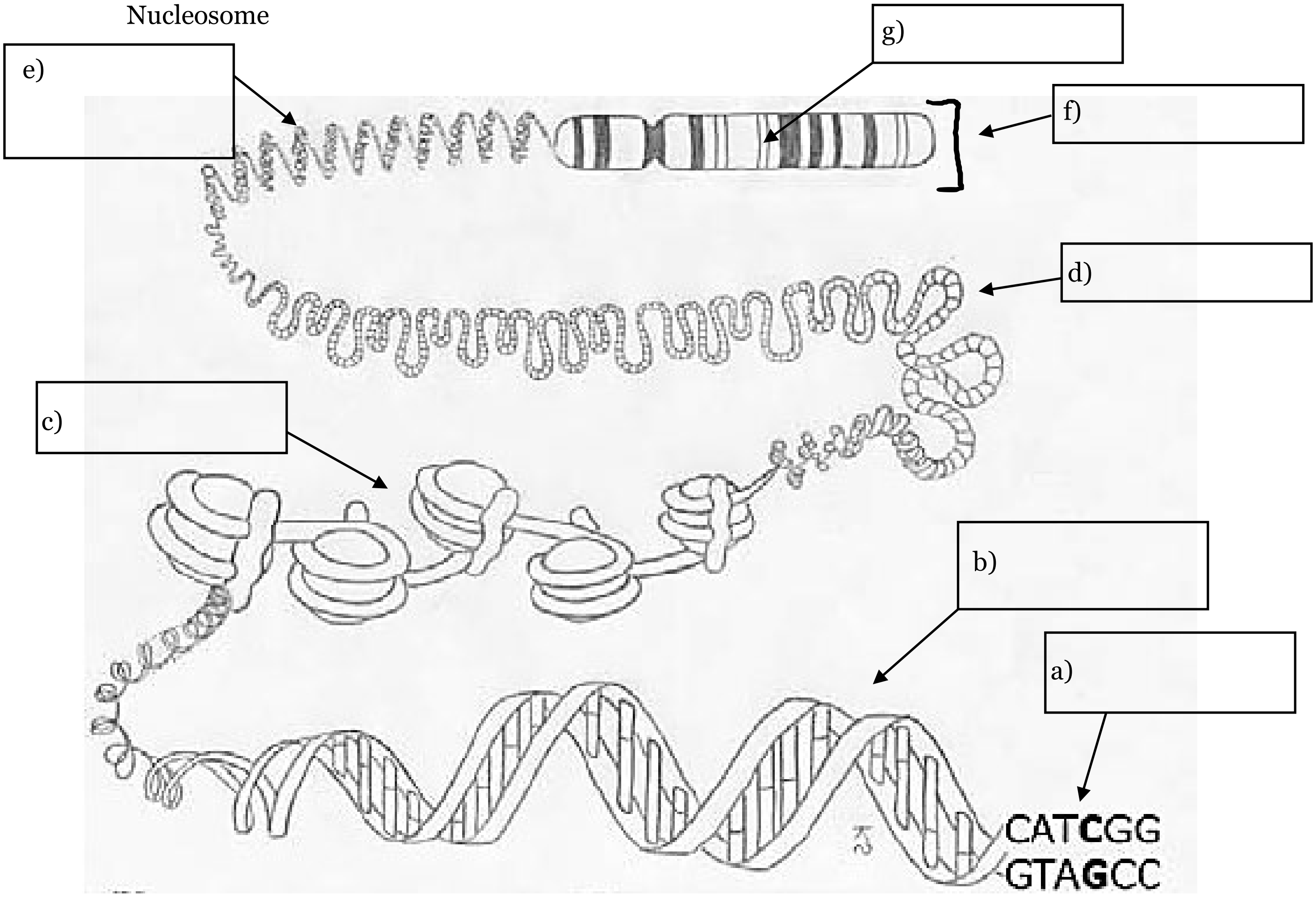
Heirarchy:





Assignment #2: Complete the following worksheet in the space provided below

1. Write what each arrow is pointing at in the diagram below. Choose from the following: Condensing of Chromatin; Nitrogen Base Pairs; Chromosome; Chromatin; Gene; Double Helix DNA; Nucleosome



2. Where in the human cell is DNA stored?

3. Organize the following terms based on size, from smallest to largest: *chromatin, nucleus, chromosome, cell, nucleotide, nitrogen containing bases, DNA double helix.*

4. a) How many chromosomes does each human cell have?

   b) How many identical pair(s)?

   c) How many different pair(s)?

