Stonegate
8th Grade
Independent Study
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https://sites.google.com/wusd.k12.ca.us/mrsheinz8thgrade/home

<table>
<thead>
<tr>
<th>Day</th>
<th>Presentation Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Click &quot;file--make a copy&quot;</strong>, and complete the slide presentation.</td>
</tr>
<tr>
<td>2</td>
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<td>6</td>
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<td>9</td>
<td><strong>Click &quot;file--make a copy&quot;</strong>, and complete the slide presentation.</td>
</tr>
<tr>
<td>10</td>
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Valine 8th Grade Math Independent Study

Go to my website

Click on the arrow next to Homework & Notebook

Click on the current Unit, find the date(s) you need and click on the homework and notebook links

Items can be either turned in when the student returns, or can have a picture taken and emailed to avaline@wusd.k12.ca.us
Rivers 8th Grade History

Have the student look on Google Classroom for the work we are completing in class.
White 8th Grade Science
Independent Study Packet
How Are New Cells Made?
As you grow, you pass through different stages in your life. Cells also pass through different stages in their life cycle. These stages are called the **cell cycle**. The cell cycle starts when a cell is made, and ends when the cell divides to make new cells.

Before a cell divides, it makes a copy of its DNA (deoxyribonucleic acid). DNA is the molecule that contains all the instructions for making new cells. The DNA is stored in structures called **chromosomes**. The chromosomes are copied to make sure that each new cell has all the DNA of the parent cell. Although all cells pass through a cell cycle, the process differs in prokaryotic and eukaryotic cells.

How Do Prokaryotic Cells Divide?
Prokaryotes are made of only one cell. Prokaryotic cells have no nucleus. They also have no organelles that are surrounded by membranes. The DNA for prokaryotic cells, such as bacteria, is found on one circular chromosome. The cell divides by a simple process called **binary fission**. Binary fission splits the cell into two parts. Each part has one copy of the cell's DNA.

**BACTERIA reproduce by binary fission.**

**STUDY TIP**
**Summarize** As you read this section, make a diagram showing the stages of the eukaryotic cell cycle.

**READING CHECK**
1. **Explain** What must happen before a cell can divide?

2. **Complete** Prokaryotic cells divide by ____________________
How Do Eukaryotic Cells Divide?

Cell division in eukaryotic cells is more complex than in prokaryotic cells. The cell cycle of a eukaryotic cell has three stages: interphase, mitosis, and cytokinesis.

The first stage of the cell cycle is called interphase. During interphase, the cell grows and makes copies of its chromosomes and organelles. The two copies of a chromosome are called chromatids. The two chromatids are held together at the centromere.

This duplicated chromosome consists of two chromatids. The chromatids are joined at the centromere.

The second stage of the cell cycle is called mitosis. During this stage, the chromatids separate. This allows each new cell to get a copy of each chromosome. Mitosis happens in four phases: prophase, metaphase, anaphase, and telophase.

The third stage of the cell cycle is called cytokinesis. During this stage, the cytoplasm of the cell divides to form two cells. These two cells are called daughter cells. The new daughter cells are exactly the same as each other. They are also exactly the same as the original cell.

How Does the Cell Cycle Work?

The figure on the following page shows the cell cycle. In this example, the stages of the cell cycle are shown in a eukaryotic cell that has only four chromosomes.
SECTION 2  The Cell Cycle continued

**Interphase**  Before mitosis begins, chromosomes are copied. Each chromatin is then made of two chromatids.

**Mitosis Phase 1 (Prophase)**  Mitosis begins. Chromatids condense from long strands to thick rods.

**Mitosis Phase 2 (Metaphase)**  The nuclear membrane dissolves. Chromosome pairs align around the equator of the cell.

**Mitosis Phase 3 (Anaphase)**  Chromatids separate and move to opposite sides of the cell.

**Mitosis Phase 4 (Telophase)**  A nuclear membrane forms around each set of chromosomes. The chromosomes uncoil. Mitosis is complete.

