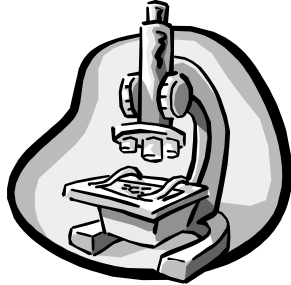


**Science 10-Biology**  
**Activity 16**  
**Worksheet on Basic Genetics**



10

Name \_\_\_\_\_

Due Date \_\_\_\_\_

Show Me  Hand In

***Correct and Hand In Again By*** \_\_\_\_\_

**NOTE: This worksheet is based on material from pages 392-396 in Science Probe.**

1. How much was known about chromosomes and genes in Mendel’s time?  
 \_\_\_\_\_
  
2. Normal cells of an organism have pairs of chromosomes called  
 \_\_\_\_\_ chromosomes.
  
3. On each of the homologous chromosomes, there is a gene for a certain trait.  
 These genes are called \_\_\_\_\_
  
4. Alleles can either be *dominant* or \_\_\_\_\_
  
5. In a pea plant, the allele (gene) for tallness is dominant over the allele for shortness. If a pea plant has one allele for tallness and one for shortness, will the  
 plant be tall or short? \_\_\_\_\_ Why? \_\_\_\_\_  
 \_\_\_\_\_
  
6. In humans, the ability to taste a type of paper called PTC is carried by a dominant allele. If a person has one allele for “tasting” and one for “non-tasting”, will the  
 person be able to taste PTC? \_\_\_\_\_. The gene for tasting is shown by the  
 person, so it is said to be \_\_\_\_\_. The allele for non-  
 tasting is recessive. We can say that the trait for “non-tasting” is \_\_\_\_\_, because  
 it is present but does not show itself.

7. In alleles which are dominant and recessive, the dominant allele is represented by a \_\_\_\_\_ letter, while the recessive allele is represented by a \_\_\_\_\_ letter.
  
8. An individual who has a pair of alleles that are the same type (both dominant or both recessive) is said to be \_\_\_\_\_ for that gene.
  
9. An individual who has a pair of alleles that are different types (one dominant and one recessive) is said to be \_\_\_\_\_ for that gene.
  
10. Peas have a gene for tallness (t). The dominant allele is Tall (T) and the recessive allele is short (t). The combination of alleles (genotypes) for some individuals are given below. Determine whether each of the individuals is homozygous or heterozygous and determine whether each plant is tall or short:

<i>Genotype</i>	<i>Homozygous or Heterozygous</i>	<i>Tall or Short Plant</i>
TT		
tt		
Tt		

11. During *meiosis* what happens to pairs of alleles? \_\_\_\_\_  
\_\_\_\_\_
  
12. A *gamete* will have only one on each type of chromosome so therefore will carry just \_\_\_\_\_ allele of each gene.
  
13. When two different gametes (*one from each parent*) combine during fertilization, they each carry an allele for a particular gene (or trait). The new individual will now have \_\_\_\_\_ alleles. (One from each \_\_\_\_\_)
  
14. The two original parents in the “cross” of pure-breds on page 393 are both (*homo/hetero*) \_\_\_\_\_zygous.

15. The offspring resulting from the first cross of two parents, are called the \_\_\_\_\_ or *first filial* generation.

16. What is meant by the **genotype** of an individual? \_\_\_\_\_  
 \_\_\_\_\_

17. What is meant by the **phenotype** of an individual? \_\_\_\_\_  
 \_\_\_\_\_

18. A little terminology here: For example with the tall and short alleles for pea plants,

The genotype **TT** is called ***homozygous tall***

The genotype **tt** is called ***homozygous short***

The genotype **Tt** is called ***heterozygous tall***

If homozygous tall (TT) plant is crossed with a homozygous short (tt) plant, all of the offspring will have the genotype \_\_\_\_\_ or \_\_\_\_\_  
 \_\_\_\_\_ (See top diagram on page 393)

19. If two heterozygous (Tt) tall plants are crossed , give the four possible genotypes of the offspring: ..... \_\_\_\_\_  
 (See the diagram at the bottom of page 393)

Still looking at this diagram, estimate the fraction (1/4, 1/2 etc.) of offspring that will have the genotype:

**TT** \_\_\_\_\_ (*homozygous tall*)

**Tt** (or tT -same thing) \_\_\_\_\_ (*heterozygous tall*)

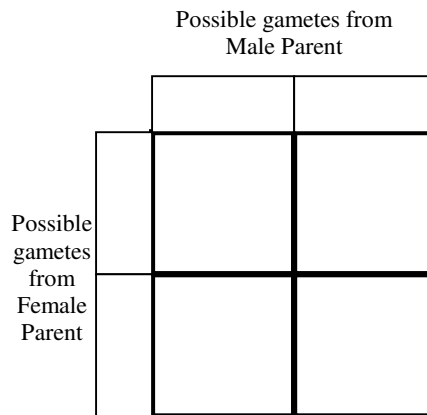
**tt** \_\_\_\_\_ (*homozygous short*)

20. Does the environment have any effect on a plants phenotype (tall or short, green or yellow etc.)? \_\_\_\_\_.

21. No matter how many times a coin is tossed and no matter how many head or tails there were, the chances of getting “heads” with one toss is \_\_\_\_\_% and the chances of getting “tails” with one toss is \_\_\_\_\_%.