5. An analogy relates one thing to a completely unrelated thing. Identify a genetics term that could be an analogy for each of the following:

    a) Letter

    b) Word

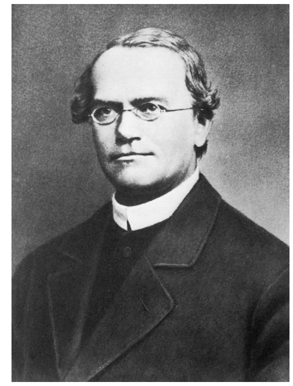
    c) Sentence

    d) Chapter

    e) Book

Lesson 1.3 – Mendel and the Discovery of Inheritance

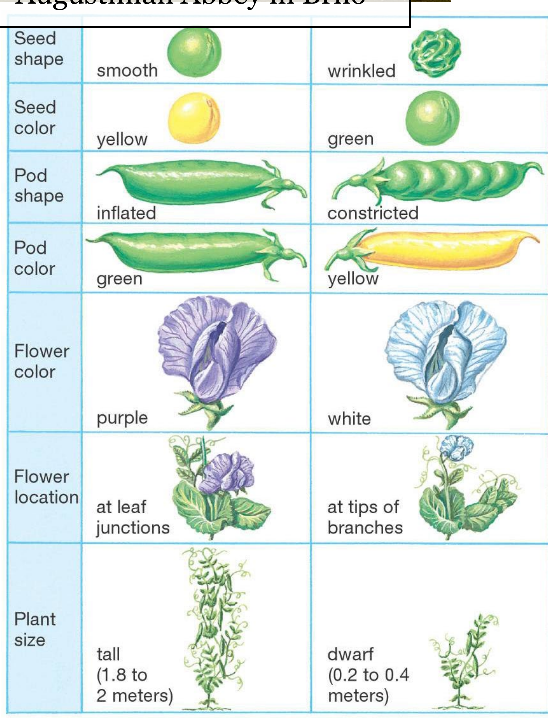
The Life of Gregor Mendel



- ☐ Gregor Johann Mendel was born in ________ in what is now the Czech Republic
- ☐ As the son of a poor farming family, he joined the Catholic Church and became a friar in the Augustinian Monastery in Brno
- ☐ Mendel experimented between 1856 and 1863 with _______________ _____________ grown in the monastery's garden
- ☐ He grew around ______________________, focusing on the seven traits, such as flower colour, seed colour, and seed shape (see diagram below).

Augustinian Abbey in Brno

Foundation of Mendel's greenhouse

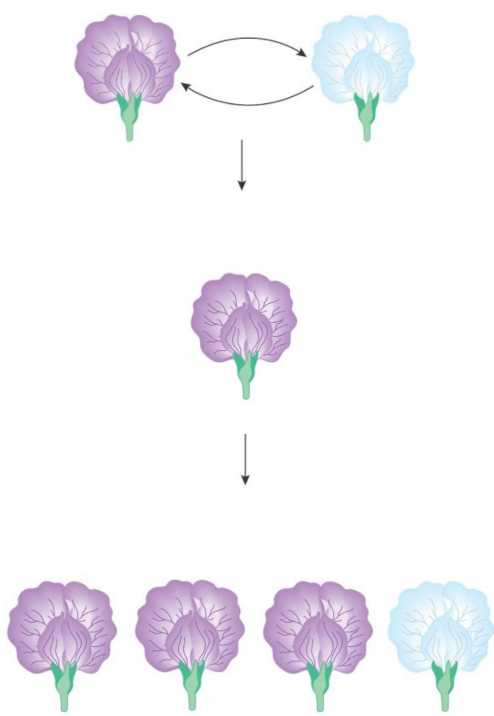


An Example of a Mendel Experiment:

- ☐ Mendel began with peas that had the following characteristics:

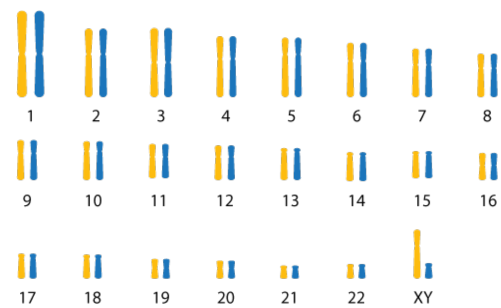
1. ________________________________ (the peas always passed down certain visible traits to its offspring)
2. The offspring always ________________ the parents
3. Plants that grew ____________ flowers or ____________ flowers

