Honors Biology Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Mr. Stone

**Chapter 11 Genetics Problem Set**

*Directions: Show work for every single question. NO WORK = NO CREDIT. You may work together on these questions, but copying is prohibited. Many of these questions ask you for multiple pieces of information. If you do not include all of the required answers you will not receive full credit. Draw a box around your answers, or highlight them with a highlighter.*

1. Green pods (*G*) are dominant to yellow pods (*g*). Draw a Punnett square to cross a homozygous (true breeding) green pod pea plant with a homozygous (true breeding) yellow pod plant (this is the P generation). Write the genotype ratio, the phenotype ratio, and the proportion of offspring as a %. These offspring are known as F1.
2. Draw a Punnett square for a cross of the F1 pea plants with each other. Write the genotype ratio, the phenotype ratio, and the proportion of offspring as a %. These offspring are known as F2.
3. Mendel isn't sure if a green pod pea plant is homozygous or heterozygous, and wants to perform a test cross. Draw a Punnett square for a cross of a homozygous green pod pea plant with a yellow pod pea plant. Write the genotype ratio, the phenotype ratio, and the proportion of offspring as a %.
4. Now draw a Punnett square for a cross of a heterozygous green pod pea plant with a yellow pod pea plant. Write the genotype ratio, the phenotype ratio, and the proportion of offspring as a %. How do the results of this cross compare with #3 above?
5. Brown hair (*B*) is dominant to blond hair (*b*). Brown eyes (*R*) is dominant to blue eyes (*r*). Consider a blond haired, blue eyed father and a heterozygous brown haired, homozygous brown eyed mother. What is the % chance that their child will have brown hair and brown eyes? What is the % chance that two children in a row will have brown hair and brown eyes?
6. In a breeding experiment with pea plants, a tall (*T*) yellow pod (*g*) pea plant was crossed with a short (*t*) green pod (*G*) pea plant. All of the offspring were tall with green pods. What were the genotypes of the parents?
7. 1. *P1* is an allele for a small nose, and *P2* is an allele for a large nose. These two alleles exhibit incomplete dominance*; P1P2* genotype corresponds to a medium nose phenotype. In a *P1P2* × *P1P2* cross, what are the genotype ratios, the phenotype ratios, and the % chances for a small, medium, or large nose. Show your work for credit.
8. Hair color is a polygenic trait. Use the following to answer question #2:

|  |  |  |
| --- | --- | --- |
| *AABB* = Black | *AaBB* = Dark Brown | *AaBB* = Blond |
| *AABb* = Black | *AaBb* = Light Brown | *AaBb* = Blond |
| *Aabb* = Red | *Aabb* = Blond | *Aabb* = White (albino) |

Mr. Jones has Black hair and is heterozygous for the B allele. Mrs. Jones has light brown hair. Surprisingly, their new baby has red hair. Mr. Jones is the jealous type and is having a fit because he suspects infidelity. Are his suspicions justified or did he not pay attention during his high school biology class?

1. Mendel mates two pea plants. He counts the following offspring:

Tall: 987

Short: 337

What were the genotypes of the parents?

1. Mendel mates two pea plants. He counts the following offspring:

Tall & green pods: 494

Tall & yellow pods: 497

Short & green pods: 162

Short & yellow pods: 167

What were the genotypes of the parents?

1. In a *AABbcc* × *aaBBCc* cross, what is the probability of *AabbCc*? Of *AaBbCc*? Of *AaBBcc*?
2. On which chromosome are A and B more linked? How does gene linkage change the results of breeding experiments?

Chromosome #1: ------A------------o------------B-------

Chromosome #2: ------A---B-------o---------------------

Challenge Questions (yes, they are required, you are an Honors Biology student!)

1. In guinea pigs, the allele for black fur (*B*) is dominant over the allele for brown (*b*) fur. A black guinea pig is crossed with a brown guinea pig, producing five F1 black guinea pigs and six F1 brown pigs.
2. How many copies of the black allele (*B*) will be present in each cell from an F1 black guinea pig at the following stages: G1, G2, metaphase of mitosis, metaphase I of meiosis, metaphase II of meiosis, and after the second cytokinesis following meiosis? Assume that no crossing over takes place.
3. How many copies of the brown allele (*b*) will be present in each cell from an F1 brown guinea pig at the same stages as those listed in part *a*? Assume that no crossing over takes place.
4. Alleles *A* and *a* are at a locus that is located on the same chromosome as is a locus with alleles *B* and *b*. *Aa Bb* is crossed with *aa bb* and the following progeny are produced:

|  |  |
| --- | --- |
| *Aa Bb* | 5 |
| *Aa bb* | 45 |
| *aa Bb* | 45 |
| *aa bb* | 5 |

What conclusion can be made about the arrangement of the genes on the chromosome in the *Aa Bb* parent?