

Corn Plant Genetics

Grade Level: 4-8

Lesson Overview

This activity illustrates the role chromosomes have in how genes are inherited from parent to offspring.

Student Objectives

1. Students will state the chemical substance that comprises genes.
2. Students will recognize the role of genes in heredity.
3. Students will distinguish between dominant and recessive genes.
4. Students will demonstrate the pairing of chromosomes and genes through a laboratory procedure

Materials

- ✓ Create a Chromosome worksheet
- ✓ My Corn Plant worksheet – *note there is no answer key for this worksheet, as all will be different*
- ✓ General Genetics worksheet
- ✓ General Genetics answer key
- ✓ Genetics crossword puzzle (optional)
- ✓ Genetics crossword puzzle answer key (optional)
- ✓ Genetics word search (optional)
- ✓ Genetics word search answer key (optional)
- ✓ 4 bags of 2 different colors of paper clips (cut up colored pieces of paper could also be used in place of paper clips)
 - Black and white
 - Green and red
 - Yellow and blue
 - Orange and pink

Vocabulary

- **allele** – variant of a gene controlling the same trait and occupying a specific region on a chromosome.
- **cell** – the basic structural and functional unit of an organism.
- **chromosomes** – threadlike structures that carry a cell's genes; located in the nucleus.

- **DNA** – genetic material found in a cell's nucleus; DNA stands for deoxyribonucleic acid.
- **dominant** – the trait that will be expressed when two different alleles of a gene are present.
- **gene** – a section of DNA that codes for a trait.
- **genotype** – an organism's genetic makeup for a specific trait.
- **heredity** – the passing of traits from parents to young.
- **hybrid** – the offspring of two parents that differ in one or more inherited traits.
- **nucleus** – central structure of the cell; contains the chromosomes.
- **offspring** – the resulting organism of a mating between two parents.
- **phenotype** – an expressed or visible trait; what an organism looks like.
- **recessive** – an allele that produces its characteristic phenotype only when its paired allele is the same.
- **trait** – feature that a living thing can pass on to its offspring.
- **variation** - change in the characteristics that are usual for a species or group.

Background Information

An understanding that chromosomes exist in the nucleus in pairs are composed of genes that must, therefore, also exist in pairs is essential. The genes are composed of a chemical substance called DNA. It is the DNA that is responsible for the expression of a variation of a trait. Paired chromosomes match up gene for gene along their entire length with an identical partner gene. For example, in the same location on both chromosomes are genes responsible for the trait of seed shape in corn plants. The DNA that makes up these genes may vary. Therefore, one gene may express wrinkled seed shape variation while the other may express smooth seed shape variation.

Procedure

1. Have each student blindly choose two paperclips from each bag. Students may end up with two paperclips of the same color, or two different colors from each bag. Every student should have eight total paperclips.
2. Once the paperclips have been selected, students should hook them together so that one clip for each trait is a member of the paper clip chain. Make sure that the order of the paper clips in both chains follows the order of the traits listed

(black or white first; green or red second; yellow or blue third; and orange or pink last).

3. Each student should sketch their paperclip chains on the Create a Chromosome worksheet in the top left box labeled “Original Pair,” and label each clip with its color.
4. Once the sketches are complete, students should identify the genotypes and phenotypes for this pair of chains in the bottom left box of the “original pair” column.
5. After all students have identified their original genotypes and phenotypes, each student should trade one of their paperclip chains with another student.
6. Students should line up the new pair of paper clip chains and sketch them in the top right box labeled “New Pair,” and label each clip with its color.
7. After the new chains are sketched, students should identify the genotype and phenotype of the new chains in the bottom right box of the “new pair” column.
8. Students should complete My Corn Plants worksheet and General Genetics worksheet. The provided word search and cross word puzzle are optional.