**Cytokinesis**  In cells with no cell wall, the cell pinches in two. In cells with a cell wall, a cell plate forms and separates the new cells.

**TAKE A LOOK**

5. List What are the four phases of mitosis?

6. Identify What structure do plant cells have during cytokinesis that animal cells do not have?
What Tells a Cell When to Divide?

After cytokinesis is complete, each new cell is an exact copy of the parent cell. How did the parent cell know when to start copying its chromosomes?

As a baby, you cried when you were hungry. Crying was your way of reporting your condition to others. Cells also report conditions. This is called feedback. Cells use feedback to control the stages of the cell cycle, as shown below.

In a cell, feedback is used to turn on switches that work like red and green traffic lights. A cell spends most of its life in interphase, when it is not dividing. During this time, the cell grows. When feedback messages report that the cell is large and healthy, proteins in the cell get the “green light.” The cell starts to copy its organelles and chromosomes.

What Happens When Cell Division Is Not Controlled?

The molecules that control the “red light-green light” signals are proteins. The information for making these proteins is found in a cell’s DNA. If the DNA mutates, or changes, the proteins the cell makes could be changed. The changed protein may not control the cell correctly. This can cause cancer to occur. Cancer is the uncontrolled growth of cells.

There are different ways cancer can begin in a cell. Some mutations in DNA cause too many molecules that make a cell grow. This speeds up the cell cycle. Other mutations turn off the proteins that stop a cell from dividing. This would allow cells to divide constantly.

Math Focus

8. Calculate Cell A normally divides once every two days. If its control mechanisms aren’t working correctly, cell A divides six times faster than normal. How many hours does it take cell A to divide when its control mechanisms aren’t working correctly?
1. **Compare** How does the DNA of prokaryotic and eukaryotic cells differ?

2. **Summarize** Complete the Process Chart to explain the three stages of the cell cycle. Include the four phases of mitosis.

   - Mitosis begins with prophase. The chromosomes condense.
   - [Blank Box]
   - [Blank Box]
   - During telophase the nuclear membrane forms. The chromosomes lengthen and mitosis ends.
   - [Blank Box]

3. **Explain** Why does a cell make a copy of its DNA before it divides?

4. **Explain** Why does cancer occur?
Mendel and His Peas

BEFORE YOU READ
After you read this section, you should be able to answer these questions:

- What is heredity?
- Who was Gregor Mendel?
- What experiments did Mendel conduct on pea plants?
- What did Mendel learn about heredity?

What Is Heredity?

Imagine a puppy. The puppy has long, floppy ears like his mother and dark brown fur like his father. How did the puppy get these traits? The passing of traits from parents to offspring is called heredity. Over 100 years ago, a monk named Gregor Mendel performed experiments on heredity that helped establish the field of genetics. Genetics is the study of how traits are inherited.

Offspring often look a little like their mother and a little like their father. This led people to think that the traits of the parents mixed together to make the traits of the offspring. This idea is called blending inheritance.

According to blending inheritance, if a brown rabbit mates with a white rabbit, the offspring should be tan. However, when a brown and a white rabbit do mate, the offspring are brown. When two brown rabbits mate, the offspring can be white! Therefore, blending inheritance is not a good explanation of heredity.

Who Was Gregor Mendel?

Gregor Mendel was born in Austria in 1822. He grew up on a farm and learned a lot about flowers and fruit trees. Mendel studied at a university and then entered a monastery. A monastery is a place where monks study religion.

Mendel examined pea plants in the monastery garden to study how traits are passed from parent to offspring. He used garden peas because they grow quickly. They also have many traits that are easy to see. His experiments showed why blending inheritance does not explain how traits are passed from parents to offspring. His results changed the way people think about inheritance.
REPRODUCTION IN PEAS

Pea plants, like many flowering plants, have both male and female reproductive parts. Many flowering plants reproduce by cross-pollination. In cross-pollination, sperm in the pollen of one plant fertilize eggs in the flower of a different plant. Pollen can be carried by organisms, such as insects. Pollen can also be carried by the wind from one flower to another.