- ☐ He bred together _______________________________ to make a first generation (_____): ______________________ offspring plant had ____________ flowers identical to their purple parents
- ☐ He then bred these F1 offspring with ________________ to make a second generation (_____): he counted 705 plants with purple flowers, and 224 plants with white flowers identical to the original white parents (____)



Mendel's Conclusions

- ☐ Mendel realized that he had discovered the rules that controlled ____________________: the passing on of characteristics ____
- ☐ He proposed that ____ were responsible for the traits of organisms, and that there were ____
- ☐ We now know these 'factors' are _____________, and their different versions are ______________
- ☐ Mendel's research was ignored during his lifetime, but his work was rediscovered around ________ and his discoveries were summarized into two 'Laws':

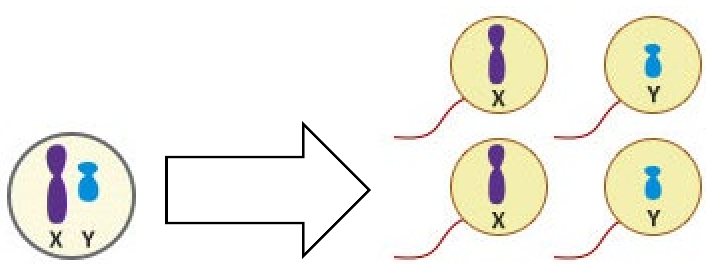


Law 1: Every organism has _____________________ for each _________ (because they are on two paired chromosomes). These separate during the formation of ________________ (eggs or sperm) so that each gamete ______________ receives ___________________________.

During fertilization, ______________________________________combines to form a new pair.

This is called the Principle of __________________________

Example: Testes cells go through ______________, producing ________ sperm cells with one chromosome from each chromosome pair.



Law 2:

____

________. This causes the organism to have the ______________________________ even if it has both alleles

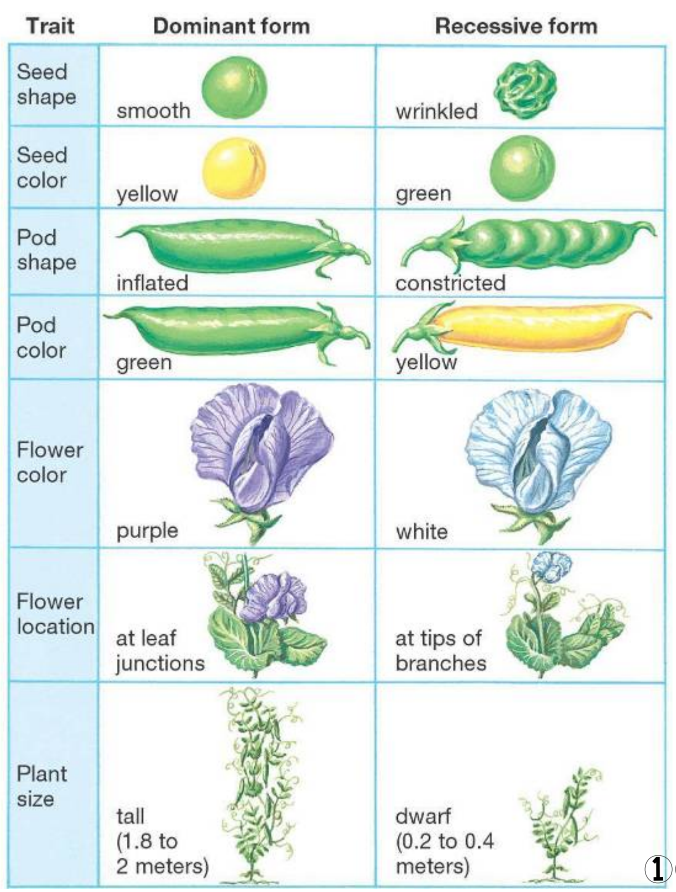
- ☐ **Dominant** = when one allele ________________ the expression of another allele, such as the ____________________ allele; often given a ______________ letter, e.g. X^R or W
- ☐ **Recessive** = when one allele is _______________ by the expression of another allele, such as the __________________ allele; often given a _________________ letter, e.g. X^r or w

Example 1: Having a curved hairline (widow's peak) is a ______________ allele, and a straight hairline is a ________________ allele. This means that if you inherit one of each allele from your parents, you will have a _______________________.

Example 2: Dominant and recessive traits of human genetic traits.