22. A father is who is **heterozygous dimpled**, and a mother who is **homozygous smooth** have children.

- a) Show the two alleles carried by the father. (Use "D" for dimpled and "d" for smooth) .....\_\_\_\_\_
- b) Show the two alleles carried by the mother. (Use "D" for dimpled and "d" for smooth) .....\_\_\_\_\_
- c) Fill in the following Punnett Square showing the cross and show the combinations of genes possible in the children.



- d) According to chance, what fraction of their children will have dimples?  

Answer \_\_\_\_\_
  - e) What fraction of the children should be homozygous smooth?  

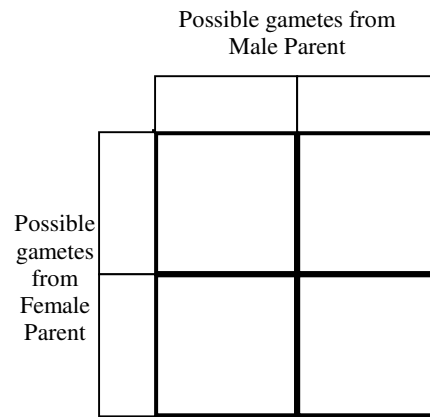
Answer \_\_\_\_\_
  - f) If these two people have four children, is it safe to assume that two will be dimpled and two will not?\_\_\_\_\_
- Explain your answer \_\_\_\_\_
- \_\_\_\_\_

23. A father is who is *homozygous dimpled*, and a mother who is *homozygous smooth* have children.

a) Show the two alleles carried by the father. (Use "D" for dimpled and "d" for smooth) .....\_\_\_\_\_

b) Show the two alleles carried by the mother. (Use "D" for dimpled and "d" for smooth) .....\_\_\_\_\_

c) Fill in the following Punnett Square showing the cross and show the combinations of genes possible in the children.



d) According to chance, what fraction of their children will have dimples?

Answer \_\_\_\_\_

e) What fraction of the children should be homozygous smooth? (if any)

Answer \_\_\_\_\_

f) What fraction of the children should be heterozygous dimpled? (if any)

Answer \_\_\_\_\_

g) What fraction of the children should be homozygous dimpled? (if any)

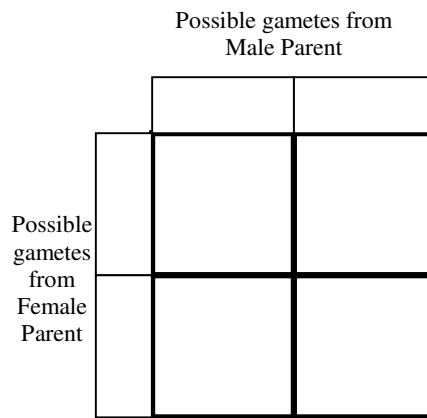
Answer \_\_\_\_\_

24. A father is who is *homozygous dimpled*, and a mother who is *heterozygous dimpled* have children.

a) Show the two alleles carried by the father. (Use "D" for dimpled and "d" for smooth) .....\_\_\_\_\_

b) Show the two alleles carried by the mother. (Use "D" for dimpled and "d" for smooth) .....\_\_\_\_\_

c) Fill in the following Punnett Square showing the cross and show the combinations of genes possible in the children.



d) According to chance, what fraction of their children will have dimples?

Answer \_\_\_\_\_

e) What fraction of the children should be *homozygous smooth*? (if any)

Answer \_\_\_\_\_

f) What fraction of the children should be *heterozygous dimpled*? (if any)

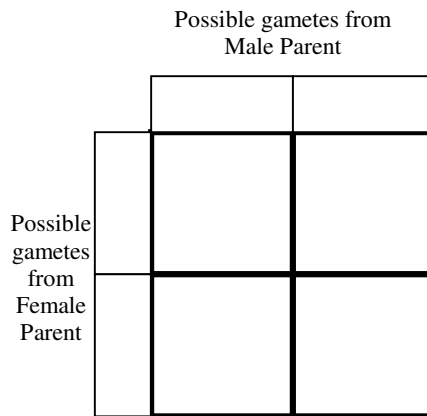
Answer \_\_\_\_\_

g) What fraction of the children should be *homozygous dimpled*? (if any)

Answer \_\_\_\_\_

25. In humans, long eyelashes (L) are dominant and short eyelashes (l) are recessive.

a) Draw a Punnett Square showing the cross between two **heterozygous long-eyelash** parents.



