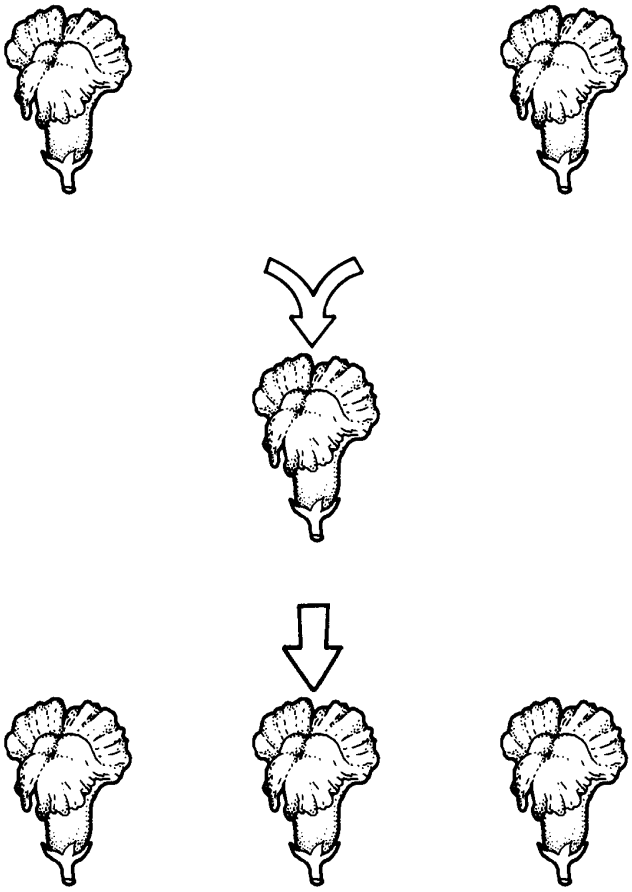
AP BIOLOGY
HEREDITY
ACTIVITY #3

NAME_____

DATE_____HOUR_____

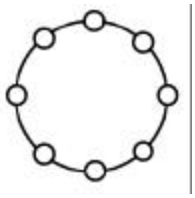
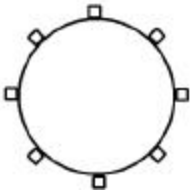
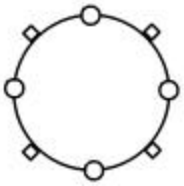
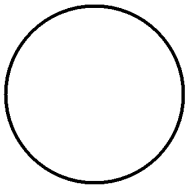
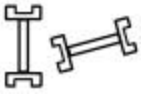
BEYOND MENDEL

INCOMPLETE DOMINANCE



CODOMINANCE:

ABO BLOOD GROUPS

Blood Type	A	B	AB	O
Genotype				
RBC Antigen				
Plasma Antibodies				
In Anti-A Serum				
In Anti-B Serum				

BLOOD TRANSFUSIONS

Blood Type	**Can Donate To**	**Can Receive From**

QUESTIONS:

1. Define the following:

Complete Dominance	
Incomplete Dominance	
Codominance	

2. Using Tay-Sachs disease as an example, explain how a heterozygous individual can appear normal at the organismal level, exhibit an intermediate phenotype at the biochemical level, and exhibit both phenotypes at the molecular level.

Organism Level	
Biochemical Level	
Molecular Level	

3. A rooster with blue (actually gray) feathers is mated with a hen of the same phenotype. Among their offspring, 15 chicks are blue, 6 are black, and 8 are white.

What is the simplest explanation for the inheritance of these colors in chickens?

_____

What offspring would you predict from the mating of blue rooster and a black hen?

_____

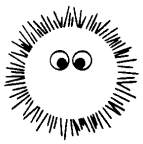
4. If two medium-tailed pigs were mated and the liter produced included three stub-tailed piglets, six medium-tailed, and four long-tailed piglets, what would be the simplest explanation of these results?

_____

5. The chart shows the results from several matings between different tribbles.

Parental Cross	**Offspring**	**Parental Cross**	**Offspring**
Blue x red	All purple	Yellow x white	All yellow
Blue x yellow	All green	Blue x black	All blue
Yellow x red	All orange	Red x black	All red
Blue x white	All blue	Yellow x black	All yellow
Red x white	All red	Black x white	All gray

a. Which crosses are examples of complete dominance?



_____

_____

b. Which crosses are examples of incomplete dominance?

