

## Study Guide: Lecture 1

1. What does “GMO” stand for and what does it mean?
2. What is the meaning of a formula such as  $2n = 2x = 18$ ?
  - a. How many chromosomes are there in a pollen grain of a plant with this formula?
  - b. How many chromosomes are there in a leaf cell of a plant with this formula?
  - c. What ploidy level is a plant with this formula?
3. Explain the meaning of “genome size”, and the units sizes used to describe genome sizes.
4. Is a 758 Mb genome size a huge, average, or small genome size for a diploid plant?
5. What is “gene flow” and does it only occur with transgenic plants?
6. Why are there fewer rows of “males” than “females” needed in hybrid seed production?
7. How can an allele at a locus be the absence of a gene?
8. Explain how the inheritance of a transgene follows Mendelian rules.
9. In 20 words or less, what is CRISPR-CAS 9 genome editing?
10. What would be needed to a Roundup Ready sugar beet using CRISPR-CAS 9 genome editing?

### Definitions:

Genome, chromosome, locus, allele, gene, dominant, recessive, homozygous, heterozygous, self-pollination (selfing), cross pollination, GMO, RNAi, CRISPR-CAS 9, F1,F2, (etc).,  $2n, 1n$

### Online research and short responses:

1. The following links will take you to descriptions of some new(er) plant varieties. After reviewing this material, answer the questions A – E.

**Genuity corn:**<http://www.genuity.com/research/Pages/Genuity-SmartStax-RIB-Complete.aspx>

**Arctic Apple:** [http://www.arcticapples.com/how-did-we-make-nonbrowning-apple/#.UIGtvm\\_A\\_ng](http://www.arcticapples.com/how-did-we-make-nonbrowning-apple/#.UIGtvm_A_ng)

**Innate potato:**<http://www.simplotplantsciences.com/index.php/about/the-science>

- A. Which of the following methods best describes how each of the varieties was developed?
  - a. Transgenic technology involving transfer of a gene (or genes) between sexually incompatible organisms
  - b. RNAi
  - c. CRISPR-CAS 9
  - d. “Conventional” crossing
- B. What traits are involved in the trait(s) that make each of the varieties unique?
- C. What was the source of the “engineered” gene(s) for each of the varieties?
- D. If the “engineered?” gene was from another organism, what was its role in the original host?
- E. If the target gene was not from another organism, what was the function of the wild type allele in the native host?

2. CRISPR-CAS9 is a breakthrough in genetics.
  - A. Watch the Ted Talk from Dr. Doudna, an inventor of harnessing the phenomenon for genetic manipulation: <https://www.youtube.com/watch?v=TdBAHexVYzc>
  - B. What is the function of the “naturally occurring” CRISPER-CAS9 system?
  - C. What would you need to know, have, and do in order to use CRISPER-CAS9 to alter the function of a gene in your favorite plant?