Honors Chemistry Hour\_\_\_\_\_ Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Wexler/Fennelly  
Brassica Genetics: Anthocyaninless Mutation  
Date: 1/31/17

**Brassica** is a genus of plants in the mustard family, the (Brassicaceae). The members of the genus are informally known as cruciferous vegetables, cabbages, or mustard plants. Crops from this genus are sometimes called cole crops—derived from the Latin caulis, denoting the stem or stalk of a plant.

**Anthocyanin** is a purple pigment found in many plants, including Brassica, otherwise known as Wisconsin Fast Plants™. Anthocyanin is best observed when the plants are 4-7 days old. Look on the stems and hypocotyls, under the cotyledons, and at the leaf tips.

A single gene, the anthocyaninless gene (anl), in Brassica regulates whether or not anthocyanin will be expressed. In the homozygous, recessive form (anl/anl), anthocyanin expression is completely

suppressed, and the plants appear a bright green color (which is the “non-purple stem” phenotype). If the genotype is anl/ANL or ANL/ANL, then anthocyanin is expressed at varying levels and the plants are the “purple stem” phenotype. The genotype of the wild type is ANL/ANL.

This activity will allow students to determine if the anl mutation is dominant or recessive according to its pattern of inheritance. If the mutant phenotype disappears in the F1 generation, then we predict that the mutant allele is recessive.

Furthermore, when F1 plants are crossed the mutant phenotype should re-emerge in the F2 if the mutation is indeed recessive. The ratios of the dominant and recessive phenotypes are also predictable. After predicting ratios of offspring phenotypes in the F1 and F2 generations, students will gather data and attempt to match the data to their predictions.

Predictions:

1. Assuming that the anthocyaninless gene mutation is recessive causing a loss of the ability to make pigment, what is the diploid genotype of the pure breeding parent (P1) with the mutant non-purple stem phenotype?
2. What is the diploid genotype of the pure breeding parent (P2) with the wild type purple stem phenotype?
3. If the anthocyaninless gene is recessive, show the F1 genotype and phenotype ratios of a cross between pure breeding parental strains P1 (non-purple stem) and P2 (purple stem). Use a Punnett Square to illustrate the cross.
4. Show the F2 genotype and phenotype ratios of a cross between F1 hybrid progeny. Use a Punnett Square to illustrate the cross.

Class Results:

1. P1 Non-Purple Stem

# purple # non-purple Total counted Phenotype Ratio

\_\_\_\_\_ purple: \_\_\_\_\_ nonpurple

Is this parent wild type or mutant?

1. P1 Purple Stem

# purple # non-purple Total counted Phenotype Ratio

\_\_\_\_\_ purple: \_\_\_\_\_ nonpurple

Is this parent wild type or mutant?

1. F1 Offspring

# purple # non-purple Total counted Phenotype Ratio

\_\_\_\_\_ purple: \_\_\_\_\_ nonpurple

Which phenotype was dominant?

Which phenotype disappeared and must therefore be recessive?

1. F2 Offspring

# purple # non-purple Total counted Phenotype Ratio

\_\_\_\_\_ purple: \_\_\_\_\_ nonpurple

Did the recessive phenotype re-emerge in the second generation?

If so, what was the ratio of wild type to recessive phenotypes?

Was this close to what you predicted in question 4 in the Predictions section?