Name _____- Date _____

Diagram: Mendelian Genetics

Chapter 3-1: Mendelian Genetics

The principles of genetics were established in the 1860s by Gregor Mendel. Mendel's two main principles describe how genes pass through generations, and we will describe the fundamentals of these principles in this plate.

This is the first of several plates that cover the science of genetics. Here, we will discuss Gregor Mendel's seminal experiments on pea plants. We will introduce some of the terminology of genetics and see how Mendel arrived at two essential principles of this discipline of biology.

Gregor Mendel performed a series of experiments using the common garden pea plant. Pea plants were readily available to Mendel, were fairly easy to grow, and other scientists had studied their breeding behaviors.

Mendel began by studying two types of seeds (peas); **yellow seeds (A)** and **green seeds (B)**. When he planted a yellow seed, it grew into a **yellow-seeded pea plant (C)**, and when he planted a green seed, it developed into a **green-seeded pea plant (D)**. The first generation of yellow-seeded and green-seeded plants is called the parent generation, or P_1 generation.

At this point, Mendel had two types of pea plants, one that produced yellow seeds (peas), and one that produced green seeds. Continue your reading below as you color the plate.

In the next experiment Mendel performed, he bred, or "crossed" a yellow-seeded plant and a green-seeded plant. This type of cross is called a monohybrid cross. In a monohybrid cross, the parent plants differ by only a single trait; in this case, that trait is seed color.

The offspring of the parental generation is referred to as the **F_1 generation (E)**; you can see our F_1 generation in the middle drawing. We will call the plant the **F_1 generation plant (F)**. All of the F_1 generation plant's seeds were yellow, which meant that the green trait had somehow been hidden. You should color the peas in the F_1 generation plant yellow (A).

Mendel deduced that, since the seeds in the F_1 generation were not a blend of the colors of the two parents, and since all of the seeds were yellow, the yellow trait was the apparent, or dominant trait, and the green trait was hidden, or recessive. At this point, Mendel was not sure whether the factor that produced the green trait had disappeared completely.

Mendel's F_1 generation plants all had yellow seeds. He assumed that yellowness dominated over greenness. To determine what had happened, Mendel proceeded as explained below. Continue your coloring as you continue to read about his experiments.

In his next experiment, Mendel permitted the pea plants from the F_1 generation to interbreed; the result was an **F_2 generation (G)**. The bracket that outlines this generation should be colored. Mendel observed something startling in the **F_2 generation plant (H)**: most of the seeds (peas) were yellow (A), but a small number were green (B). The green trait had reappeared!