_____

_____

c. Give the genotypes for each of the following tribble colors. Remember to use a capital letter to indicate a dominant allele and a lower case letter to indicate a recessive letter. If the color is the result of incomplete dominance, two capital letters (or two lower case letters) should be used. For example, in some flowers when red flowers (RR) are crossed with white flowers (WW), pink (RW) flowers are produced.

Blue	_____	Red	_____
Purple	_____	Yellow	_____
Green	_____	White	_____
Black	_____	Grey	_____

d. Two blue tribbles mate and produce offspring that include white tribbles. What are the genotypes of the parents?

_____

e. If two orange tribbles mate, how many of the 852 offspring would you expect to be yellow? Show your work.

_____

f. A special investigation was conducted to determine the identity of the parents of an abandoned litter of tribbles. The litter included blue, purple, green, and orange tribbles. What are the phenotypes and genotypes of the parents?

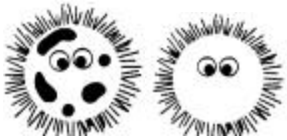
_____

6. Tribbles can be spotted (color against a white background) or solid color. The spotted allele is dominant to the solid color allele.

a. When two spotted tribbles were mated, 45 spotted tribbles and 15 solid-colored tribbles were produced. How many of the spotted tribble offspring would you expect to be heterozygous? Show your work.

_____

_____



b. Two red spotted tribbles were mated. Each tribble had a black solid-colored parent. How many of the 5,280 offspring would you expect to be black, solid-colored? Show your work.

_____

_____

7. Define multiple alleles:_____

_____

Example:_____

8. Explain why a type O person can donate blood to all other blood types but can only receive type O blood.

_____

_____

_____

9. Blood typing has often been used as evidence in paternity cases, when the blood type of the mother and child may indicate that a man alleged to be the father could not possibly have fathered the child. For the following mother and child combinations, indicate which blood groups of potential fathers would be exonerated.

Blood Group of Mother	Blood Group of Child	Blood Group that would Exonerate Man
AB	**A**	
O	**B**	
A	**AB**	
O	**O**	
B	**A**	

10. Fred has type AB blood, Wilma has type B blood, and Pebbles, their daughter has type A blood. Betty has type B blood, Barney has type A blood, and their some BamBam has type O blood. In the bloodiest fight ever witnessed in Bedrock, BCE, Barney accused Betty of having an affair with Fred. Barney also claimed that Fred is BamBam's father, sighting evidence from the new field of Geneticsrock. Could Barney be right? Could Fred be BamBam's father? Support your answer.

11. A man with group B blood marries a woman with group B blood. Their child has group O blood. What are the genotypes of these individuals? What other genotypes, and in what frequencies, would you expect in offspring form this marriage?

12. Color pattern in a species of duck is determined by a single pair of genes with three alleles. Alleles H and I are codominant, and allele i is recessive to both. How many phenotypes are possible in a flock of ducks that contains all the possible combinations of these three alleles?

13. Imagine that a newly discovered, recessively inherited disease is only expressed in individuals with group O blood, although the disease and blood group are independently inherited. A normal man with A blood and a normal woman with B blood have already had one child with the disease. The woman is now pregnant for a second time. What is the probability that the second child will also have the disease? Assume the parents are heterozygous for the "disease" gene. Show your work.

_____

_____

14. Match the description/example with the correct pattern of inheritance.

A. Epistasis B. Pleiotropy
C. Polygenic Inheritance

_____ Single gene with multiple effects

_____ Gene at 1 locus alters the phenotypic expression of a second gene

_____ Several genes determine one phenotype

_____ Sickle-celled anemia

_____ Coat color in mice and rodents

_____ Skin color in humans

_____ Height in humans

15. In guinea pigs, the gene for production of melanin is epistatic to the gene for the deposition of melanin. The dominant allele M causes melanin to be produced; mm individuals cannot produce the pigment. The dominant allele B causes the deposition of a lot of pigment and produces a black guinea pig, whereas only a small amount of pigment is laid down in bb animals, producing a light-brown color. Without an M allele, no pigment is produced so the allele B has no affect and the guinea pig is white. A homozygous black guinea pig is crossed with a homozygous recessive white: MMBB x mmbb. Give the phenotypes of the F_1 and F_2 generations.

F_1 generation:_____

F_2 generation:_____

_____

_____

16. The height of spike weed is a result of polygenic inheritance involving three genes, each of which can contribute 5 cm to the plant. The base height of the weed is 10 cm, and the tallest plant can reach 40 cm.

If a tall plant (AABBCC) is crossed with a base-height plant (aabbcc), what is the height of the F_1 plants? Show your work.

How many phenotypic classes will there be in the F_2? List them.