Hairline	Widow peak ____________ & straight hairline ____________
Eyebrow shape	Separated ____________ & joined ____________
Earlobes	Free lobe ____________ & attached ____________
Freckles	Freckles ____________ & no freckles ____________
Tongue rolling	Roller ____________ & nonroller ____________
Tongue folding	Inability ____________ & ability ____________
Bent little finger	Bent ____________ & straight ____________
Interlaced fingers	Left thumb over right ____________ & right over left ____________

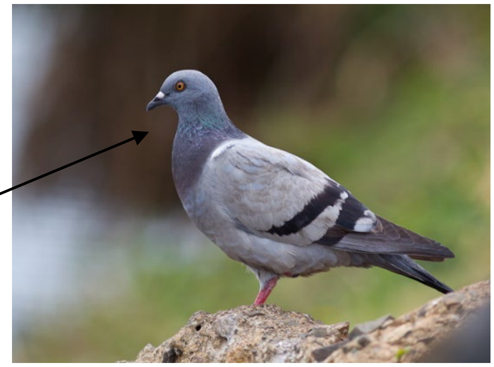
Example 3: Dominant and recessive traits of Mendel's pea plants.



Assignment #3: Complete the following worksheet in the space provided below

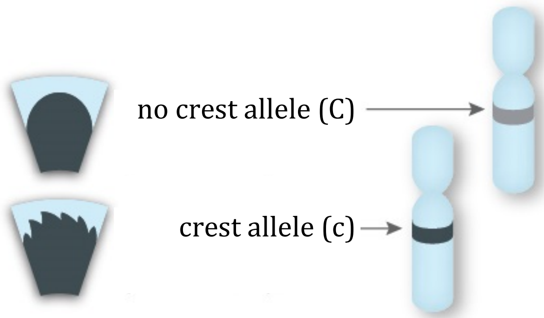
Part 1 – In this part of the worksheet, you will examine several different traits of the rock pigeon, and the genes behind them.

A Wild Rock Pigeon



Section 1 – The *crest* Gene

There are two alleles for the *crest* gene which creates a crest of feathers on the head:



Alleles	Traits
CC	no crest
Cc	no crest
cc	crest

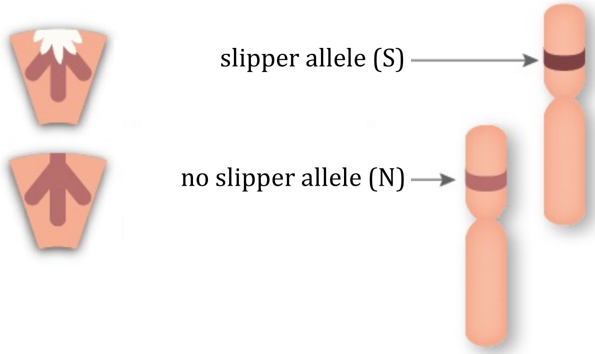
1. Consider the information in above.
   a. What are the different alleles for head feathers in pigeons?

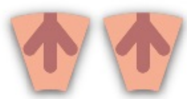
   b. What are the different traits for head feathers found in pigeons?

2. Which allele, C or c, is the dominant head feather allele? Justify your answer with specific evidence from above.

Section 2 – The *slipper* Gene

There are two alleles for the *slipper* gene which creates a slipper of feathers on the feet:



Alleles	Traits
 SS	 full slipper
 SN	 partial slipper
 NN	 no slipper

3. Consider the information in above.
   a. What are the different alleles for slippers in pigeons?

   b. What are the different traits for slippers found in pigeons? What combination of alleles results in each of these traits?

4. What is different about the traits of the *slipper* gene, compared to the traits of *crest* gene?

Part 2 – Mendel's Experimental Results

5. Mendel crossed one pea plant with each trait together (to form the F1 generation). In every case, he found that the F1 generation all showed the same trait as ONE of their parents (the dominant trait). He then self-fertilized the F1 plants (crossed two F1 plants together), and found different results. These results are shown in the table below. Calculate the ratio (to two decimal places) of the dominant to recessive traits.

Table 1: A Summary of Mendel's Results.

	F_2		
Trait	**Dominant**	**Recessive**	**Ratio** (to two decimal places) **Dominant : Recessive**
Seed form	5474	1850	
Seed color	6022	2001	
Flower position	651	207	
Flower color	705	224	
Pod form	882	299	
Pod color	428	152	
Stem length	787	277	

REMINDER: To find ratio, divide BOTH numbers by the smaller one.

