

## Genetics Study Guide

Pick 30 questions to answer. You must include the ones with ★ .

### Mendel's Work, Sexual and Asexual Reproduction

1. Define trait. *A physical characteristic*
2. Define gene. *A unit of heredity passed from parent to offspring; a section of DNA*
- ★ 3. Define phenotype. *The physical appearance of a trait*
- ★ 4. Define genotype. *The gene combination of a trait*
5. Define dominant (include letter type). *A trait/gene that is stronger; represented by a capital letter*
6. Define recessive (include letter type). *A trait/gene that is weaker than others and will be overpowered by dominant genes; represented by a lower-case letter*
7. Purebred/homozygous. *A genotype that is either two dominant or two recessive genes (TT or tt)*
8. Hybrid/heterozygous. *A genotype that is a dominant gene and a recessive gene (Tt)*
9. Give three reasons Mendel used pea plants to study inheritance.
  - *Pea plants have many easily observed traits*
  - *Pea plants grow quickly; many generations can be observed in a short amount of time*
  - *Pea plants could be easily cross-pollinated (Mendel could control)*
10. What did Mendel conclude from his experiment?  
*He determined there are two factors that determine an organism's traits where one comes from each parent (later called genes). Also, he determined that the combination of genes will be different in each offspring.*
- ★ 11. What are the three types of asexual reproduction? (list and explain)
  - *Budding - a new organism stays attached to its parent until fully grown (hydra)*
  - *Fragmentation - a piece of a parent organism breaks off and grows into an offspring (starfish)*
  - *Binary fission - an organism splits into two identical copies (bacteria)*
- ★ 12. Which type of reproduction allows for more diversity? *Sexual reproduction provides more variety because the genes from two parents mix instead of the genes from one parent just getting copied.*
13. Which type of reproduction allows for no diversity; the daughter cells are identical to the parent cells? *Asexual reproduction does not allow for diversity in a species because the genes from just one parent are copied so the offspring is identical to its parent.*
14. What are the four nucleotide bases of DNA? *Adenine, Thymine, Cytosine, Guanine*
- ★ 15. How do the base pairs in DNA pair up? *Adenine and Thymine, Cytosine and Guanine*

- ★ 16. Complete the chart comparing mitosis and meiosis. Use the options listed.

Meiosis	Question	Mitosis
<i>Half the number</i>	How do the number of chromosomes in the resulting cells compare to the original cell?	<i>Same number</i>
<i>23 chromosomes</i>	What is the end result if you started with 46 chromosomes?	<i>46 chromosomes</i>
<i>Reproductive Organs</i>	Where in the body does the process take place?	<i>All throughout the body</i>
<i>Create sperm and egg cells for reproduction</i>	What is the purpose of this process?	<i>Create body cells for growth, development, and repair</i>

### Probability and Patterns of Inheritance

17. What is probability? *The chance or likelihood that an event will happen*
18. If purebred blue flowers and crossed with purebred red flowers and the offspring are all purple flowers, the genes for flower color are showing *incomplete dominance*.
- ★ 19. Complete the Punnett square with the letter H. A recessive giggle gobble is crossed with a hybrid giggle gobble that has horns.

	<i>h</i>	<i>h</i>
<i>H</i>	<i>Hh</i>	<i>Hh</i>
<i>h</i>	<i>hh</i>	<i>hh</i>

- ★ 20. Use the Punnett square in 19 to answer:
- What is the recessive trait? *No horns*
  - What is the dominant trait? *Horns*
  - How do you know which is dominant and which is recessive? *Since the hybrid has horns and dominant genes will overpower recessive genes, the dominant trait must be horns.*
- ★ 21. Use the Punnett square in 19 to list the genotypes of the offspring.
- HH = 0 %*  
*Hh = 50 %*  
*hh = 50 %*
- ★ 22. Use the Punnett square in 19 to list the phenotypes of the offspring.
- Horns = 50 %*  
*No horns = 50 %*
23. Create a Punnett square using two DIFFERENT purebred parents for a new generation.  
 N = normal joints, n = double jointed

	<i>N</i>	<i>N</i>
<i>n</i>	<i>Nn</i>	<i>Nn</i>
<i>n</i>	<i>Nn</i>	<i>Nn</i>

24. Use the Punnett square in 23 to list the phenotypes and genotypes of the offspring.

**Genotypes**

NN = 0%

Nn = 100%

nn = 0%

**Phenotypes**

normal joints = 100%

double jointed = 0%

- ★ 25. A child is born with a genetic disease, however, neither of the parents have the disease. Set up a Punnett square to show how this is possible. Use the letter D.

	D	d
D	DD	Dd
d	Dd	dd

- ★ 26. A trait on the X or Y chromosome is known as a sex-linked trait.
27. People who have one gene for a disease but show no symptoms are called carriers.
28. What do you use to show how a trait is distributed within a family? Pedigree charts
29. Describe the parts of a pedigree below:

- Half-shaded circle *A female that is a carrier but does not have the trait*
- Blank square *A male that does not have the trait*
- Shaded circle *A female that has the trait*
- Horizontal line *Connects the male and female parents*

- ★ 30. Give 3 important facts about cloning. (make sure you include a definition)
- *Creates an exact genetic replica of an organism*
  - *The personality and some traits will be different because of environmental factors*
  - *Clones experience many problems such as early death, low success rate, obesity, and other illnesses*

**Genetic Diseases and Disorders**

31. What is a mutation? *A permanent change in the DNA of an organism*
- ★ 32. Give an example of a when a mutation causes:
- Negative effect *The mutation decreases the chances of survival (a disease or disorder)*
  - Neutral effect *The mutation doesn't affect the organism's chance of survival (skin color change)*
  - Positive/beneficial effect *The mutation increases the chances of survival (immunity to a disease)*
33. As a result of a mutation, an arctic fox is born with brown fur that will never lighten to white fur. How would this mutation affect the animal's ability to survive in its environment? Give at least two ways that fur color impacts the fox in the arctic environment.
- *The brown fur will keep the fox from blending with its environment and prevent it from sneaking up on its prey or hiding from predators*
  - *The brown fur might make the fox absorb more heat from the Sun and affect its body temperature*

- ★ 34. Define genetic disease/disorder. *A disease or disorder caused by mutation or chromosome abnormality*
- 35. What is cancer? *Cells in the body divide uncontrollably and unpredictably*
- ★ 36. What is Down syndrome? *A genetic disorder where there is an extra copy of the 21<sup>st</sup> chromosome; person has serious health and living complications*
- 37. What is hemophilia? *A genetic disorder where the body does not produce cells to clot blood when bleeding; can be deadly if not properly monitored/treated*
- 38. What is sickle cell anemia? *A genetic disorder where the body produces sickle-shaped blood cells instead of round cells which prevents them from carrying oxygen through the body*

Identify whether the following traits are inherited (I) or caused by environmental (E) factors.

I eye color

Both weight

E skin cancer

E language spoken

Both athletic talent

Both height

E ability to play an instrument

E favorite foods

