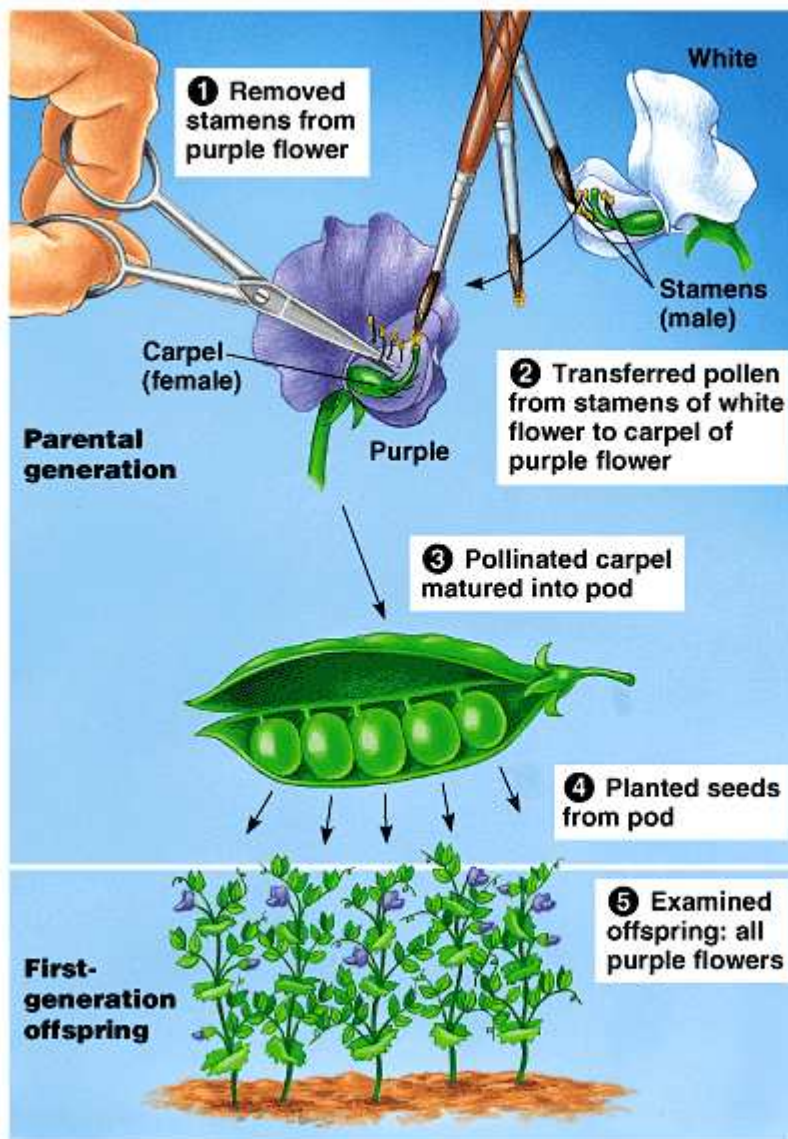


Inheritance is \_\_\_\_\_

Genetics is \_\_\_\_\_

1. Who was Gregor Mendel?

He spent a lot of time “crossing” pea plants. Just what does that involve?



Define:  
Pollination

self-pollination















cross-pollination

Fertilization

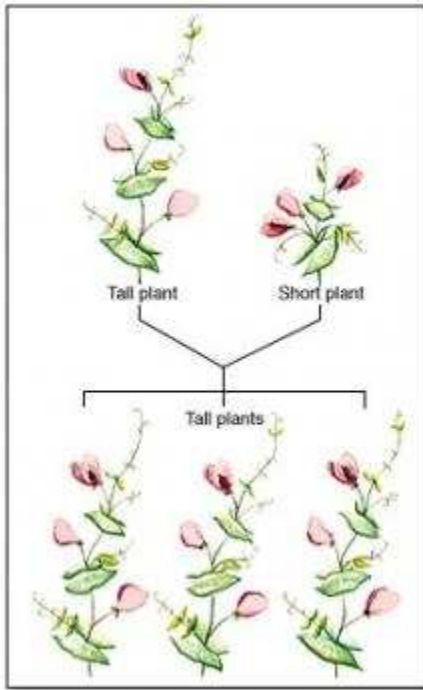
2. When Mendel took charge of the monastery garden, he had several stocks of **true-breeding** pea plants. True-breeding means \_\_\_\_\_