Part 3 – Definitions

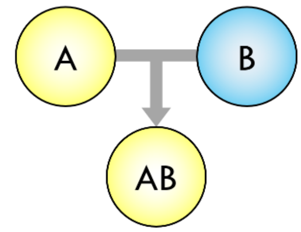
6. Define the following vocabulary terms using complete sentences. Make sure to be detailed.

a. Allele	
b. Chromatin	
c. Chromosome	
d. Complementary Base Pairing	
e. DNA	
f. Dominant	
g. F1	
h. F2	
i. Gene	
j. Mendelian Genetics	
k. Nucelosome	
l. Nucleus	
m. Principle of Segregation	
n. Protein	
o. Recessive	

Lesson 1.4 – Understanding Inheritance

Mendel's Inheritance

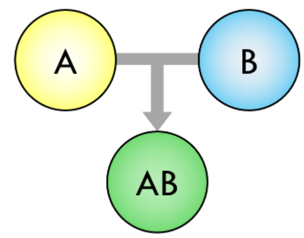
- ☐ The system of inheritance described by Mendel is now known as ____________________________ in his honour
- ☐ In peas, he had discovered several genes where the dominant allele ____ the expression of the _________________ allele. This is called _______________________
- ☐ All of Mendel's pea plants showed complete dominance



in complete dominance, only the dominant trait is expressed

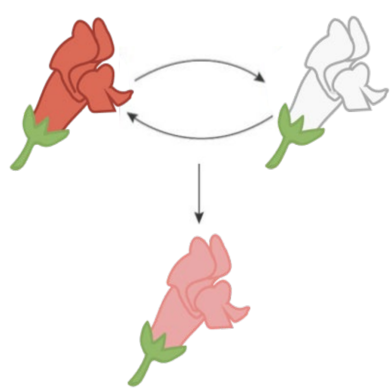
Incomplete Dominance

- ☐ When neither allele completely masks the other, and the two alleles ________________ to create a _________________ that is a blend of ___________________, this is called _____________________________

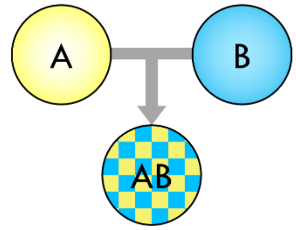


in incomplete dominance, two dominant alleles **blend** together to create a different trait

Example: In snapdragons, the gene for _________________ shows incomplete dominance. When red and white-flowered parents are crossed together, the offspring have __________ flowers (a blend of the ________ and ___________ alleles).



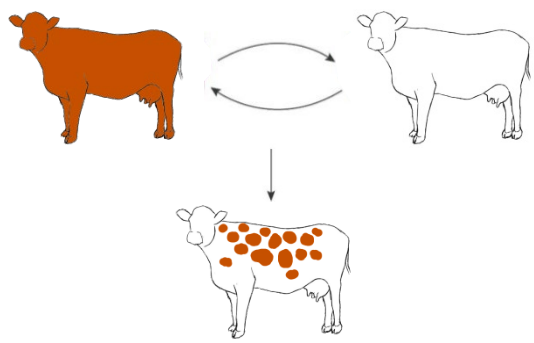
Co-Dominance



in co-dominance, two dominant alleles are expressed **together** at the same time

- ☐ When ____,
  and the two alleles are expressed _________________________________
  __________________, this is called ___________________________

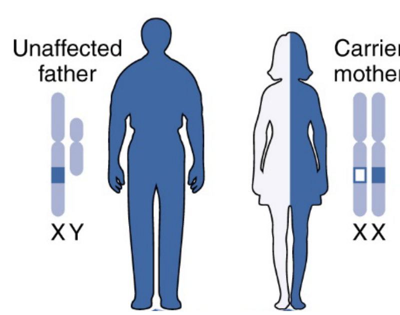
Example: In cattle, a gene for ___________________________ shows co-dominance. When brown and white-haired parents are crossed together, all of the offspring have ________________________________ (they show __________ brown and white hair).



Sex-Linked Inheritance

- ☐ Sometimes the genes (and their alleles) that we are interested in are found on the ____________ chromosomes, either __________________ in humans
- ☐ This leads to a special form of inheritance called ___________________________________, in which the alleles are expressed differently in males (_______) and females (_______)

Example: Red-green colour blindness in humans is caused by an allele of a gene on the __________________________. ______________ are much more likely to have this colour blindness because ___________________________________ _____________ on their Y chromosomes. For females to be



affected, ____________of their X chromosomes must have the-green colour blindness allele.