Some flowering plants must use cross-pollination. They need another plant to reproduce. However, a pea plant can also reproduce by self-pollination. In self-pollination, sperm from one plant fertilize the eggs of the same plant.

Mendel used self-pollination in pea plants in order to grow true-breeding plants for his experiments. When a true-breeding plant self-pollinates, its offspring all have the same traits as the parent. For example, a true-breeding plant with purple flowers always has offspring with purple flowers.

During pollination, pollen from the anther (male part) is carried to the stigma (female part). Fertilization happens when a sperm from the pollen moves through the stigma and enters an egg in an ovule.

READING CHECK

3. Compare How is cross-pollination different from self-pollination?

TAKE A LOOK

4. Identify What are two ways pollen can travel from one plant to another during cross-pollination?

Critical Thinking

5. Infer How do you think pollen might move during self-pollination?
CHARACTERISTICS

Mendel studied one characteristic of peas at a time. A characteristic is a feature that has different forms. For example, hair color is a characteristic of humans. The different forms, or colors, such as brown or red hair, are called traits.

Mendel used plants that had different traits for each characteristic he studied. One pea characteristic he studied was flower color. He chose plants that had purple flowers and plants that had white flowers. He also studied other characteristics, such as seed shape, pod color, and plant height.

CROSSING PEA PLANTS

Mendel was careful to use true-breeding plants in his experiments. By choosing these plants, he would know what to expect if his plants were to self-pollinate. He decided to find out what would happen if he crossed, or bred, two plants that had different traits.

Mendel removed the anthers from a plant that made round seeds. Then, he used pollen from a plant that made wrinkled seeds to fertilize the plant that made round seeds.
What Happened in Mendel’s First Experiment?

Mendel studied seven different characteristics in his first experiment with peas. For example, he crossed plants that were true-breeding for purple flowers with plants that were true-breeding for white flowers. The offspring from such a cross are called *first-generation plants*. All the first-generation plants in this cross had purple flowers. What happened to the trait for white flowers?

Mendel got similar results for each cross. One trait was always present in the first generation, and the other trait seemed to disappear. Mendel called the trait that appeared the **dominant trait**. He called the other trait the **recessive trait**. To *recede* means “to go away or back off.” To find out what happened to the recessive trait, Mendel did another set of experiments.

What Happened in Mendel’s Second Experiment?

Mendel let the first-generation plants self-pollinate. When a first-generation plant with purple flowers self-pollinated, the recessive trait for white flowers showed up again in the second generation.

Mendel did the same experiment on seven different characteristics. Each time, some of the second-generation plants had the recessive trait.

---

8. **Identify** What kind of trait appeared in the first generation?

9. **Identify** What type of trait reappeared in the second generation?
RATIOS IN MENDEL'S EXPERIMENTS

Mendel counted the number of plants that had each trait in the second generation. He hoped that this would help him explain his results.

As you can see, the recessive trait did not show up as often as the dominant trait. Mendel decided to figure out the ratio of the dominant traits to the recessive traits. A ratio is a relationship between two different numbers. It is often written as a fraction. For example, the second generation produced 705 plants with purple flowers and 224 plants with white flowers. Mendel used this formula to calculate the ratios:

\[
\frac{705}{224} = 3.15/1 \text{ or } 3.15:1
\]

### Math Focus

10. **Find Ratios** Calculate the missing ratios of the pea plant characteristics in the table.

11. **Round** Round off all the numbers in the ratios to whole numbers. What ratio do you get?