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<b>FLOWER COLOR</b>	 <b>Purple</b>	 <b>White</b>
<b>FLOWER POSITION</b>	 <b>Axial</b>	 <b>Terminal</b>
<b>SEED COLOR</b>	 <b>Yellow</b>	 <b>Green</b>
<b>SEED SHAPE</b>	 <b>Round</b>	 <b>Wrinkled</b>
<b>POD SHAPE</b>	 <b>Inflated</b>	 <b>Constricted</b>
<b>POD COLOR</b>	 <b>Green</b>	 <b>Yellow</b>
<b>STEM LENGTH</b>	 <b>Tall</b>	 <b>Dwarf</b>

3. Mendel studied the seven different pea plant traits shown above. A “trait” is \_\_\_\_\_  
Mendel crossed individuals with contrasting traits, for example \_\_\_\_\_  
\_\_\_\_\_



The original pair of plants are referred to as the \_\_\_\_\_  
Their offspring are called the \_\_\_\_\_  
\_\_\_\_\_

Mendel then crossed the F<sub>1</sub> plants with other F<sub>1</sub> plants. When F<sub>1</sub> plants are crossed with other F<sub>1</sub> plants their offspring are referred to as \_\_\_\_\_  
Mendel found that about 1/4 of the F<sub>2</sub> seeds grew into short pea plants. The “short” trait appeared to skip a generation.

If he crossed two short plants all the offspring were short.

From these types of experiments, Mendel drew two conclusions:

① \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

② \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Define the following terms:

gene \_\_\_\_\_

allele \_\_\_\_\_

hybrid \_\_\_\_\_

gametes \_\_\_\_\_  
\_\_\_\_\_

segregation \_\_\_\_\_

4. **Probability** \_\_\_\_\_

When you flip a coin, what is the probability that it will come up heads? \_\_\_\_\_

Another way to answer that is \_\_\_\_\_

What are the chances of tossing heads 4 times in a row?

Probabilities are used to predict \_\_\_\_\_

5. More words to define:

**homozygous**

**heterozygous**

**phenotype**

**genotype**

6. In garden peas, purple flower color is dominant to white flower color. The dominant allele for the trait purple flower color can be represented by \_\_\_\_\_ and the recessive allele for the trait white flower color can be represented by \_\_\_\_\_. The actual letter of the alphabet you use isn't as important as whether it is \_\_\_\_\_ or \_\_\_\_\_. A good strategy to use is \_\_\_\_\_

What is the genotype of a true-breeding, purple-flowered plant? \_\_\_\_\_

a white-flowered plant? \_\_\_\_\_

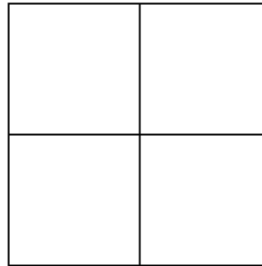
a purple-flowered plant that had a white-flowered parent? \_\_\_\_\_

a purple-flowered plant that produced white flowered offspring? \_\_\_\_\_

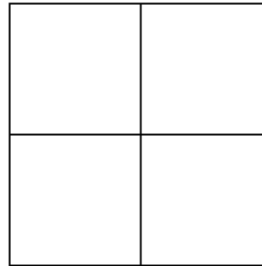
a heterozygous purple-flowered plant? \_\_\_\_\_

Show a cross between a true-breeding purple-flowered plant and a white-flowered plant.