Predicting Inheritance with Punnett Squares

- ☐ It is possible to predict the alleles inherited by offspring using a technique called a ______________________________
- ☐ **STEPS:**
  1. Determine the ______________________________ ______________________________: what alleles do they have for the gene in question?
  2. _____________ the alleles in each parent and place one parent's alleles on the top and the other parent's alleles on the side of a 2x2 grid (this is the square)
  3. Fill in the grid by ______________________________, as though they were fertilizing each other to create an offspring

Example: A smooth pea plant (SS) is crossed with a wrinkled pea plant (ss). What is the outcome?

Punnett Square Examples

Example 1: Use Punnett squares to confirm the results of Mendel's experiment on pea plants (remember, his pea plants showed complete dominance):

F1 Generation: one purple (PP - dominant) plant was crossed with one white (WW - recessive) plant.

- ☐ Outcome: ________ of the plants inherited ________________________ ______________________________, which means that they all show the _____________ ________________________________

F2 Generation: two of the F1 generation plants (______) were crossed.

- ☐ Outcome: _________ of the plants inherited __________________________ _________________, _________ of the plants inherited ________________ __________________________, and _________ of the plants inherited ____. This means that ____ ____ ____________

Example 2: In snapdragons, the gene for flower colour shows incomplete dominance. If you cross a pink and white flowered plant, what is the chance that the offspring are pink?

Example 3: Red-green color blindness (b) is a recessive allele on the X chromosome. A colorblind male marries a normal female, will any of their children be colour blind?

Homework

Assignment #4: Complete the following worksheet in the space provided below

Complete the following Punnett Square problems. For each question:

- Draw and complete the Punnett Square (show your work)
- Answer each question *in the form of a complete sentence*

1. In peas, the allele for yellow pea colour (Y) is completely dominant over green peas (y). If you crossed a true-breeding yellow pea plant (YY) with a hybrid yellow pea plant (Yy), what is the chance that the offspring will inherit two dominant alleles?

2. Some people can roll their tongues into a U-shape. The ability to do so is a dominant allele. If a father and mother cannot roll their tongues, what is the probability that their children will be able to form a U-shape with their tongues?

3. In some chickens, the gene for feather colour has two co-dominant alleles: an allele for black feathers (B) and an allele for white feathers (W). Hybrids with both alleles (BW) have a mix of black and white feathers known as erminette. If a black chicken is crossed with a white chicken, what is the chance that they would have an erminette chick?

4. In Japanese four o'clock plants, red flower color (R) is incompletely dominant over white flowers (r), and the combination (Rr) results in plants with pink flowers. If you crossed a pink flowered plant with itself, what percentage of the offspring would have white flowers?

5. In some cats the gene for tail length shows incomplete dominance. True-breeding cats can have long tails or no tails, and cats with one long tail allele and one no-tail allele have short tails. If you crossed a long tail cat and a short tail cat, what is the chance that the offspring will have short tails?

6. In cats, the gene for hair colour has a black allele (B) and a yellow allele (b) that shows co-dominance, combining to create black and yellow spots called tortoiseshell. This gene is found on the X chromosome. If you cross a tortoiseshell female with a yellow male, what percentage of the kittens will have black hair?

7. In humans, the blood-clotting disease hemophilia is a recessive allele found on the X chromosome. The normal allele creates a protein that forms blood clots after an injury. If a female who is a carrier for hemophilia – she has both alleles – has children with a male with normal blood-clotting, what is the probability of male children with hemophilia, and female children with hemophilia?

Bikini Bottom Genetics Activity
(quiz prep)

Scientists at Bikini Bottoms have been investigating the genetic makeup of the organisms in this community. Use the information provided and your knowledge of genetics to answer each question.

1. For each genotype below, indicate whether it is a heterozygous (He) OR homozygous (Ho).

TT _____ Bb _____ DD _____ Ff _____ tt _____ dd _____

Dd _____ ff _____ Tt _____ bb _____ BB _____ FF _____

Which of the genotypes in #1 would be considered purebred? ________________________________

Which of the genotypes in #1 would be hybrids? ____

2. Determine the phenotype for each genotype using the information provided about SpongeBob.

Yellow body color is dominant to blue.

YY ________________ Yy ________________ yy ________________

Square shape is dominant to round.

SS ________________ Ss ________________ ss ________________

3. For each phenotype, give the genotypes that are possible for Patrick.

A tall head (T) is dominant to short (t).

Tall = _______________ Short = _______________

Pink body color (P) is dominant to yellow (p).

Pink body = _____________ Yellow body = _________________

4. SpongeBob SquarePants recently met SpongeSusie Roundpants at a dance. SpongeBob is heterozygous for his square shape, but SpongeSusie is round. Create a Punnett square to show the possibilities that would result if SpongeBob and SpongeSusie had children. HINT: Read question #2!

