CRACK THE CODE

TEACHER GUIDE

LAUNCH

PLANNING

Here's a suggested schedule for this kit! The activities should be completed in order, but you can choose when the lessons take place over time.

ACTIVITY INFORMATION	SECTION (S)	TIME REQUIRED	DAY/ LESSON
ACTIVITY 1: THE UNKNOWN Elizabeth and members of her family have an unknown disease. Can you figure it out? **Total time: 30 min**	☐ Medical Mystery	30 minutes	Day 1
ACTIVITY 2: BACK IN TIME Learn about the history of genetics. **Total time: 2 h 45 min**	☐ Monk Life	60 minutes	Day 2
	☐ Foundational Findings and Fruit Flies	45 minutes	Day 3
	☐ Visualizing Chromosomes	60 minutes	Day 4
ACTIVITY 3: SPLITTING UP Make models to understand cell replication. **Total time: 3 h**	☐ Like Mot[illegible]		Day 5
ACTIVITY 4: WHAT MAKES YO[illegible]			

15+ hours

Law #2: Law of Segregation

• In this sub-section, your student will learn about the law of segregation.

THINK ABOUT IT!

Question 1: What are the genotypes and phenotypes for each parent?

Answer: • Mom: Dd
• Dad: dd

How to Help:

• Students are informed that Elizabeth's mom is heterozygous dominant, which means that she had one dominant and one recessive gene.

• Students are informed that Elizabeth's dad is homozygous recessive, which means that he has two recessive genes.

Question 2: Create a Punnett square for gene combinations offspring from Elizabeth's parents could have.

Answer:

	d	d
D	Dd	Dd
d	dd	dd

Question 3: What is Elizabeth's genotype? Is she heterozygous or homozygous?

Answer: Her genotype is Dd, which is heterozygous dominant.

How to Help: *If your student is confused as to why Elizabeth couldn't be dd, remind them that she expresses the trait, like her mother.*

Law #3: Law of Independent Assortment

• In this subsection, your student will learn about the law of independent assortment.

• It can be helpful to pose questions for your student about their own family and traits expressed. They can use this information to determine the likelihood they would have been born with a different trait.

3

FOUNDATIONAL FINDINGS AND FRUIT FLIES

Foundation of Genetics

• In this sub-section, your student will learn the following vocabulary terms: allele, chromatid, chromosome, chromosome theory of inheritance, and loci.

• Your student will also learn about a foundational theory in genetics (chromosome theory of inheritance). Often, understanding what a theory is can be confusing because the common use of theory indicates a guess or hunch without evidence. However, in science, a theory is a well-tested explanation for something found or seen in the natural world.

4

Fruit Flies

• In this sub-section, your student will learn the following vocabulary terms: autosomal chromosome, homologous pair, sex chromosome, and sex-linked.

THINK ABOUT IT!

Question 1: You are crossing a white-eyed male (X^wY) fruit fly and a homozygous red-eyed female (X^RX^R). What percentage of offspring will have white eyes? Use a Punnett square to explain

Answer:

	X^R	X^R
X^w	X^RX^w	X^RX^w
Y	X^RY	X^RY

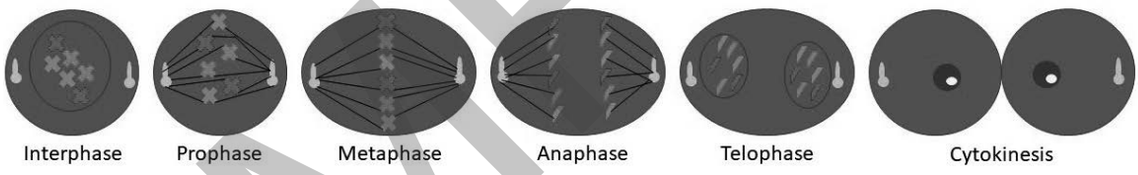
How to Help: *Your student may recognize that some offspring are heterozygous red-eyed (XRXW) and assume that this means 50 % will have white eyes. If they do so, remind them that red eyes are dominant to white eyes.*

Question 3: To produce 6 diploid cells, how many cells underwent mitosis? Explain.
Answer: 3 because each mother cell produces two daughter cells.

Question 4: To produce 6 haploid cells, how many cells underwent meiosis? Explain.
Answer: This is not possible because meiosis produces 4 haploid cells from a single diploid cell.
How to Help:
• Your student may also say that 1.5 cells underwent meiosis. Unfortunately, you can't have half a cell, so this would be incorrect.
• Help your student recognize this is a trick question.

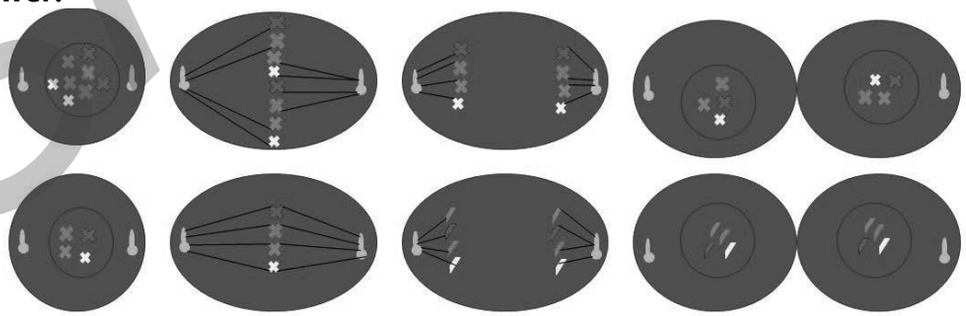
Question 5: Your teacher has been studying a new species of plant and asks you to finish the study. As you read through the notes, you notice that there are 27 chromosomes. Is this the haploid or diploid number? Explain.
Answer: This is the haploid number because diploid numbers are always even.
How to Help: *If your student struggles, encourage them to test it both ways. If it's the haploid number, what would be the diploid number, and if it's the diploid number, what's the haploid number.*

Question 6: Draw the stages of mitosis with 6 homologous chromosomes in prophase.
Answer:



How to Help: *In previous representations, there has always been 4 sets of homologous chromosomes. If your student struggles with the extra set, encourage them to discuss what happens to a single set of chromosomes during each stage of mitosis.*

Question 7: Draw the stages of meiosis with 8 homologous chromosomes in prophase I.
Answer:



How to Help: *In prior representations, there has always been 4 sets of homologous chromosomes. If your student struggles with these additional sets, remind them that the extra sets of chromosomes experience the same division and processes.*

Question 8: Do you think the medical mystery disease from Activity 1 could have been caused during cell division? Why or why not?
Answer: No, because there are not extra or missing chromosomes, but instead a part of chromosome 4 that is causing the disease.

LAUNCH

SCIENCE UNLOCKED

Contact us at: www.homesciencetools.com/customer-service/

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Kit	SU-CTCDNA
Instructions	IN-CTCDNAT
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