**Biology 180 Practice Exam 1 Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Spring 2015**

**Question 1 2 points**

A pea plant has the genotype hhGgDDRr. What are the genotypes of the gametes produced by this individual, and what is the frequency each?

Sample answer:

25% (or 0.25 or ¼) hGDR

25% hGDr

25% hgDR

25% hgDr

Rubric:

2pts (full credit): All four genotypes and frequencies must be correct.

1pt (partial credit): Two or three of the genotypes and frequencies are correct.

0pt (no credit): Zero or one of the genotypes and frequencies are correct.

**Question 2 2 points**

In cells that are triploid (3*n*), mitosis can occur normally, but meiosis cannot. Explain why.

Sample answer:

In mitosis, individual chromosomes line up during metaphase, and a sister chromatid goes to each daughter cell. Thus, both daughter cells end up with the same set of chromosomes as the original cell regardless of ploidy. In meiosis I, homologous chromosomes pair and line up during metaphase, and a homolog of each pair goes to each daughter cell. Because a triploid has three homologs of each type of chromosome, one is left unpaired, and randomly ends up in one of the daughter cells. As a result, the daughter cells of meiosis I don't get the correct number of chromosomes.

Rubric:

For full credit (2 points), the answer must 1) directly draw the key contrast between chromosomes lining up individually in mitosis versus as homologous pairs in meiosis, AND 2) make the connection to the consequences—recognize that each daughter will get a normal set of chromosomes in mitosis but an abnormal set in meiosis.

Give partial credit (1 point) if the answer provides one of the two points listed in the full credit answer.

Give no credit (0 points) if the answer is missing both points listed in the full credit answer.

**Question 3 2 points**

Female Australian jack jumper ants have 2*n* = 2 chromosomes. A female has the genotype Ab//aB, and produces the following gamete genotypes:

13% *AB*

13% *ab*

37% *Ab*

37% *aB*

Describe the location of the A and B genes in the females genome (be as specific as possible). What physical mechanism produced the pattern that allowed you to determine the location of the genes?

Sample answer:

The A and B genes are on the same chromosome, and are 26cM apart. The physical mechanism is crossing over (or recombination).

Rubric:

1pt for the genes being 26cM apart, and 1pt for crossing over (or recombination).

**Question 4 2 points**

You have a pea plant with round and yellow seeds. Your friend has a pea plant with a known genotype of rryy (it has wrinkled and green seeds). You cross your plant with your friend's plant and the progeny have the following phenotypes:

½ round-yellow, ½ wrinkled-yellow

What is the genotype of your plant? What fraction of the progeny have the same genotype?

Allele notation: R = round (dominant) and r = wrinkled (recessive); Y = yellow (dominant) and y = green (recessive)

Sample answer:

My pea plant's genotype is RrYY. None of the progeny has this genotype.

Rubric:

1pt for the correct genotype (RrYY), and 1pt for correctly stating that none of the progeny has this genotype.