A. List the possible genotypes and phenotypes for their children.

B. What are the chances of a child with a square shape? ____ out of ____ or ____%

C. What are the chances of a child with a round shape? ____ out of ____ or ____%

5. Patrick met Patti at the dance. Both of them are heterozygous for their pink body color, which is dominant over a yellow body color. Create a Punnett square to show the possibilities that would result if Patrick and Patti had children. HINT: Read question #3!

A. List the possible genotypes and phenotypes for their children.

B. What are the chances of a child with a pink body? ____ out of ____ or ____%

C. What are the chances of a child with a yellow body? ____ out of ____ or ____%

6. Everyone in Squidward's family has light blue skin, which is the dominant trait for body color in his hometown of Squid Valley. His family brags that they are a "purebred" line. He recently married a nice girl who has light green skin, which is a recessive trait. Create a Punnett square to show the possibilities that would result if Squidward and his new bride had children. Use B to represent the dominant gene and b to represent the recessive gene.

A. List the possible genotypes and phenotypes for their children.

B. What are the chances of a child with light blue skin? ____%

C. What are the chances of a child with light green skin? ____%

D. Would Squidward's children still be considered purebreds? Explain!

7. Assume that one of Squidward's sons, who is heterozygous for the light blue body color, married a girl that was also heterozygous. Create a Punnett square to show the possibilities that would result if they had children.

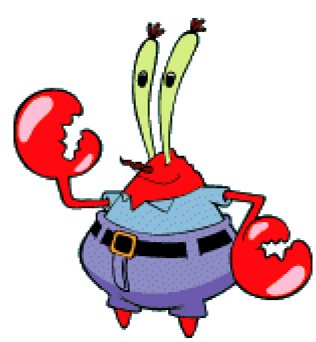
A. List the possible genotypes and phenotypes for their children.

B. What are the chances of a child with light blue skin? ____%

C. What are the chances of a child with light green skin? ____%

8. Mr. Krabbs and his wife recently had a Lil' Krabby, but it has not been a happy occasion for them. Mrs. Krabbs has been upset since she first saw her new baby who had short eyeballs. She claims that the hospital goofed and mixed up her baby with someone else's baby. Mr. Krabbs is homozygous for his tall eyeballs, while his wife is heterozygous for her tall eyeballs. Some members of her family have short eyes, which is the recessive trait. Create a Punnett square using T for the dominant gene and t for the recessive one.

A. List the possible genotypes and phenotypes for their children.



B. Did the hospital make a mistake? Explain your answer.

Bikini Bottom Genetics 2 Name ____________________________

Use your knowledge of genetics to complete this worksheet.

1. Use the information for SpongeBob's traits to write the phenotype (physical appearance) for each item.

Trait	Dominant Gene	Recessive Gene
Body Shape	Squarepants (S)	Roundpants (s)
Body Color	Yellow (Y)	Blue (y)
Eye Shape	Round (R)	Oval (r)
Nose Style	Long (L)	Stubby (l)

(a) LL-______________
(b) yy-_______________
(c) Ss-_______________
(d) RR - _____________
(e) Rr-_______________
(f) ll- _______________
(g) ss- _______________
(h) Yy -______________

2. Use the information in the chart in #1 to write the genotype (or genotypes) for each trait below.

(a) Yellow body - ___________
(b) Roundpants - ___________
(c) Oval eyes - ______________
(d) Long nose - _____________
(e) Stubby nose - ___________
(f) Round eyes - ____________
(g) Squarepants - ___________
(h) Blue body - ____________

3. Determine the genotypes for each using the information in the chart in #1.

(a) Heterozygous round eyes -_____
(b) Purebred squarepants - ______
(c) Homozygous long nose - ______
(d) Hybrid yellow body - ______

4. One of SpongeBob's cousins, SpongeBillyBob, recently met a cute squarepants gal, SpongeGerdy, at a local dance and fell in love. Use your knowledge of genetics to answer the questions below.

(a) If SpongeGerdy's father is a heterozygous squarepants and her mother is a roundpants, what is her genotype? Complete the first Punnett square to show the possible genotypes.

Based on your results, what would Gerdy's genotype have to be? _________

(b) Complete the second Punnett square to show the possibilities that would result if Billy Bob & Gerdy had children.
NOTE: SpongeBillyBob is heterozygous for his squarepantsshape.

