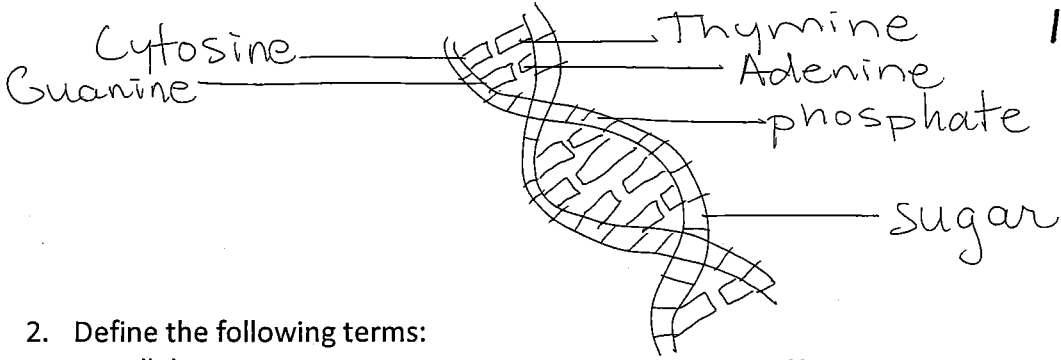


# KEY

## SCIENCE 10 Genetics Review

1. Identify the 2 mistakes made in the following diagram of DNA:



1. Thymine pairs with Adenine and Cytosine pairs with Guanine.
2. Nucleic acids attached to sugar not phosphate on backbone.

2. Define the following terms:

- |              |                 |
|--------------|-----------------|
| a. Allele    | g. Homozygous   |
| b. Trait     | h. Heterozygous |
| c. Gene      | i. Offspring    |
| d. Recessive | j. Phenotype    |
| e. Dominant  | k. Genotype     |
| f. Heredity  |                 |

3. If a chicken's DNA is composed of 26% guanine, what percentage will be cytosine? **26%**

4. What is the relationship between a trait, a gene, and a chromosome?

**Genes code for traits, genes are found on DNA that is stored as chromosomes in cells**

5. {
- a. What is a mutation?
  - b. Describe the 3 types of mutations.
  - c. Identify the 3 potential ~~types~~ **outcomes** of mutations.

**a. error in DNA**

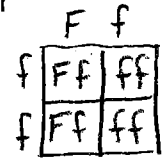
**b. substitution:**  
one or more bases are replaced by different bases.

**insertion:**  
1+ bases extra inserted into DNA

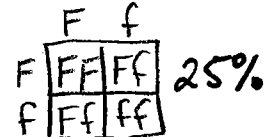
**deletion:**  
1+ bases deleted from DNA

In dogs, the gene for fur color has two alleles. The dominant allele (F) codes for grey fur and the recessive allele (f) codes for black fur.

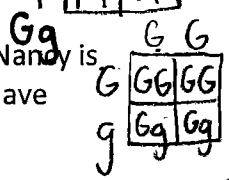
a. The female dog is heterozygous. The male dog is homozygous recessive. If these two dogs reproduce, what percentage of their offspring will be grey? **50%**



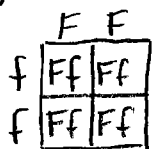
b. The female dog is heterozygous. The male dog is heterozygous. If these dogs reproduce what percentage of their offspring will be homozygous dominant? **25%**



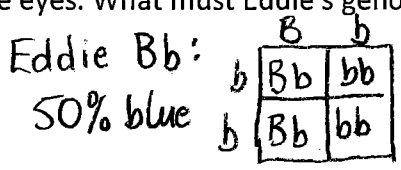
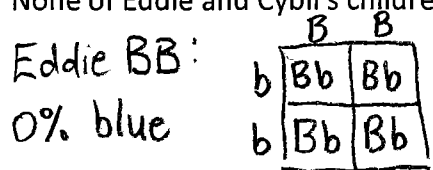
7. Cystic fibrosis is a recessive genetic disorder. Ron is homozygous dominant and Nancy is a carrier of cystic fibrosis. What is the probability that one of their children will have cystic fibrosis? **0%**



8. FF is homozygous dominant for freckles, while Charlie is homozygous for no freckles. What is the probability of their children having freckles? **100%**



9. Eddie has brown eyes, while Cybil has blue. Brown eyes are known to be dominant. None of Eddie and Cybil's children have blue eyes. What must Eddie's genotype be? **BB**



**c. advantageous deleterious neutral**

	A	a
A	AA	Aa
a	Aa	aa

10. Larry and Lola Little have achondroplasia, a dominant form of dwarfism. Both are heterozygotes. Their son, Big Bob Little, is 7'1". What is the probability of Larry and Lola having a child without achondroplasia? **25%**

### Patenting of Genes

Dr. Lydia Mendoza and her company, *Genmania*, have spent years working to identify how the gene for albinism works. The mutation in this gene causes no pigment to be produced in the hair, skin or eyes. Identifying the gene would open the door to curing the condition. Finally, her team succeeds.