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Dominant trait</th>
<th>Recessive trait</th>
<th>Ratio</th>
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<tbody>
<tr>
<td>Flower color</td>
<td>705 purple</td>
<td>224 white</td>
<td>3.15:1</td>
</tr>
<tr>
<td>Seed color</td>
<td>6,002 yellow</td>
<td>2,001 green</td>
<td></td>
</tr>
<tr>
<td>Seed shape</td>
<td>5,474 round</td>
<td>1,850 wrinkled</td>
<td></td>
</tr>
<tr>
<td>Pod color</td>
<td>428 green</td>
<td>152 yellow</td>
<td></td>
</tr>
<tr>
<td>Pod shape</td>
<td>882 smooth</td>
<td>299 bumpy</td>
<td></td>
</tr>
<tr>
<td>Flower position</td>
<td>651 along stem</td>
<td>207 at tip</td>
<td></td>
</tr>
<tr>
<td>Plant height</td>
<td>787 tall</td>
<td>277 short</td>
<td></td>
</tr>
</tbody>
</table>

What Did Mendel Conclude?

Mendel knew that his results could be explained only if each plant had two sets of instructions for each characteristic. He concluded that each parent gives one set of instructions to the offspring. The dominant set of instructions determines the offspring's traits.
**BEFORE YOU READ**

After you read this section, you should be able to answer these questions:

- What is a sex cell?
- How are sex cells made?
- How does meiosis help explain Mendel’s results?

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**How Do Offspring Get Their Genetic Information?**

When organisms reproduce, their genetic information is passed on to their offspring. This information is in the form of a chemical called DNA.

In sexual reproduction, two parents each give genetic information to their offspring. Before this happens, both parents must reduce their genetic information by half. That way, when the genetic information of the two parents is combined, the offspring will have the same amount as each parent. Genetic information is located on structures called chromosomes.

**CHROMOSOME NUMBERS**

Most species have a certain number of chromosomes in their body cells. For example, human cells usually have 46 chromosomes. Corn cells usually have 20 chromosomes. Dog cells usually have 78 chromosomes. Most of the time, the chromosomes are spread out in long, thin strands. They cannot be seen with a microscope. However, when a cell divides, the chromosomes get shorter and thicker. Then they can be seen with a microscope.

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**STUDY TIP**

*Summarize* As you read, make a diagram that shows the steps of meiosis.

---

**TAKE A LOOK**

1. **Identify** How many pairs of chromosomes are in each human body cell?

2. **Identify** How many total chromosomes are in each human body cell?
**SECTION 3  Meiosis continued**

**Homologous Chromosomes**

Organisms that reproduce sexually have two kinds of cells, body cells and sex cells. Most of your cells are body cells. In body cells, the chromosomes are found in pairs. Each member of the pair has a similar structure. They carry similar genetic information.

Chromosomes that carry the same set of genes are called homologous chromosomes. These chromosomes carry the same genes, but they may have different versions, or alleles, for those genes.

- **Gene**
- Genes can also be different alleles.
- Genes can be the same version, or allele.

### What Is a Sex Cell?

Cells that have pairs of homologous chromosomes are called **haploid**. Body cells are diploid cells. However, before an organism can reproduce sexually, it must make sex cells. Sex cells do not have homologous chromosomes.

When sex cells are made, homologous chromosomes separate from one another. So, each sex cell has only one copy of each gene, instead of two. A cell that does not have homologous chromosomes is called **haploid**. Sex cells are haploid cells.

In sexual reproduction, two sex cells combine to form a new individual. Males produce sex cells called **sperm**. Females make sex cells called **eggs**. Sperm and eggs are haploid cells.

Fertilization happens when a sperm cell and an egg cell join. When the two haploid cells join, a diploid cell is formed. This new diploid cell has homologous chromosomes. The diploid cell can divide and produce more diploid cells by mitosis. These cells can grow into a new organism.
**How Are Sex Cells Made?**

Sex cells are made during meiosis. **Meiosis** is a copying process that produces cells with half the usual number of chromosomes. In meiosis, each sex cell that is made gets only one chromosome from each homologous pair. For example, a human egg cell has 23 chromosomes. A sperm cell also has 23 chromosomes. When human sex cells join together, the new cell that forms has 46 chromosomes.