(c) What is the probability of kids with squarepants? _____ %

(d) What is the probability of kids with roundpants? _____ %

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5. SpongeBob's aunt and uncle, SpongeWilma and SpongeWilbur, have the biggest round eyes in the family. Wilma is believed to be heterozygous for her round eye shape, while Wilbur's family brags that they are a pure line. Complete the Punnett square to show the possibilities that would result if SpongeWilma and SpongeWilbur had children.

(a) Give the genotype for each person. Wilma - _______ Wilbur - ________

(b) Complete the Punnett square to show the possibilities that would result if they had children.

(c) What is the probability that the kids would have round eyes? ____ %

(d) What is the probability that the kids would be oval eyes? ____ %

6. SpongeBob's mother is so proud of her son and his new wife, SpongeSusie, as they are expecting a little sponge. She knows that they have a 50% chance of having a little roundpants, but is also hoping the new arrival will be blue (a recessive trait) like SpongeSusie and many members of her family. If SpongeBob is heterozygous for his yellow body color, what are the chances that the baby sponge will be blue? Use the Punnett square to help you answer this question.

7. SpongeBob's aunt is famous around town for her itty, bitty stubby nose! She recently met a cute squarepants fellow who also has a stubby nose, which is a recessive trait. Would it be possible for them to have a child with a regular long nose? Why or why not? Use the Punnett square to help you answer this question.

8. If SpongeBob's aunt described in #7 wanted children with long noses, what type of fellow would she need to marry in order to give her the best chances? Use the Punnett square to help you answer this question.

Bikini Bottom Genetics
Incomplete Dominance

SpongeBob loves growing flowers for his pal Sandy! Her favorite flowers, Poofkins, are found in red, blue, and purple. Use the information provided and your knowledge of incomplete dominance to complete each section below.

1. Write the correct genotype for each color if R represents a red gene and B represents a blue gene.

Red - _____ Blue - ______ Purple - _____

2. What would happen if SpongeBob crossed a Poofkin with red flowers with a Poofkin with blue flowers. Complete the Punnett square to determine the chances of each flower color.

(a) Give the genotypes and phenotypes for the offspring.

(b) How many of the plants would have red flowers? _____%

(c) How many of the plants would have purple flowers? _____ %

(d) How many of the plants would have blue flowers? _____ %

3. What would happen if SpongeBob crossed two Poofkins with purple flowers? Complete the Punnett square to show the probability for each flower color.

(a) Give the genotypes and phenotypes for the offspring.

(b) How many of the plants would have red flowers? _____%

(c) How many of the plants would have purple flowers? _____ %

(d) How many of the plants would have blue flowers? _____ %

4. What would happen if SpongeBob crossed a Poofkin with purple flowers with a Poofkin with blue flowers? Complete the Punnett square to show the probability for plants with each flower color.

(a) Give the genotypes and phenotypes for the offspring.

(b) If SpongeBob planted 100 seeds from this cross, how many should he expect to have of each color?

Purple flowers - ______ Blue flowers - ______ Red flowers - ______

SpongeBob and his pal Patrick love to go jellyfishing at Jellyfish Fields! The fields are home to a special type of green jellyfish known as Goobers and only really great jellyfishermen are lucky enough to catch some on every trip. Many of the jellyfish are yellow (YY) or blue (BB), but some end up green as a result of incomplete dominance. Use this information to help you complete each section below.

5. What would happen if SpongeBob and Patrick crossed two "goobers" or green jellyfish? Complete the Punnett square to help you determine the probability for each color of jellyfish.

(a) Give the possible genotypes and phenotypes for the offspring.

(b) What percentage of the offspring would be yellow? _____%

(c) What percentage would be blue? _____ %

(d) What percentage would be "goobers" (green)? _____ %

6. What would happen if they crossed a yellow jellyfish with a goober? Complete the Punnett square to help you determine the probability for each color of jellyfish.

(a) Give the possible genotypes and phenotypes for the offspring.

(b) What percentage of the offspring would be yellow? _____%

(c) What percentage would be blue? _____ %

(d) What percentage would be "goobers" (green)? _____ %

7. What would happen if they crossed a blue jellyfish with a yellow jellyfish? Complete the Punnett square to help you answer the questions.

If 100 jellyfish were produced from this cross, how many would you expect for each?

Yellow - _____ Blue - _____ Goobers - ______

8. What would happen if they crossed a blue jellyfish with a goober? Complete the Punnett square to help you answer the questions.

If 100 jellyfish were produced from this cross, how many would you expect for each?

Yellow - _____ Blue - _____ Goobers - ______