Extension Activities

1. Challenge students to find out how many genes and chromosomes are in the corn genome, then compare the number of genes affected when corn is altered via traditional breeding vs. genetic engineering? Find out whether corn and humans share any genes?
2. DNA: Expressions in Agriculture <https://aqclassroom.org/matrix/lesson/381/>
3. Applying Heredity Concepts <https://aqclassroom.org/matrix/lesson/331/>
4. Inherited Traits in the Living Corn Necklace (Grades 6-8) <https://aqclassroom.org/matrix/lesson/543/>
5. Peas in a Pod <https://aqclassroom.org/matrix/lesson/130/>

Additional Resources

- *Gregor Mendel: The Friar Who Grew Peas* by Cheryl Bardoe ISBN: 978-1419718403
- *Farmer George Plants a Nation* by Peggy Thomas ISBN: 978-1620910290
- *Thomas Jefferson Grows a Nation* by Peggy Thomas ISBN: 978-1620916285

- *George Washington Carver for Kids: His Life and Discoveries, with 21 Activities* by Peggy Thomas ISBN: 978-0915864003
- <http://www.agintheclassroom.org/TeacherResources/TeacherResources.shtml>
Illinois Agriculture in the Classroom interactive Corn Ag Mag & Reader

Standards

Illinois Science Standard

MS-LS3-2. Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.

Illinois English Language Arts Standard

RST1 Cite specific textual evidence to support analysis of science and technical texts.

The **M**ultidisciplinary **A**gricultural Integrated Curriculum (mAGic) was created in 2004 under the leadership of the Illinois State Board of Education (ISBE) and the Facilitating Coordination in Agricultural Education Project (FCAE). Funding was made available through the FCAE grant budget from the agricultural education line item of the ISBE budget. This revision, as printed, was developed in April 2021.



These mAGic lessons are designed to bring agriculture to life in your classroom. They address the Illinois Learning Standards in math, science, English language arts and social studies.

Plant mAGic project update writers/reviewers: Rhodora Collins – Dekalb County; Suzi Myers – Kane County; Connie Niemann – Montgomery County; Debbie Ruff – Livingston County; Jennifer Waters – Sangamon County; and Dawn Weinberg – Hancock County.

Name _____

Create a Chromosome

Original Pair		New Pair	
Original Strand	Original Strand	Original Strand	Classmate's Strand
Genotype and Phenotype		Genotype and Phenotype	

Trait to Color Identity Chart

Trait	Variation (phenotype)	Symbol (genotype)	Paper Clip Color
height	tall	T	black
	short	t	white
leaf color	green	G	green
	white	g	red
seed color	yellow	Y	yellow
	white	y	blue
seed shape	smooth	S	orange
	wrinkled	s	pink

Name _____

My Corn Plant

1. Which variation does the new corn plant show for height?
2. Which variation does the new corn plant show for leaf color?
3. Which variation does the new corn plant show for seed color?
4. Which variation does the new corn plant show for seed shape?
5. Examine your original pair of paper clip chains. Which one of the variations shows through for height, leaf color, seed color, and seed shape?
6. What are the differences, if any, that appear in the new pairs of paper clips when compared to the old pairs?
7. Which traits are pure in the new corn plant?
8. Which traits are hybrid in the new corn plant?
9. Which dominant genes does your new organism have?
10. Which recessive genes does your new organism have?

Name _____

General Genetics

1. In your paperclip chain, what did the chain represent?
2. What did the individual paper clip represent?
3. What is the term when a variation of a trait is *masked or hidden* by another variation of the same trait?
4. What is the term when a variation of a trait is *masking or hiding* another variation of the same trait?
5. List two of the four traits studied and their variations. Tell which variation is dominant (D) and which is recessive (R) in each trait.