**Why Is Meiosis Important?**

Meiosis is necessary for all organisms that carry out sexual reproduction. It is important because it keeps the chromosome number the same from one generation to the next. Just one extra chromosome in a cell can be harmful for an individual. ✓

When two sex cells join during fertilization, all of the sperm's chromosomes combine with all of the egg's chromosomes. The new cell has twice the number of chromosomes as each of the sex cells.

If the sex cells were diploid, the number of chromosomes would double in every generation. For example, if each human sex cell had 46 chromosomes, each cell in the offspring would have 92 chromosomes. How many chromosomes would there be in each cell of the next generation?
**Steps of Meiosis**

**First cell division**

1. The chromosomes are copied before meiosis begins. The identical copies, or chromatids, are joined together.

2. The nuclear membrane disappears. Pairs of homologous chromosomes line up at the equator of the cell.

**Second cell division**

3. The chromosomes separate from their homologous partners. Then they move to the opposite ends of the cell.

4. The nuclear membranes re-form, and the cell divides. The paired chromatids are still joined.

5. Each cell contains one member of the homologous chromosome pair. The chromosomes are not copied again between the two cell divisions.

6. The nuclear membrane disappears. The chromosomes line up along the equator of each cell.

**TAKE A LOOK**

8. **Identify** How many times does the cell nucleus divide during meiosis?

**TAKE A LOOK**

9. **Identify** At the end of meiosis, how many sex cells have been produced from one cell?

7. The chromatids pull apart and move to opposite ends of the cell. The nuclear membranes re-form, and the cells divide.

8. Four new haploid cells have formed from the original diploid cell. Each new cell has half as many chromosomes as the original cell.
How Does Meiosis Explain Mendel's Results?

The steps in meiosis explain why Mendel got his results. The figure below shows what happens to chromosomes during meiosis and fertilization in pea plants. The cross shown is between two true-breeding plants. One produces round seeds, and the other produces wrinkled seeds.

**Meiosis and Dominance**

**Male Parent** In the plant cell nucleus below, each homologous chromosome has an allele for seed shape. Each allele carries the same instructions: to make wrinkled seeds.

**Female Parent** In the plant cell nucleus below, each homologous chromosome has an allele for seed shape. Each allele carries the same instructions: to make round seeds.

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**Take a Look**

10. Explain How many genotypes are possible for the offspring? Explain your answer.

---

4. After meiosis, each sperm cell has a recessive allele for wrinkled seeds. Each egg cell has a dominant allele for round seeds.

6. Fertilization of any egg by any sperm gives the same genotype (Rr) and the same phenotype (round). This result is exactly what Mendel found in his studies.
1. **Identify** Is a sex cell a diploid cell or a haploid cell?


2. **Compare** What is the difference between a diploid cell and a haploid cell?


3. **Explain** Why is meiosis necessary in organisms that carry out sexual reproduction?


4. **Organize** Use the Pyramid Chart below to place the following in order from largest to smallest: chromosome, gene, and cell.
CHAPTER 7  Genes and DNA
SECTION 1  What Does DNA Look Like?

BEFORE YOU READ
After you read this section, you should be able to answer these questions:
• What units make up DNA?
• What does DNA look like?
• How does DNA copy itself?

What Is DNA?
Genes determine the inherited traits of organisms. Genes are located on chromosomes inside cells. Chromosomes are made of protein and DNA, or deoxyribonucleic acid. DNA is the genetic material of living things.

What Is DNA Made Of?
DNA is made up of many repeating units called nucleotides. A nucleotide contains a sugar, a phosphate, and a base. The sugar and the phosphate are the same for every nucleotide. However, each nucleotide has one of four different bases.

The four bases found in DNA nucleotides are adenine, thymine, guanine, and cytosine. Scientists often refer to a base by its first letter: A for adenine, T for thymine, G for guanine, and C for cytosine. Each base has a different shape.