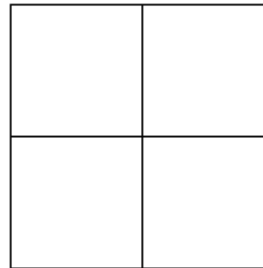
7. A Punnett Square can show the possible types of offspring that two parents can produce:



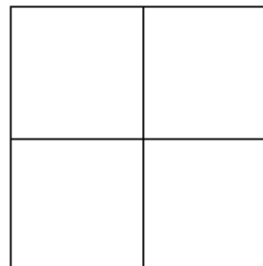
Show a cross between two of the  $F_1$  offspring from the above cross.



Show a cross between a heterozygous purple-flowered plant and a white plant.



Show a cross between two white-flowered plants.



8. In one set of experiments, purple-flower color appeared 6,022 times in the F<sub>2</sub> generation while white-flowers appeared 2,001 times. The probability that a plant is purple-flowered is \_\_\_\_\_. Expressed as a percentage? \_\_\_\_\_  
 Expressed as a fraction? \_\_\_\_\_ Expressed as a ratio? \_\_\_\_\_

9. A cross between individuals involving \_\_\_\_\_ trait is a **monohybrid cross**.


Cross a short pea plant with a heterozygous tall one.  
 What is the probability of producing tall offspring?  
 What is the probability of producing short offspring?  
 What is the phenotypic ratio among the offspring?  
 What is the genotypic ratio among the offspring?


Cross two heterozygous tall plants.  
 What is the probability of producing tall offspring?  
 What is the probability of producing short offspring?  
 What is the phenotypic ratio among the offspring?  
 What is the genotypic ratio among the offspring?


Cross a homozygous tall with a heterozygous tall plant.  
 What is the probability of producing tall offspring?  
 What is the probability of producing short offspring?  
 What is the phenotypic ratio among the offspring?  
 What is the genotypic ratio among the offspring?

10. In silkworms, a single gene determines the color of the cocoon. The yellow cocoon allele is dominant; the white allele is recessive. Show a cross between a homozygous yellow male and a white female.

11. The length of fur in guinea pigs is controlled by a single gene. The dominant allele F produces long fur. Show a cross between a heterozygous male and a homozygous recessive female.

12. Brown color in mice is dominant over albinism (\_\_\_\_\_)  
Two brown mice produce an albino offspring. Explain.

Will albino mice be true-breeding? Explain.

Albinism in plants is lethal. Any plant without chlorophyll cannot photosynthesize and as soon as the food supply in the seed is gone the young seedling always dies. If all albino plants die, why doesn't this trait "die out"?

13. If you need to know the genotype of an individual expressing the dominant phenotype...(for example a tall pea plant) a \_\_\_\_\_ is made.

In a test cross the unknown individual (T?) is crossed with \_\_\_\_\_

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Show the possible outcomes below:



14. **Dihybrid** or “two-factor crosses” involve \_\_\_\_\_

In pea plants, round seeds are dominant to wrinkled ones and yellow-colored seeds are dominant to green ones.

Fill in the table below:

Phenotype	Genotype
homozygous round/homozygous yellow	
heterozygous round/heterozygous yellow	
wrinkled, green seeds	
heterozygous round, wrinkled seeds	
wrinkled/heterozygous yellow	

14. There are a pair of alleles controlling seed \_\_\_\_\_ and another pair of alleles controlling seed \_\_\_\_\_. How many alleles for each characteristic though will be in a gamete?

Fill in the table below:

Genotype of Plant	Possible Gamete Genotype(s)
RRYY	
RRyy	
RrYY	
rrYy	
rrYY	
RrYy	

15. Show a cross between a **RRYY** plant and a **rryy** plant. Carry the cross through to the F<sub>2</sub> generation.


15a. In dogs, dark coat color is dominant over albino and short hair is dominant over long hair. Two dogs are mated. One is albino with long hair ( $ddss$ ) and the other is a true-breeding, dark, short-haired ( $DDSS$ ). The puppies from this cross will all look alike. Show the cross. These puppies represent the  $F_1$  generation.