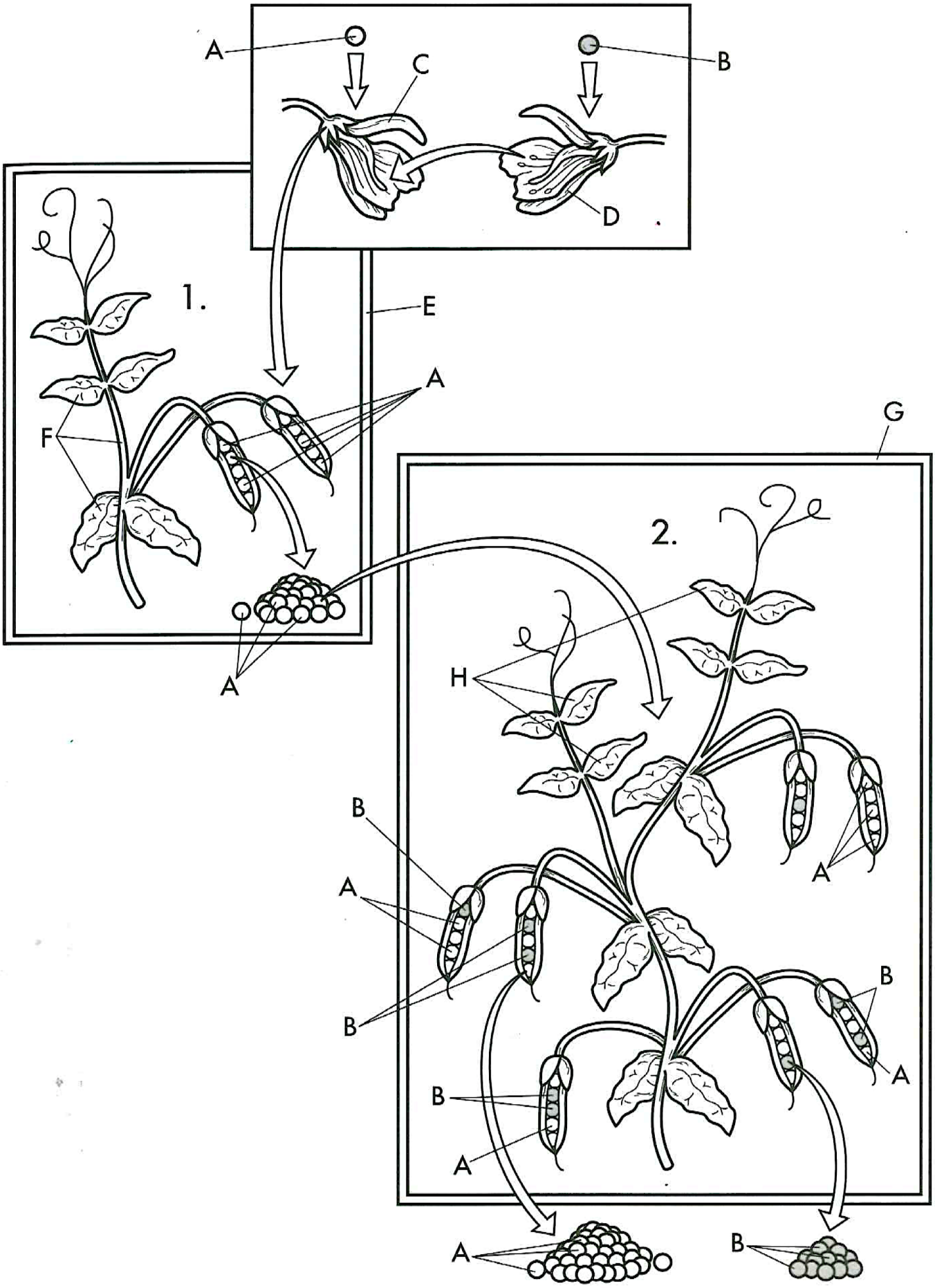
Mendel took a careful count of the number of yellow and green peas in the F_2 generation plant and discovered that about three-quarters of the seeds were yellow, while about one-quarter were green. In other words, there was a color ratio of 3:1, yellow to green.

From hundreds of experiments like these, Mendel concluded that each hereditary trait is determined by two factors, which we now call genes. Mendel suggested that each parent contributed one gene for a trait. These alternative forms of genes are called alleles, so there are two alleles of each gene. If the two alleles are the same, the individual is said to be homozygous for a trait, and if the individual has two different alleles, then the individual is said to be heterozygous for a trait, or hybrid.

Mendel further proposed in his first law (the law of segregation) that alleles separate, or segregate, during the formation of sperm and egg cells in plants and animals. He also determined that each pair of alleles separates independently of other pairs of alleles. This second law of Mendel's is called the law of independent assortment.

Mendelian Genetics

- ○ Yellow Seed.....A
- ○ Green Seed .....B
- ○ Yellow-seeded Pea Plant C
- ○ Green-seeded Pea Plant.....D
- ○ F_1 Generation.....E
- ○ F_1 Generation Plant....F
- ○ F_2 Generation.....G
- ○ F_2 Generation Plant....H


A
B
C
D
E
1.
F
A
A
G
2.
H
A
B
A
B
B
A
B
A
A
B