The Four Nucleotides of DNA

Take a Look
1. Identify What are two things that are the same in all nucleotides?
What Does DNA Look Like?

As you can see in the figure below, the DNA molecule looks like a twisted ladder. This spiral shape is called a double helix. The two sides of the ladder are made of the sugar and phosphate parts of nucleotides. The sugars and phosphates alternate along each side of the ladder. The rungs of the DNA ladder are made of pairs of bases.

The bases in DNA can fit together only in certain ways. Adenine on one side of a DNA rung always pairs with thymine on the other side. Guanine always pairs with cytosine. This means that adenine is complementary to thymine, and guanine is complementary to cytosine. Because the pairs of bases in DNA are complementary, the two sides of the DNA molecule are also complementary.

Critical Thinking

3. Apply Concepts Imagine that you are a scientist studying DNA. You measure the number of cytosines and thymines in a small strand of DNA. There are 45 cytosines and 55 thymines. How many guanines are there in the strand? How many adenines are there?

Take A Look

4. Identify How can DNA bases pair up?

Each side of a DNA molecule is complementary to the other side.
How Does DNA Copy Itself?

Before a cell divides, it makes a copy of its genetic information. The pairing of bases allows the cell to replicate, or make copies of, DNA. Remember that bases are complementary and can fit together only in certain ways. Therefore, the order of bases on one side of the DNA controls the order of bases on the other side. For example, the base order CGAC can fit only with the complementary base order GCTG.

When DNA replicates, the double helix splits in the middle, and the pairs of bases separate. The unpaired bases attract new complementary bases. This action builds a new complementary strand of nucleotides on each side of the split. Finally, two DNA molecules are formed. Half of each one, that is, one strand, comes from the original molecule. The other strand is built from new nucleotides.

DNA is copied every time a cell divides. Each new cell gets a complete copy of all of the cell's DNA. Proteins in the cell unwind, copy, and rewind the DNA. Other proteins help with the job of carrying out the instructions found in DNA. Therefore, DNA is usually found with several kinds of proteins.
Section 1 Review

SECTION VOCABULARY

1. Compare How are the four kinds of DNA nucleotides different from each other?

2. Apply Concepts The diagram shows part of a DNA molecule. Using the order of bases in the top strand, write the letters of the bases that belong on the bottom strand.

   CTAGGCTTAAACC

3. Describe How is DNA related to chromosomes?

4. Identify Relationships How are proteins involved in DNA replication?

5. List What are three parts of a nucleotide?

6. Explain What happens when DNA replicates?
BEFORE YOU READ

After you read this section, you should be able to answer these questions:

- What does DNA look like in different cells?
- How does DNA help make proteins?
- What happens if a gene changes?

What Does DNA in Cells Look Like?

The human body contains trillions of cells. Most cells are very small and can be seen only with a microscope. A typical skin cell, for example, has a diameter of about 0.0025 cm. However, almost every cell contains about 2 m of DNA. How can 2 m of DNA fit into the nucleus of such a small cell?

Large amounts of DNA can fit inside a cell because the DNA is tightly bundled by proteins. The proteins found with DNA help support the structure and function of DNA. Together, the DNA and the proteins it winds around make up a chromosome.

1. A single strand of chromatin is made up of a long strand of DNA that is coiled around proteins.

2. Each strand of DNA has two halves that are connected in the middle. The strands are twisted into a double helix.

3. The DNA in the nucleus is part of a material called chromatin. Long strands of chromatin are usually bundled loosely inside the nucleus.

STUDY TIP

Clarify Concepts As you read the text, make a list of ideas that are confusing. Discuss these with a small group. Ask your teacher to explain things that your group is unsure about.

CALIFORNIA STANDARDS CHECK

7.2.a Students know DNA (deoxyribonucleic acid) is the genetic material of living organisms and is located in the chromosomes of each cell.

1. Identify What are two things that are found in a chromosome?

TAKING A LOOK

2. Describe What is chromatin made of?
DNA IN DIVIDING CELLS
When a cell divides, its genetic material is spread equally into each of the two new cells. How can each of the new cells receive a full set of genetic material? It is possible because DNA replicates before a cell divides.

