AP Biology: Genetic Practice Problems

Complete the provided practice problems on a separate piece of paper. Include all Punnett squares and work used to determine each answer.

Monohybrid Crosses:
1. The gene for tall is dominant over dwarf in pea plants used by Mendel. A pea plant that comes from a line of plants that are all tall is crossed with a dwarf pea plant. What are the phenotypes and genotypes you will see in the F1 generation? Be sure to provide the ratios.

2. If a plant from the F1 generation is then crossed with a dwarf plant what would the phenotypic and genotypic ratios be?

3. Assume that dimples are inherited as a simple dominant gene. A dimpled mans whose mother has no dimples marries a woman with no dimples. What is the probability they will have a child with dimples?

4. In goats, a recessive gene causes the goats to faint when they are startled. A farmer breeds two goats (that have never fainted) and their first offspring faints two days after its birth. What must the parent's genotypes have been? Show the cross as evidence.

Dihybrid Crosses:

5. Assume a cross is made between fruit flies with the following genotypes: aaBB and Aabb. Create the Punnett square for the F1 generation. Then provide the phenotypic ratio.

6. In guinea pigs, short hair is dominant to long hair. Also in guinea pigs, black eyes are dominant to red eyes. A male guinea pig that is heterozygous for both traits is crossed with a female that is long haired and red eyed. What are the expected phenotypes of their offspring? Provide the phenotypic ratio as well.

7. In a certain cactus, prickly spines can be two pronged or one pronged. If a true breeding one-pronged cactus is crossed with a true breeding two-pronged cactus, the F1 generation has a mixture of spines, some are two-pronged, some are one-pronged. Is this incomplete or codominance? Explain your answer.

8. Cross two of the F1 generation cacti from the question above. What phenotypes will you see? Provide the phenotypic ratio.

9. In some flowers, a red flower will provide all pink flowers when crossed with a white flower. RR(red) x rr(white) = Rr (pink). If flower position is inherited using typical Mendelian genetics, what will be the phenotypes created by crossing axial, red flowers with terminal white?

Multiple Alleles:

10. A man with blood type A marries a woman with blood type A, and their first child has blood type O. What are the genotypes of both parents and the child?

11. A man with type A blood is married to a woman with type O blood. What are ALL of the possible blood types of their children?

12. A man whose father is blood type B and mother is blood type A has blood type A. He marries a type A woman whose parents have the same blood types as his parents. What are the genotypes of the man and the woman? What is the probability they will have a child with blood type A?

Probability Practice:

13. What is the probability that each of the following parents would produce the provided offspring (assume independent assortment)?
    a. AABBCC x aabbcc = AaBbCc
    b. AABbCc x AaBbCc = AabbCC
    c. AaBbCc x AaBbCc = AaBbCc
    d. AaBbCC x AABbcc = AaBbCc

14. The genotype of two individuals in a tetrahybrid cross is AaBbCcDd. What is the probability the offspring would have the following genotypes assuming independent assortment?
    a. aabbccdd
    b. AaBbCcDd
    c. AabbCCdd
    d. AABbCCdd

15. Pea flowers may be purple or white & the seeds may be round or wrinkled. What is the probability of the offspring from the cross WwRr x WwRr will have white flowers & wrinkled seeds?

16. In tigers, a recessive allele causes an absence of fur pigmentation and a cross-eye condition. If two phenotypically normal tigers that are heterozygous mate, what percent of their offspring will be cross-eyed? What percent will be white?

Polygenic Inheritance:

17. In snarlymonsters, the number of teeth is polygenic. The recessive condition (aabbcc) results in a toothless snarlymonster, and the dominant condition (AABBCC) results in a snarlymonster with 6 teeth. There are 5 other possible variations. How many teeth would a AaBbCc snarlymonster have?