AP Biology   Name: P:

Chapter 11 Reading Guide: Mendel and the Gene idea

How to use this reading guide: Look over the entire reading guide—read each question to prepare yourself for reading the chapter. Read the chapter carefully and thoroughly. Make sure to look at all of the figures and pictures and read their captions. Then…answer the questions posed below.

Drawing from the Deck of Genes
1. We know that the information for all of our traits are inherited from our parents and are encoded by genes. But are there patterns to the "passing on" of our traits.
    a. What are the two possible explanations for "heredity"? Explain what each predicts will happen over many generations.

Mendel used the scientific approach to identify two laws of inheritance
2. Explain, IN DETAIL, ALL of the advantages of using pea plants to study inheritance.

3. Mendel did three things in particular that were extremely useful in his experiment. Explain why these were important and "good experimental" design.
    a. Controlling plant reproduction (either ensuring self-pollination or cross-pollination)-

    b. Tracking "either-or" traits not "more or less" traits-

    c. Beginning with true-breeding plants-

4. Describe a "typical" experiment-include the terms hybridization, P generation, F1 generation, and F2 generation, in your response.
    a. The F2 generation was extremely useful to Mendel.
        i. Explain what it is about the F2 generation that made it so useful.
        ii. What principles of heredity did Mendel discover (or formulate) based on the result seen in the F2 generations?

5. Read/Study Figure 11.3 and Figure 11.5—which shows an experiment that supports the Law of Segregation.
    a. Describe how this experiment supports the following assertions by Mendel
        i. "Alternative version of genes account for variations in inherited characters."
        ii. "For each character an organism inherits two alleles, one from each parent."
        iii. "If the two alleles at a locus differ, then one, the dominant allele, determines the organisms appearance, and the other, the recessive allele, has no noticeable effect."
        iv. Law of Segreation

6. What is an allele?

7. What is significant about the 3:1 ratio? What will a 3:1 ratio ALWAYS tell you about the "parents" in a monohybrid cross?

8. Define the following words.
    a. Homozygous
        i. Know what homozygous dominant and homozygous recessive means!!
    b. Heterozygous
    c. Phenotype
    d. Genotype
    e. Test cross (show a test cross)
    f. Monohybrid
    g. Dihybrid

9. Study Figure 11.8—What question was Mendel trying to answer?
    a. What do you do to answer this question?
    b. Which step is the key step in the experiment?

c. There are two possibilities for what the alleles could be doing: 1. The alleles could be traveling together on the same chromosome or 2. The alleles could be traveling separately on different chromosomes.
   i. Explain what each possibility means and what you would expect to find in the offspring if this was "the answer."

10. Define the Law of Independent Assortment.

The laws of probability govern Mendelian Inheritance

11. Explain probability and the probability scale (what does a 1 mean? What does a 0 mean?)

12. In your own words, how do you apply "probability" to any event?

13. How does probability apply to alleles when they undergo meiosis and make eggs or sperm?

14. How does probability apply to the alleles when the gametes combine to form a zygote?

15. What does the multiplication rule state?
    a. How is it applied to genetics?

16. What does the addition rule state?
    a. How is it applied to genetics?

17. In solving complex problems, how can you use the rules that apply to monohybrid problems to help?
    a. Give an example and explain each step in the process.

18. How can you combine the multiplication rule and the addition rule to solve really complex problems?
    a. Give an example that uses 3 traits! Explain each step in the process.

Inheritance patterns are often more complex than predicted by simple Mendelian genetics
    19. In what way was Mendel "one lucky son of a gun?"

20. In ONE SENTENCE how can single gene inheritance differ from simple Mendelian patterns?

21. Explain the "spectrum of dominance."

22. What is co-dominance?
    a. Give a human example of co-dominance.
    b. Draw a picture that would help explain what the red blood cells with each genotype would look like.

    c. What would the ratio of the offspring in the F2 be if the P generation were MM and NN (homozygous)? SHOW YOUR WORK!

23. What is incomplete dominance?
   a. Give an example.
   b. What would the ratio of the offspring be in the F2 if the P generation were C^RC^R and C^rC^r? SHOW YOUR WORK!!!

24. What is the relationship between genotype and phenotype?
   a. How do the terms "dominant" and "recessive" play into this relationship?

25. Explain how dominance and phenotype are involved in Tay-Sachs disease.

26. Using human blood groups as the example, explain multiple alleles.

27. What is pleiotropy? How is it related to cystic fibrosis?

28. Study Figure 11.12. Explain what epistasis is using the labrador example in Figure 11.12

29. What are "quantitative characters"? How are they related to polygenic inheritance?
   a. Explain how skin pigmentation works.

30. Describe what the term "nature vs. nurture" refers to. How is the "norm of reaction" involved in this? Why are these traits called "multifactorial?"

Many human traits follow Mendelian patterns of inheritance

31. Why is pedigree analysis used to study human inheritance?

For the Human Disorders describe on pages 221-223 describe the following:
    a. type of inheritance
    b. symptoms of the disorder
    c. group of people it seems to affect most

Tay-Sachs

Cystic Fibrosis

Sickle-Cell Disorder

Achondroplasia

Huntington's Disease

32. What is genetic counseling?

33. What do we "genetically" test for?