

## What are chromosomes?

“Mary has her mother’s eyes.” “Tom is built just like his father.” How often have you heard remarks like these?

All people resemble their parents in some ways. They have similar traits. ...And it is no accident. Many traits are passed on from parents to offspring. We say they are inherited. How are they inherited? The answer is found in the cell nucleus.

Each kind of organism has a specific number of chromosomes. For example, every body cell of a fruit fly has 8 chromosomes (4 pairs); a human has 46 (23 pairs); a garden pea has 14 (7 pairs).

Along each chromosome there are many dark bands. Each band is a small part of a chromosome called a gene. There are many, many genes, at least one million in every nucleus. Genes determine the traits of an organism.

There are genes for height, genes for nose size and shape, genes for the color of hair, skin, and eyes. In fact, there are genes for most traits any individual has. Some genes even affect traits like voice, intelligence and behavior. Genes also control the life processes of your cells.

In both asexual and sexual reproduction, chromosomes (and genes) are passed from parents to offspring. During asexual reproduction, each daughter cell receives chromosomes from a single parent cell. The daughter cell is an exact copy of the parent. Some organisms and the body cells of all organisms reproduce asexually.

During sexual reproduction, an offspring receives chromosomes from each parent cell. The chromosomes in gametes, or sex cells, are not paired. A sperm or an egg cell has only half the number of chromosomes as a body cell. When fertilization takes place, the sperm cell and the egg cell unite. Together, their chromosomes add up to the full number of chromosomes found in body cells. The fertilized egg, or zygote, has chromosomes from both of its parents. It also has traits from both parents.

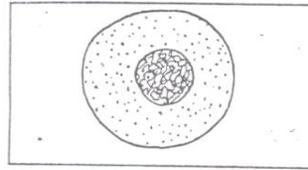


Figure A

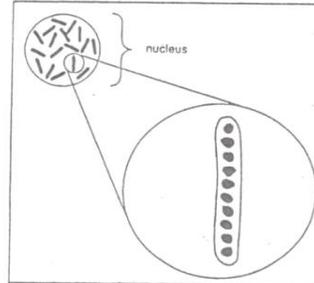


Figure B

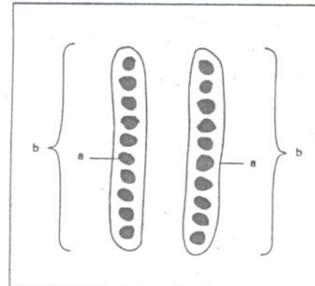


Figure C

Every cell has a nucleus.

1. Figure A shows an animal cell.

a) Draw a line to the nucleus.

b) Label it "nucleus."

Check students' labels.

2. A nucleus contains tiny rod-shaped bodies. What are they called?

3. A chromosome is made up of even smaller bodies. What are they called?

4. Figure C shows a pair of chromosomes and their genes.

a) The chromosomes are labeled \_\_\_\_\_.

b) Two genes are labeled \_\_\_\_\_.

5. Why are genes important? \_\_\_\_\_



Figure D Human chromosomes

Figure D shows what actual human chromosomes look like.

- Every body cell of a particular organism has the same chromosomes.
- No two individuals that reproduce sexually have the same chromosomes.

You have trillions of body cells. Each cell has the same chromosomes. No one else in the world has the same chromosomes. There is no "duplicate" of you—anywhere!

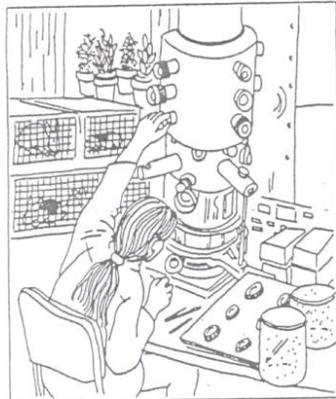


Figure E

The study of traits and how they are passed on is called genetics [juh-NET-iks].

- All living things have traits.
- All living things have genes.
- Only living things have genes.

Genes contain the "plans" for the traits an organism has.

What are genes made of? Scientists have discovered that genes are made of a complicated compound called DNA. DNA stands for deoxyribonucleic [dee-oks-ee-ry-boh-noo-KLEE-ik] acid. Try to pronounce it.

Complete each statement using a term or terms from the list below. Write your Answers in the spaces provided. Some words may be used more than once.

genes	46	specific
pairs	genetics	23
inherited	traits	chromosomes

- The characteristics an individual has are called \_\_\_\_\_.
- Traits are passed down from parents to offspring. Another way of saying this is "traits are \_\_\_\_\_."
- The study of heredity is called \_\_\_\_\_.
- The nucleus has tiny rod-shaped bodies called \_\_\_\_\_.
- A chromosome is made up of a chain of \_\_\_\_\_.
- Genes determine the \_\_\_\_\_ of an individual.
- Every organism has a \_\_\_\_\_ number of chromosomes.
- In body cells, chromosomes are found in \_\_\_\_\_.
- Each of your body cells has \_\_\_\_\_ pairs of chromosomes.  
This is a total of \_\_\_\_\_ single chromosomes.
- A human sperm or egg has \_\_\_\_\_ single chromosomes.