General Genetics ANSWER KEY

1. In your paperclip chain, what did the chain represent?

chromosome

2. What did the individual paper clip represent?

gene

3. What is the term when a variation of a trait is *masked or hidden* by another variation of the same trait?

recessive

4. What is the term when a variation of a trait is *masking or hiding* another variation of the same trait?

dominant

5. List two of the four traits studied and their variations. Tell which variation is dominant (D) and which is recessive (R) in each trait.

height – tall (D) or short (R)

leaf color – green (D) or white (R)

seed color – yellow (D) or white (R)

seed shape – smooth (D) or wrinkled (R)

Name _____

Genetics Word Search

Find the genetics terms in the letter grid below. Terms may be oriented vertically, horizontally, or diagonally.

W S J Y A X I C E L L X Y O E T I J R V
Z M G Z W K P Y X F I D O K O L G R A F
T I Q L T R A I T O I D V G E N E M R A
M S Y C B M Y O N F L B Y P I B X D H H
J W T V R A I G H L Q W Y R E Z C C B S
A H E R E D I T Y Z J T P V J F F K U I
L U P X I C O O L C O S A N L Q R E A S
C O Z S C H U Q V N F V A L L E L E B V
O R H T T R K D E F M Y A U D C B A N X
M Z Y N C O E H O A U M A R U F R Z A I
V Z B A G M P C Q M Q D T N I M L B A S
B Y R N U O X U E P I J V F A A N R U O
U Q I S M S D D Q S T N W E B B T Y A N
S Z D U P O T O T T S P A S Y F Y I O U
M K X Q Q M C K L A C I O N U N C F O T
B N F N S E F Z N W Y L V Q T N P H Q N
O C T C F S B D L X F C G E N O T Y P E
J Z G I S T Q I G A I S H X X L F M B R
M E F N Z C U O L G F K I P U T D B I T
W V G P O B N L X L K X Q L U X F J C P

