SYNTHESIZE THE UNIT

In your Evidence Notebook, make a concept map, graphic organizer, or outline using the Study Guides you made for each lesson in this unit. Be sure to use evidence to support your claims.

When synthesizing individual information, remember to follow these general steps:

- Find the central idea of each piece of information.
- Think about the relationships between the central ideas.
- Combine the ideas to come up with a new understanding.

DRIVING QUESTIONS

Look back to the Driving Questions from the opening section of this unit. In your Evidence Notebook, review and revise your previous answers to those questions. Use the evidence you gathered and other observations you made throughout the unit to support your claims.

PRACTICE AND REVIEW

1. What processes that occur during meiosis contribute to genetic diversity in offspring? Select all correct answers.

a. crossing over
b. cytokinesis
c. gametogenesis
d. independent assortment

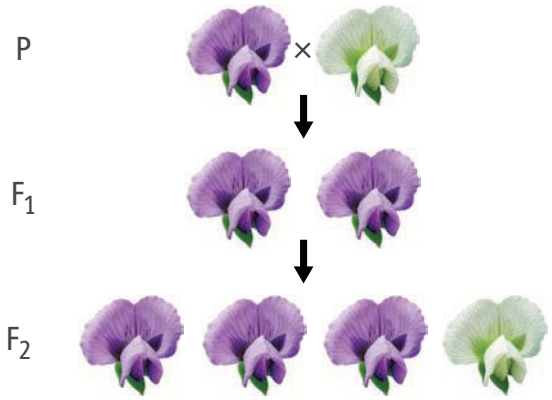
2. If meiosis produces four daughter cells, why does gametogenesis in females produce only a single egg cell?

a. Egg cells contain four times the amount of DNA as sperm gamete cells.
b. Egg cells in females are not produced via meiosis.
c. Gametogenesis involves steps in addition to meiosis, in which a single egg cell is retained.
d. The process of meiosis does not fully complete when producing an egg cell.

3. The human genome contains roughly 1,000 olfactory receptor genes, which allow us to detect and distinguish different odors. While only about one-third of these genes are functional, all of the genes may have arisen as duplications of a single ancestral gene. Put these steps in order to illustrate how this process could have occurred.

a. mutations accumulate over time in the duplicate copy of the gene
b. chromosomes exchange uneven amounts of DNA
c. the duplicate gene encodes a protein with a slightly different function
d. homologous chromosomes line up in the middle of the cell during meiosis
e. a chromosome obtains multiple copies of the same gene

FIGURE 4: A purebred purple and purebred white flower were crossed. The F_1 generation self-pollinated, resulting in the F_2 generation.



4. Examine the image shown in Figure 4 representing the cross of purebred plants and the self-pollination of the F_1 generation. Use these terms below to complete the statement explaining why some plants in the F_2 generation display white flowers.

dominant, *recessive*, *heterozygous*, *homozygous*

The F_1 plants are ____, with one ____ allele coding for white flowers. The plants in the F_2 generation with white flowers are ____, with two alleles for white flowers. The plants in the F_2 generation with purple flowers may have one or two copies of the purple flower allele, because it is ____ and masks the white trait.

5. Imagine that a species of mouse has a gene controlling fur color, with the dominant allele associated with black fur and the recessive allele associated with white fur. A second, epistatic gene also influences fur color in these animals. What can you say about the color of a mouse that is heterozygous for the first fur-color gene?

a. The mouse's fur color will be black.

b. The mouse's fur color will be white.

c. The mouse's fur color will be gray, or a mix of black and white.

d. The mouse's fur color cannot be determined without knowing the genotype of the epistatic gene

Use the information below to answer Questions 6–8.

The trait for red coloring (*R*) is dominant to the trait for white coloring (*r*) in birds. Image two heterozygous birds were crossed.

6. Make a Punnett square for the cross between two heterozygous birds.

7. What is the probability that the offspring of this cross will have red coloring?

8. What precentage of possible offspring will have *RR*, *Rr*, or *rr* genotypes?

9. In what ways can a recessive X-linked disease such as red-green color blindness be inherited by male offspring?

a. From the father, but only if the father has the colorblind phenotype.

b. From the father, even if the father is unaffected.

c. From the mother, but only if the mother has the colorblind phenotype.

d. From the mother, even if the mother is unaffected.

10. Would you expect a mutation that deletes one base in a protein-coding region of DNA to be more or less harmful than a mutation that deletes three bases in a coding region? Explain your answer.

11. Imagine that a pea plant develops a somatic cell, or body cell, mutation that allows the plant to grow twice as tall as other pea plants. What will be true of the plant's offspring?

a. All offspring will be taller than other plants.

b. Some offspring will be taller than other plants.

c. Some offspring may be taller, but only if the plant self-pollinates.

d. None of the offspring are likely to be taller than other plants.

12. The polymerase chain reaction, or PCR, allows scientists to amplify target regions of genetic material for further study. What are some of the possible applications of PCR? Select all correct answers.

a. Amplify the sequence of a gene from a human blood sample to determine if a mutation is present.

b. Amplify a protein sequence from a salamander egg to inject into another egg.

c. Amplify a DNA region from a herbicide-resistant plant to insert into the DNA of another plant species.

d. Amplify a region of human DNA to insert into a bacterial plasmid.

UNIT PROJECT

Return to your unit project. Prepare your research and materials into a presentation to share with the class. In your final presentation, include an evaluation of your predictions, analysis, and conclusions.

Remember these tips while evaluating:

- Look at the empirical evidence—evidence based on observations and data. Does the evidence support your explanation of the cause or causes of progeria?
- Consider if the explanation is logical. Does it contradict any evidence you have seen?
- Is there enough evidence from credible sources to support your conclusions?