Show a cross between two of the  $F_1$  puppies from the cross above.


<b>Phenotypes</b>	<b>How many out of 16?</b>
Dark/short-haired	_____
Dark/long-haired	_____
albino/short-haired	_____
albino/long-haired	_____

List all the possible genotypes that would result in the following phenotypes.

<i>Dark fur/Short-haired</i>	_____
<i>Dark fur/long-haired</i>	_____
<i>albino fur/Short-haired</i>	_____
<i>albino fur/long-haired</i>	_____

What phenotypes will result from the following genotypes?

$DdSS$ _____	$ddss$ _____
$ddSs$ _____	$dDss$ _____
$DdSs$ _____	$DDss$ _____
$dDss$ _____	$DdSs$ _____

15b. In horses, black coat ( $B$ ) is dominant to chestnut ( $b$ ) and trotting gait ( $T$ ) is dominant to pacing gait ( $t$ ). What are the chances, expressed as a fraction,

that two  $BbTt$  horses would produce a colt with their own phenotype?

\_\_\_\_\_ Show your work below.


**OTHER PATTERNS OF INHERITANCE**

16. In Mendel's pea plants, the \_\_\_\_\_ trait completely masked the \_\_\_\_\_ trait. **AA** individuals looked just like **Aa** individuals. Not all phenotypes come from strictly \_\_\_\_\_ and \_\_\_\_\_ genes. What would our world look like if it did?

When genes are completely dominant and recessive like in Mendel's pea plants, the \_\_\_\_\_ or \_\_\_\_\_ is called \_\_\_\_\_

17. Some traits are inherited through **incomplete dominance**. Alleles that exhibit incomplete dominance will result in a phenotype that is \_\_\_\_\_

In Four O'clock flowers, the color of the blossom can be **red, white or pink**.

<b>Genotype</b>	<b>Phenotype</b>	What color(s) would be found among the offspring (and in what proportions) from the following sets of parents?
_____	_____	
_____	_____	
_____	_____	

red X red

white X white

red X white

red X pink

white X pink

pink X pink

Which colors will breed-true ( \_\_\_\_\_ )  
among 4'Oclocks?

18. **Codominance** is an inheritance pattern in which \_\_\_\_\_

\_\_\_\_\_

An example of a trait controlled with this mechanism is a type of coat color in horses.

**Genotype**

**Phenotype**

*Roan* animals have \_\_\_\_\_

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

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

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

What types of offspring are expected from two roan parents?

19. **Multiple alleles** traits are controlled by \_\_\_\_\_

Each individual will have only \_\_\_\_\_

In humans, the ABO blood groups are controlled by this mechanism. There are \_\_\_\_\_ alleles. They are \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.  
The alleles \_\_\_\_\_ and \_\_\_\_\_ are dominant. Both \_\_\_\_\_

are dominant to \_\_\_\_\_. Alleles \_\_\_\_\_ are codominant to each other.

<u>Genotype</u>	<u>Phenotype</u>
$I^A I^A$	_____
$I^A i$	_____
$I^B I^B$	_____
$I^B i$	_____
$I^A I^B$	_____
$i i$	_____

Fill in the table below:

Parents	Children can be	Children can't be
A x A		
B x B		
A x B		
A x O		
B x O		
O x O		
AB x O		
AB x B		
AB x A		
AB x AB		

19a. A woman has type A blood type and her husband has type B. A physician types the blood of their four children and is amazed to find one of each of the four blood types among them. He is not familiar with genetics and calls upon you to explain how such a thing could happen. What would you tell him?

19b. Woolly, sharply curled hair is caused by a rare dominant gene in European populations. A woman who is heterozygous for this trait and belongs to blood group O marries a man with non-wooly hair who belongs to blood group AB. What are the chances that they will have a wooly-haired child belonging to blood type B?