allele

DNA

genotype

nucleus

recessive

cell

dominant

heredity

offspring

trait

chromosomes

gene

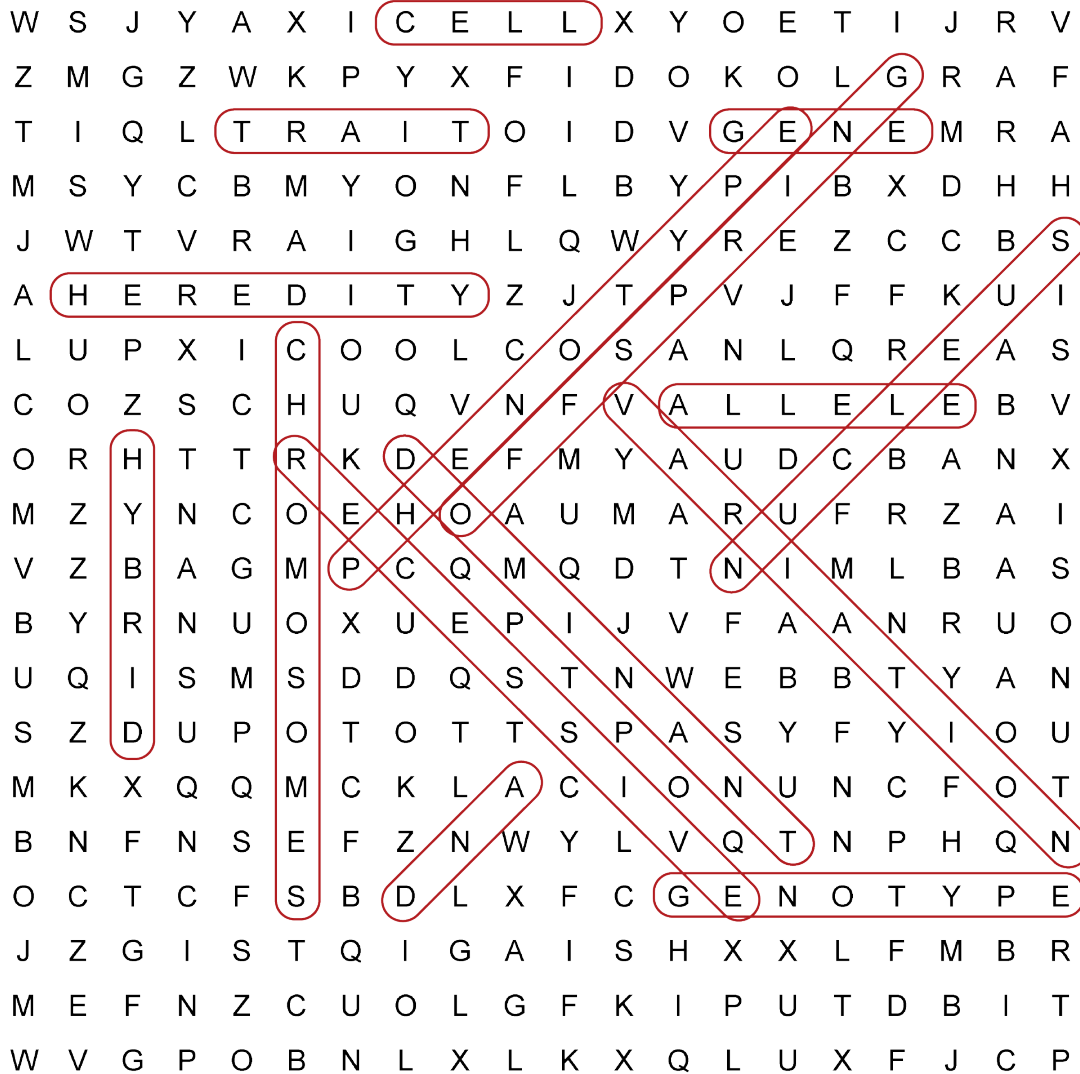
hybrid

phenotype

variation

Genetics Word Search ANSWER KEY

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allele

DNA

genotype

nucleus

recessive

cell

dominant

heredity

offspring

trait

chromosomes

gene

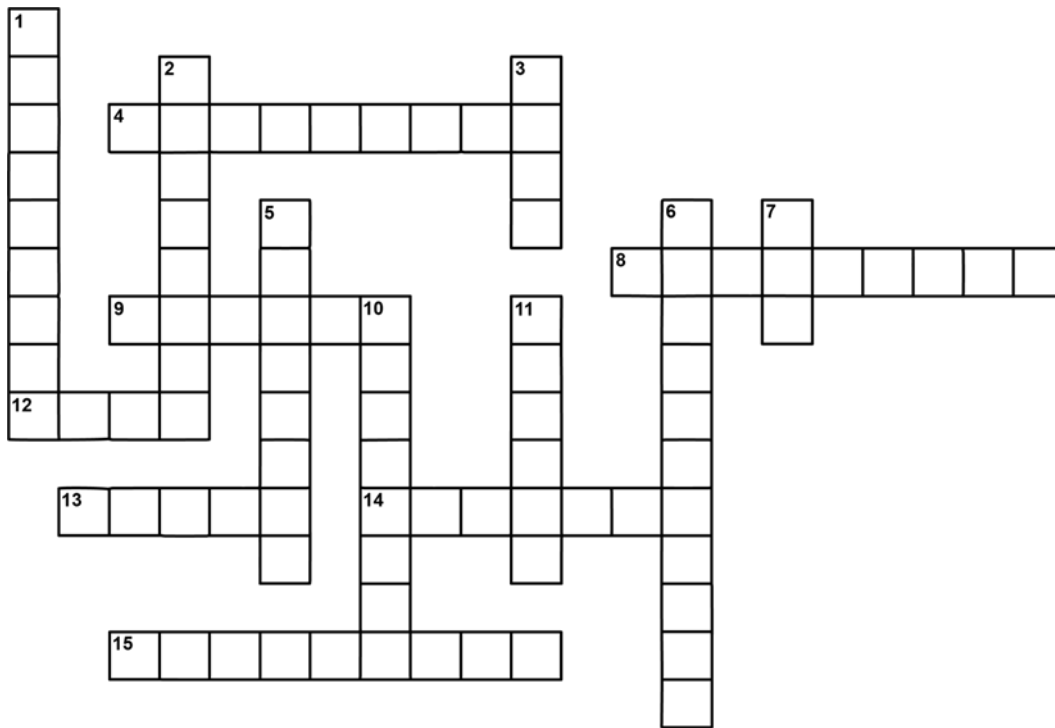
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phenotype