But the years spent on research were expensive. One way to make back that money is to patent the gene that team members just identified. Then, anyone who wanted to develop either treatments or tests would have to pay a fee to use the gene.

When a patent is submitted to the government, the company must prove that the item to be patented is original and patentable.

11. a. What do you think about patenting a gene that already exists in the human body?
- b. Should the government allow this gene to be patented? Why or why not?
- c. Some think that genes should not be patented because they are a medical discovery and not an invention, and everyone should be allowed to use the information without paying. What do you think?
- d. If, in the future, *Genmania* develops a test for this gene, should they be allowed to patent the test? Why or why not?

**Answers will vary.**

OO

AO

22. A man with Type O blood marries a woman with heterozygous Type A blood.

	O	O
A	A <sub>O</sub>	A <sub>O</sub>
O	OO	OO

o. What are the possible genotypes of the offspring?

heterozygous  
homozygous recessive

p. What are the possible phenotypes of the offspring?

Type A / Type O

q. What is the probability of each genotype?

50%  
50%

r. What is the probability of each phenotype?

50%  
50%

23. In humans colorblindness (b) is an example of a sex-linked recessive trait. In this problem, a male with colorblindness marries a female who is not colorblind but carries the (b) allele. Using a Punnett square, determine the genotypic and phenotypic probabilities for their potential offspring.

	X <sup>B</sup>	X <sup>b</sup>
X <sup>b</sup>	X <sup>B</sup> X <sup>b</sup>	X <sup>b</sup> X <sup>b</sup>
Y	X <sup>B</sup> Y	X <sup>b</sup> Y

Genotype of offspring:

heterozygous / homozygous recessive

Phenotype of offspring:

50% not colour blind  
50% colour blind.

24. A man that has an AB blood type has a child with a woman with type B blood. Can they have a type O child? Use a Punnett square or Punnett squares to show your work.

woman homozygous dominant

	B	B
A	AB	AB
B	BB	BB

no

woman heterozygous.

	B	O
A	AB	A <sub>O</sub>
B	BB	B <sub>O</sub>

no

19. In pea plants, round (R) is dominant to wrinkled (r). A heterozygous female is crossed with a wrinkled male. Make a Punnett Square to determine the possible offspring.

- a. What are the possible genotypes of the offspring?  
 heterozygous + homozygous recessive
- b. What are the possible phenotypes of the offspring?  
 dominant (round) + recessive (wrinkled)
- c. What is the probability of having an offspring that is round?
- d. What is the probability of having an offspring that is homozygous?

	R	r
r	Rr	rr
r	Rr	rr

20. The color of flowers in snap dragons shows incomplete dominance. Red ( $C^R C^R$ ) and white ( $C^W C^W$ ) are homozygous and pink ( $C^R C^W$ ) is heterozygous.

- e. If a red snap dragon is crossed with a white snap dragon, what is the phenotype of the offspring?  
 Pink
- f. What are the possible genotypes of the offspring?  
 $C^R C^W$
- g. A pink flower is crossed with a red flower. Make a Punnett Square to determine the possible offspring.

- h. What is the probability of the offspring being red?  
 50%
- i. What is the probability of the offspring being white?  
 0%
- j. What is the probability of the offspring being pink?  
 50%

	$C^R C^W$	$C^R C^W$
$C^R C^R$	$C^R C^R C^R C^W$	$C^R C^R C^R C^W$
$C^R C^R$	$C^R C^R C^R C^W$	$C^R C^R C^R C^W$

21. Sickle Cell Anemia is condition that shows codominance. The genotype for normal blood cells is NN. Sickle cell trait is the heterozygous condition (NS) and contains both normal and sickle shaped blood cells. Sickle cell disease (SS) is when all of the blood cells are sickle-shaped and has lifelong medical implications. A man with sickle cell trait has a child with a woman with sickle cell trait.

- k. Complete the Punnett Square.
- l. What is the probability of having a child with sickle cell trait?  
 50%
- m. What is the probability of having a normal offspring?  
 25%
- n. What is the probability of having a child with sickle cell disease?  
 25%

	N	S
N	NN	NS
S	NS	SS