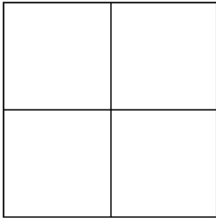
19c. A woman sues a man for support of her child. She has type A blood, her child has type O, and the man has type B. Could the man be the father? Show all your work.

19d. A wealthy, elderly couple die together in an accident. Soon a woman shows up to claim their fortune, claiming that she is their only child who ran away from home when she was a teenager. Other relatives dispute this claim. Hospital records show that the deceased couple were types AB and O. The claimant to the fortune has blood type O. Do you think the claimant is an imposter? Explain.

20. Most human traits are controlled by \_\_\_\_\_.  
A trait that is controlled by 2 or more genes is \_\_\_\_\_. Human skin color is influenced by \_\_\_\_\_.  
The alleles have an additive effect. The lightest skin has a genotype of \_\_\_\_\_ and the darkest skin has a genotype of \_\_\_\_\_. A genotype of AaBbCcDdEe would result in what type of phenotype? \_\_\_\_\_

**21. Sex Determination**

The \_\_\_\_\_ and \_\_\_\_\_ chromosomes are the sex chromosomes and their \_\_\_\_\_ or maybe their \_\_\_\_\_ determines sex in many animals. Males are \_\_\_\_\_ and females are \_\_\_\_\_. The \_\_\_\_\_ parent determines the sex of the offspring. Make a Punnett Square to show that with this method \_\_\_\_\_% of the offspring should be male and \_\_\_\_\_% female.



Genes on the **X** and **Y** chromosomes are said to be \_\_\_\_\_ to those chromosomes. Genes on the **X** chromosome are \_\_\_\_\_ and those on the **Y** chromosome are \_\_\_\_\_.

The following human conditions are **X**-linked recessives and dominant would be

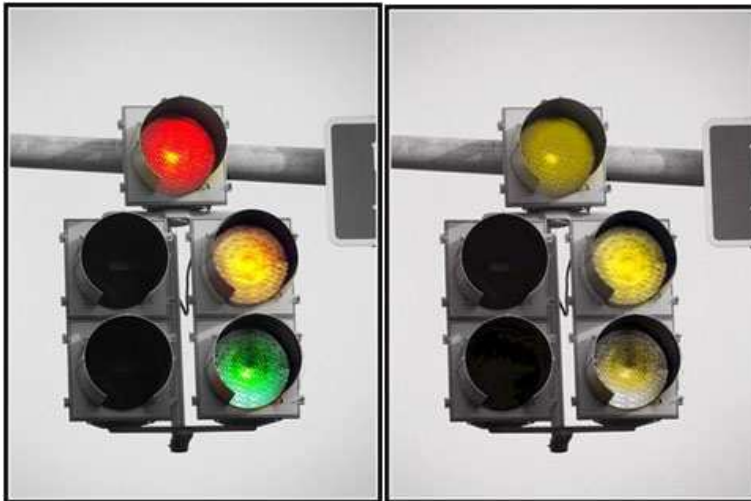
- (1) \_\_\_\_\_
- (2) \_\_\_\_\_
- (3) \_\_\_\_\_

22. A daughter is born with red-green colorblindness. What do you know about her parents?

Can two “normal” parents have a daughter with a X-linked recessive condition? Explain.

Normal color vision:

Red-green color blindness:



22a. One particular type of cat fur-color is inherited in the following way: Males are either black or yellow. Females are black, yellow or calico (black and yellow patches against a white background). Calico is the phenotype seen in the heterozygous condition as there is a lack of dominance between the two alleles.

**The gene is located on the X chromosome.**

Show a cross between a black male and a yellow female.



Show a cross between a black female and a yellow male.

Why would you expect male calico cats to be extremely rare?

22b. Duchenne's muscular dystrophy is a sex-linked recessive. DMD is a degenerative muscular disease affecting all voluntary muscles as well as the heart and breathing muscles. Onset begins in early childhood. Survival is rare beyond the early 30s.

What is the probability that a woman whose brother has DMD will have an afflicted child?