variation

Name _____

Key Genetics Terms Crossword Puzzle



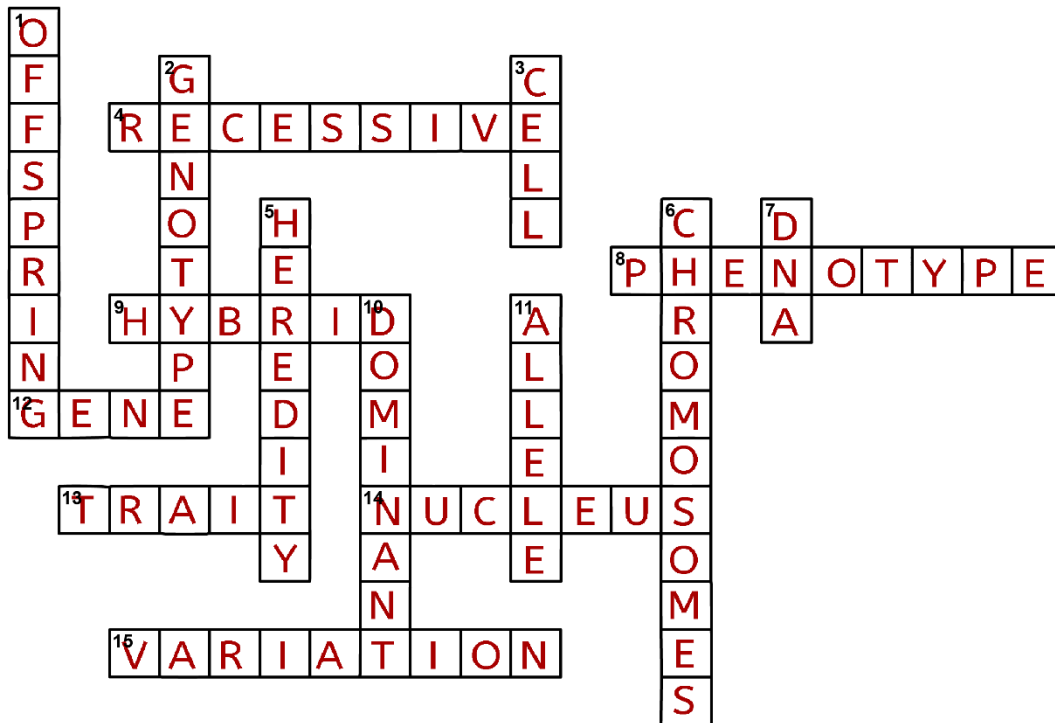
Across

4. An allele that produces its characteristic phenotype only when its paired allele is the same
8. An expressed or visible trait; what an organism looks like
9. The offspring of two parents that differ in one or more inherited traits
12. A section of DNA that codes for a trait
13. Feature that a living thing can pass on to its offspring
14. Central structure of the cell; contains the chromosomes
15. Change in the characteristics that are typical for a species or group

Down

1. Organism resulting from the mating of two parents
2. An organism's genetic makeup for a specific trait
3. The basic structural and functional unit of an organism
5. The passing of traits from parents to young
6. Threadlike structures that carry a cell's genes; located in the nucleus
7. Genetic material found in a cell's nucleus; stands for deoxyribonucleic acid
10. The trait that will be expressed when two different alleles of a gene are present
11. Variant of a gene controlling the same trait and occupying a specific region on a chromosome

Key Genetics Terms Crossword Puzzle ANSWER KEY



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