Remember that when DNA replicates, the strand of DNA splits down the middle. New strands are made when nucleotide bases bind to the exposed strands. Each of the new strands is identical to the original DNA strand. This is because the DNA bases can join only in certain ways. A always pairs with T, and C always pairs with G.

How Does DNA Help Make Proteins?
The order of bases in DNA is a code. The code tells how to make proteins. Proteins are made from many subunits called amino acids. A long string of amino acids forms a protein.

A group of three DNA bases acts as a code for one amino acid. For example, the group of DNA bases CAA stand for the amino acid valine. A gene usually contains instructions for making one specific protein.

PROTEINS AND TRAITS
Proteins are found throughout cells. They cause most of the differences that you can see among organisms. A single organism can have thousands of different proteins.

Proteins act as chemical messengers for many of the activities in cells. They help determine traits, such as the color of your eyes and how tall you will grow.
HELP FROM RNA

RNA, or ribonucleic acid, is a chemical that helps DNA make proteins. RNA is similar to DNA. It can act as a temporary copy of part of a DNA strand. One difference between DNA and RNA is that RNA contains the base uracil instead of thymine. Uracil is often referred to as U.

How Are Proteins Made in Cells?
The first step in making a protein is to copy one side of part of the DNA. This mirrorlike copy is made of RNA. It is called messenger RNA (mRNA). It moves out of the nucleus and into the cytoplasm of the cell.

READING CHECK
6. Identify What is one difference between RNA and DNA?

TAKE A LOOK
7. Compare How does the shape of RNA differ from the shape of DNA?
RIBOSOMES
In the cytoplasm, the messenger RNA enters a protein assembly line. The "factory" that runs this assembly line is a ribosome. A ribosome is a cell organelle composed of RNA and protein. The mRNA moves through a ribosome as a protein is made.

Critical Thinking
8. Explain Proteins are made in the cytoplasm, but DNA never leaves the nucleus of a cell. How does DNA control how proteins are made?

TAKE A LOOK
9. Identify What does tRNA do?
What Happens If Genes Change?

Read this sentence: "Put the book on the desk." Does it make sense? What about this sentence: "Rut the zook in the tesk."? Changing only a few letters in a sentence can change what the sentence means. It can even keep the sentence from making any sense at all! In a similar way, even small changes in a DNA sequence can affect the protein that the DNA codes for. A change in the nucleotide-base sequence of DNA is called a mutation.

Some mutations happen because of mistakes when DNA is copied. Other mutations happen when something in the environment damages DNA. Things that can cause mutations are called mutagens. Examples of mutagens include X-rays and ultraviolet radiation. Ultraviolet radiation is one type of energy in sunlight. It can cause suntans and sunburns.

Mutations can cause changes in traits. Some mutations produce new traits that can help an organism survive. For example, a mutation might allow an organism to survive with less water. If there is a drought, the organism will be more likely to survive.

Many mutations produce traits that make an organism less likely to survive. For example, a mutation might make an animal a brighter color. This might make the animal easier for predators to find.

Some mutations are neither helpful nor harmful. These mutations may not affect the protein that a gene codes for. If a mutation does not cause a change in a protein, then the mutation will not help or hurt the organism.

Cells make proteins that can find and fix mutations. However, not all mutations can be fixed. If a mutation happens in egg or sperm cells, the changed gene can be passed from one generation to the next.
1. Identify  What structures in cells contain DNA and proteins?