- b) What fraction of the offspring should have long eyelashes? \_\_\_\_\_
- c) What fraction of the offspring should have short eyelashes? \_\_\_\_\_
- d) What fraction of the offspring will be **homozygous long eyelash**? \_\_\_\_\_
- e) What fraction of the offspring will be **homozygous short eyelash**? \_\_\_\_\_
- f) What fraction of the offspring will be **heterozygous long eyelash**? \_\_\_\_\_
- g) A cross is made between two *different* parents and **all** the offspring have the genotype Ll (*They are all heterozygous long eyelash.*). Determine the genotypes of both parents. (*Don't worry about which one is male and which one is female.*)

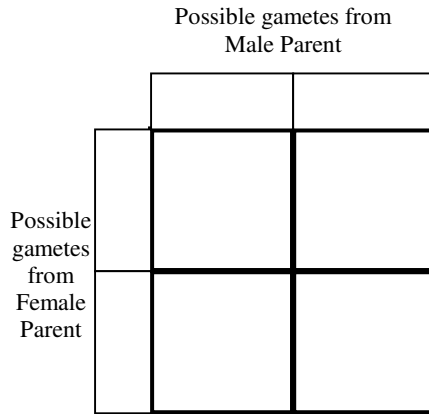
Answer \_\_\_\_\_ and \_\_\_\_\_

26. In mice, gray colour (G) is dominant over white (g). A mouse from a population that **always** produces **gray** mice is mated with a **white** mouse.

- a) What is the genotype of the gray mouse? ..... \_\_\_\_\_
- b) What is the genotype of the white mouse? ..... \_\_\_\_\_

(This question is continued on the next page....)

c) Fill in the following Punnett Square showing this cross:

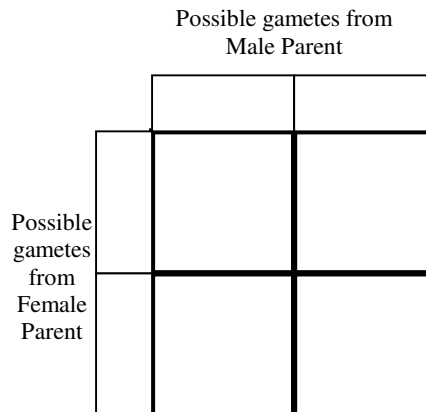


d) Describe the phenotype of all the first generation of mice from this cross?  
\_\_\_\_\_

e) What is the genotype of each one of the offspring? \_\_\_\_\_

f) These mice are all \_\_\_\_\_zygous.

27. A **heterozygous gray** mouse is mated with a **white** mouse. Use the following Punnett Square to predict the possible offspring as asked below:



a) \_\_\_\_\_ of the offspring are gray and \_\_\_\_\_ of the offspring are white.

b) Are any of the offspring **homozygous gray**? \_\_\_\_\_

c) \_\_\_\_\_ of the offspring are **homozygous white**.

e) Is it possible to have a **heterozygous white** mouse? \_\_\_\_\_

26. In chimpanzees, straight fingers are dominant to bent fingers. Complete a punnett square to show the genotypes and phenotypes expected for the following cross: heterozygous straight x homozygous bent.
27. In humans, the gene for brown eyes (b) is dominant to the gene for blue eyes and the gene for right handedness (r) is dominant to the gene for left handedness. Two individuals heterozygous for both of these characteristics marry. Complete a punnett square to show the expected genotypes and phenotypes of the offspring.

Summarize the ratio of the phenotypes:

\_\_\_ out of \_\_\_ are right handed and have brown eyes

\_\_\_ out of \_\_\_ are right handed and have blue eyes

\_\_\_ out of \_\_\_ are left handed and have brown eyes

\_\_\_ out of \_\_\_ are left handed and have blue eyes

28. A male who is homozygous right handed and heterozygous brown eyed marries a female who is heterozygous right handed and has blue eyes. Complete a punnett square to show the expected genotypes and phenotypes of the offspring.

Summarize the ratio of the phenotypes:

\_\_\_ out of \_\_\_ are right handed and have brown eyes

\_\_\_ out of \_\_\_ are right handed and have blue eyes

\_\_\_ out of \_\_\_ are left handed and have brown eyes

\_\_\_ out of \_\_\_ are left handed and have blue eye