If **your** mother's brother had the disease, what is the probability that you carry the gene? check one of these two boxes:  I'm female  I'm male

*Explain your answer.*

If **your** father's brother had the disease, what is the probability that you carry the gene?

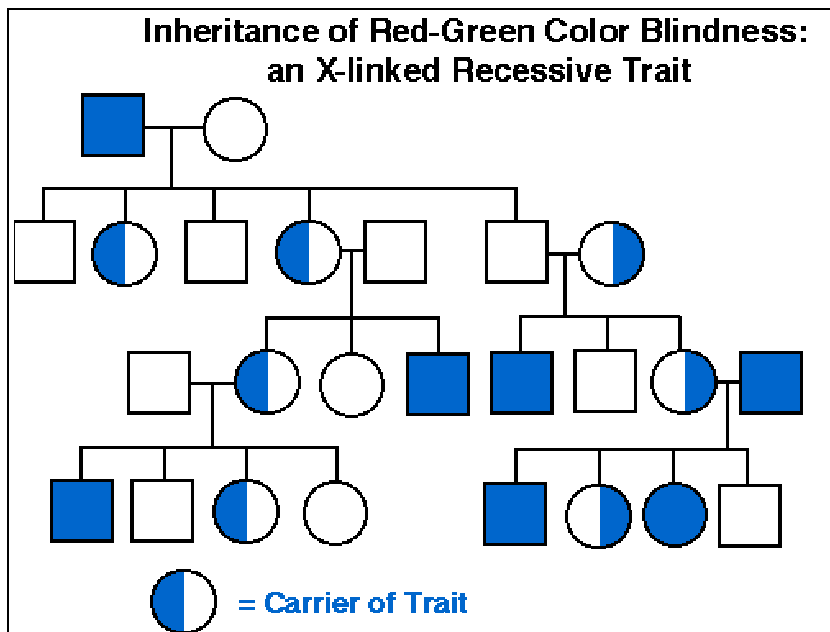
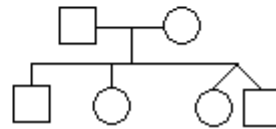
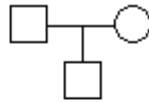
*Explain your answer.*

Children afflicted with DMD are always boys. Explain.

23. A pedigree is a \_\_\_\_\_

Males are shown with a \_\_\_\_\_ and females with a \_\_\_\_\_. Affected individuals are identified by \_\_\_\_\_

Some pedigrees will identify "carriers" ( \_\_\_\_\_ ) by \_\_\_\_\_



Some types of \_\_\_\_\_ can be determined by looking at \_\_\_\_\_

In the mountains of British Columbia a small group of Sasquatches was discovered. Many years of study produced the following results: A. Fill in the genotypes for the following sets of parents. B. Draw a sasquatch (on the other side).

Phenotype of Parent 1	Phenotype of Parent 2	Genotype of Parent 1	Genotype of Parent 2	<u>Offspring</u>		<u>Offspring</u>	
				Bowlegged with Hairy knees	Bowlegged with Smooth knees	Knock-kneed with Hairy knees	Knock-kneed with Smooth knees
bowlegs with hairy knees	bowlegs with smooth knees	_____	_____	1/2	1/2	none	none
bowlegs with smooth knees	bowlegs with smooth knees	_____	_____	none	3/4	none	1/4
bowlegs with hairy knees	bowlegs with hairy knees	_____	_____	9/16	3/16	3/16	1/16
bowlegs with hairy knees	knock-kneed with smooth knees	_____	_____	1/4	1/4	1/4	1/4
bowlegs with hairy knees	bowlegs with smooth knees	_____	_____	3/8	3/8	1/8	1/8
knock-kneed with hairy knees	knock-kneed with hairy knees	_____	_____	none	none	3/4	1/4
knock-knees with smooth knees	knock-kneed with smooth knees	_____	_____	none	none	none	all
knock-kneed with smooth knees	bowlegs with hairy knees	_____	_____	all	none	none	none