### MATCHING

Match each term in Column A with its description in Column B. Write the correct letter in the space provided.

Column A	Column B
_____ 1. genes	a) compound that makes up genes
_____ 2. chromosomes	b) made up of many genes
_____ 3. DNA	c) have unpaired chromosomes
_____ 4. body cells	d) pass on traits
_____ 5. gametes	e) have paired chromosomes

**WHAT DO THE PICTURES SHOW?\_**

The pictures below show how chromosomes are passed from parent to offspring during asexual and sexual reproduction. Study figures F and G. Then answer the questions.

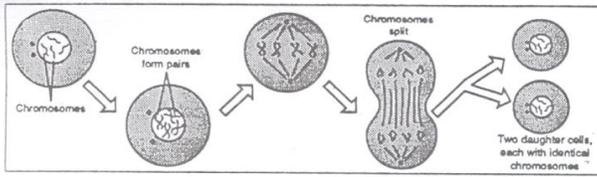


Figure F Asexual reproduction

1. How many chromosomes does the parent cell in Figure F have? \_\_\_\_\_
2. How many chromosomes does each daughter cell have? \_\_\_\_\_
3. In Figure F, how do the parent cell's chromosomes compare to the daughter cell's chromosomes? \_\_\_\_\_
4. Which Figure shows how body cells reproduce? \_\_\_\_\_

F, G

5. a. In Figure G, how many chromosomes does each sperm cell contain? \_\_\_\_\_
- How many chromosomes does each egg cell contain? \_\_\_\_\_

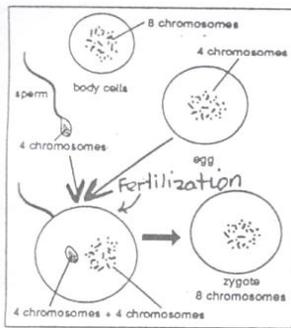


Figure G Sexual reproduction

6. Gametes have \_\_\_\_\_ the number of chromosomes as body cells. \_\_\_\_\_
7. Fertilization produces a single cell. What is it called? \_\_\_\_\_
8. How many chromosomes does the zygote in Figure G have? \_\_\_\_\_
9. How many chromosomes will each body cell of the organism have? \_\_\_\_\_
10. The offspring will have traits of both the mother and father. Why? \_\_\_\_\_

Fill in the missing number of chromosomes.

	Organism	Chromosomes in each body cell	Chromosomes in each sperm or egg
1.	Human	46	
2.	Horse	60	
3.	Housefly		6
4.	Dog	78	
5.	Grasshopper		7
6.	Mosquito		3
7.	Chicken	18	
8.	Apple		17
9.	Spinach	12	
10.	Lily		12

11. A gamete has \_\_\_\_\_ the number of chromosomes that a body cell has. \_\_\_\_\_
12. How many pairs of chromosomes are there in each body cell of the following? b. \_\_\_\_\_

- a) horse \_\_\_\_\_
- b) mosquito \_\_\_\_\_
- c) spinach \_\_\_\_\_
- d) lily \_\_\_\_\_
- e) human \_\_\_\_\_
- f) housefly \_\_\_\_\_

**WORD SCRAMBLE**

Below are several scrambled words you have used in this Lesson. Unscramble the words and write your answers in the spaces provided.

1. NEEG \_\_\_\_\_
2. HERINIT \_\_\_\_\_
3. NEGITECS \_\_\_\_\_
4. ETEMAG \_\_\_\_\_
5. CHOMEOSORM \_\_\_\_\_

# What are Chromosomes ?

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Group: \_\_\_\_\_

Directions: Using your packet, answer the questions below. This will be collected for a homework grade.

## TRUE OR FALSE

*In the space provided, write "true" if the sentence is true. Write "false" if the sentence is false.*

- \_\_\_\_\_ 1. Traits are the characteristics of living things.
- \_\_\_\_\_ 2. Only animals have traits.
- \_\_\_\_\_ 3. Traits are passed on from offspring to parents.
- \_\_\_\_\_ 4. Traits are passed on by genes.
- \_\_\_\_\_ 5. A cell has only a few genes.
- \_\_\_\_\_ 6. Only animals have genes.
- \_\_\_\_\_ 7. Different genes control different traits.
- \_\_\_\_\_ 8. Genes form chromosomes.
- \_\_\_\_\_ 9. Every organism has the same number of chromosomes.
- \_\_\_\_\_ 10. Body cells have paired chromosomes.
- \_\_\_\_\_ 11. Gametes have paired chromosomes.
- \_\_\_\_\_ 12. A body cell and a sex cell have the same number of chromosomes.
- \_\_\_\_\_ 13. Gametes have half the number of chromosomes of body cells.
- \_\_\_\_\_ 14. A human body cell has a total of 23 chromosomes.
- \_\_\_\_\_ 15. A human gamete has 23 single chromosomes.

## REACHING OUT

Which organism would more closely resemble its parent, one produced by asexual reproduction, or one produced by sexual reproduction?

Why? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_