2. Calculate  How many amino acids can a sequence of 24 DNA bases code for?

3. Explain  Fill in the Flow Chart below to show how the information in the DNA code becomes a protein.

```
makes a copy of itself called  
which moves into the cytoplasm to a  
where amino acids are joined to make a  
```

4. Describe  How can a mutation in a DNA base sequence cause a change in a protein?

5. Draw Conclusions  How can a mutation in a DNA base sequence cause a change in a trait?
PHYSICAL EDUCATION
Independent Study Work

Student Name: _____________________________________________

Dates of Absence: _________________________________________

**Activity Log Directions:**

1. Please use a piece of clean 8.5 x 11 paper for the activity log.
2. You will need to make a log for each day of absence (can put as many log on one paper as will fit)
3. Include (2 points for each)
   a. Student Name / Period
   b. Date of Absence
   c. Describe the Activity
   d. How long you did activity
   e. What fitness component it addressed and why/how

**ACE Paragraph Directions**

1. Use a 8.5 x 11 paper (different than activity log)
2. Read the attached article:
   “The Tremendous Benefits of Physical Education in Schools”
3. Write an ACE paragraph on the benefits of physical education in school (minimum 100 words)
THE TREMENDOUS BENEFITS OF PHYSICAL EDUCATION IN SCHOOL

Physical education (PE) is the most powerful (and unappreciated) ‘medicine’ for present and future health issues. For the body, mind and spirit. When you look at the section below and some of the quotes from respected world organizations, you can see why we say nothing is better than physical education. Physical education in schools captures everyone and not those who want to be active. It teaches great life and health lessons. Putting it simply, PE conditions a child to be more active and healthy adults.

However, there are trends around the world which are disturbing. UNESCO states, "physical education is in decline across all world regions". In the USA, the average school budget for PE is $764 per year. In other countries the value of quality PE is being challenged.

On the positive side, we have more and more evidence and research that physical education is the ultimate solution to producing a more healthy world... for a body, mind and spirit of humans. Look at the facts below. Physical education prepares children to be physically and mentally active, fit and healthy... for life. Here are some of the many benefits children receive from a quality PE program:

- Improved physical fitness
- Skill and motor skills development
- Provides regular, healthful physical activity
- Teaches self discipline
- Facilitates development of student responsibility for health and fitness
- Influence moral development, leadership, cooperate with others
- Stress reduction – an outlet for releasing tension and anxiety
- Strengthened peer relationships
- Physical education can improve self-confidence and self-esteem
- Respect - PE helps you respect your body, classmates and teammates
- Experience in setting goals
- Improved academics - The big bonus benefit!
UNESCO laid out 4 reasons - Physical literacy and civic engagement, academic achievement, inclusion, and health. We believe in these and are adding a few more:

1. Healthy For Life - Kids who have quality PE are taught life skills (see above) that can be used forever.
2. Reduced Healthcare Costs - We have more of a 'sick-care' system than healthcare. One of the best ways to prevent 'sick-care' expenses is to have real healthcare. PE is true healthcare and prevention. As been mentioned "Prevention is Better than a Cure".
3. Physical Education Captures Everyone - Recess is nice as are after school programs, but it only hits kids that want to be active. Physical education gets every child conditioned to live a healthy life.
4. It Is Harder To Condition Adults - Habits early in life are a lot easier than trying to "teach an old dog new tricks". Let's condition activity into every kids resources that then can use forever
5. The Academic Payoff - The research and evidence is overwhelming. Kids who are active are better students period.

Look at the brain functioning after just 20 minutes of walking. Getting kids to move helps strengthen and stimulate their brains. This is why so many recent research studies are showing increased fitness = improved academics. Note: The blue color represents inactivity in the brain (Source: University of Urbana)

![After sitting quietly vs. after 20-minute walk](image)

John Ratey, an Associate Professor Psychiatry at Harvard University has stated, "Exercise is like Miracle-Gro for the brain." So, when anyone says we can't afford to have PE in our schools because it takes up too much time, please let them know of all the research which conclusively shows how exercise builds brain cells and improves academics. And, just by elevating your heart rate you can lift your mood, beat stress, sharpen your intellect, and function better.

Physical education is the grassroots program for all activity. Children with PE are 2-3 times more likely to be active outside of school. Adults who had PE in school are twice as likely to be active today.