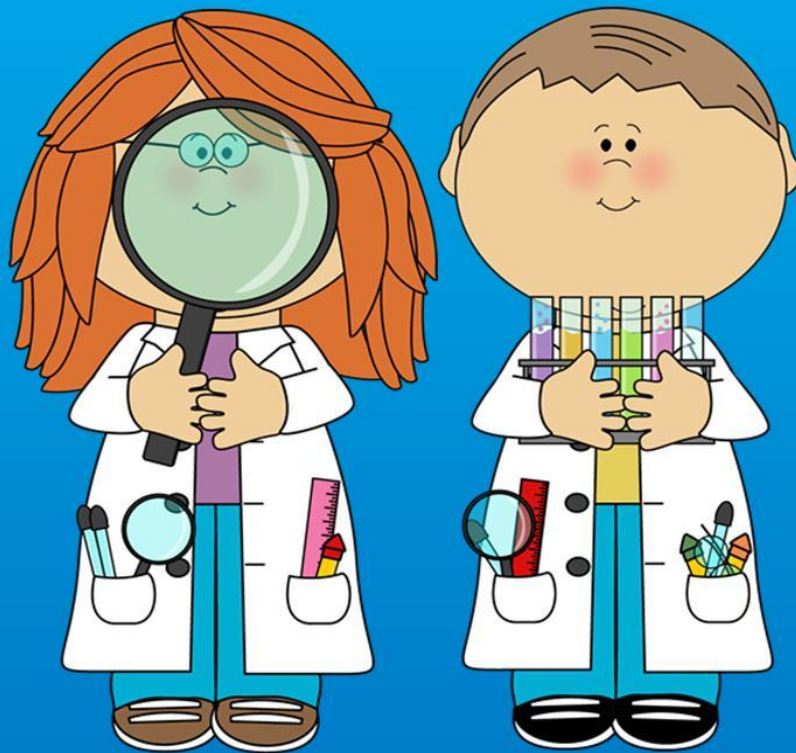


Hands-On Minds-On Science Explorations  
Grades 3-5

# Human Body & Nutrition



Hands-On Minds-On Publications

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Name \_\_\_\_\_ Date \_\_\_\_\_

### RESPIRATION: EXPLORING LUNG CAPACITY

**Background Information:** Your lungs are essential in breathing. No two individuals breathe exactly alike. When you **inhale** air, you breathe the air into your lungs. When you **exhale**, you breathe air out of your lungs. When your lungs fill with air, your chest expands. **Tidal Air Volume** is the amount of air that your lungs contain during normal breathing. **Reserve Air Volume** is the amount of air that can be forced out of the lungs after you exhale normally. Vital air volume, or **vital capacity**, is the maximum amount of air that your lungs can hold. People who smoke, have asthma, or are severely overweight might experience difficulty in breathing.

In this activity, you will learn what your lung capacity is.

#### Procedure:

##### Test 1: Reserve Air Capacity

1. Sit still and breathe normally. After breathing normally, place the balloon in your mouth after inhaling. As you exhale, let the air go into the balloon. Do not take a second breath or blow hard. This test is only trying to see how much air is used during normal breathing.
2. Hold the balloon closed while your partner uses the centimeter tape to measure the distance around the balloon.
3. Record the circumference (distance around the balloon) below for Trial 1.
4. Give your partner a chance to do steps 1-3.
5. Repeat steps 1-3 for two more trials, taking turns with your partner.

##### RESERVE AIR CAPACITY

Trial 1: \_\_\_\_\_

Trial 2: \_\_\_\_\_

Trial 3: \_\_\_\_\_

Total: \_\_\_\_\_

Average: \_\_\_\_\_

##### Test 2: Vital Air Capacity

1. Take the deepest breath you can. Blow out every bit of air from your lungs into the balloon.
2. Hold the balloon closed while your partner uses the centimeter tape to measure the distance around the balloon.
3. Record the circumference (distance around the balloon) below for Trial 1.
4. Give your partner a chance to do steps 1-3.
5. Repeat steps 1-3 for two more trials, taking turns with your partner.

##### VITAL AIR CAPACITY

Trial 1: \_\_\_\_\_

Trial 2: \_\_\_\_\_

Trial 3: \_\_\_\_\_

Total: \_\_\_\_\_

Average: \_\_\_\_\_

## **Show What You Know**

### **Lung Capacity**

1. People who \_\_\_\_\_, \_\_\_\_\_, or \_\_\_\_\_ might experience difficulty breathing.
2. The amount of air that your lungs contain during normal breathing is known as \_\_\_\_\_.
3. Your \_\_\_\_\_ are essential in breathing.
4. When you \_\_\_\_\_, you breathe air out of your lungs.
5. When your lungs fill with air, your chest \_\_\_\_\_.
6. When you \_\_\_\_\_, you breath air into your lungs.
7. The amount of air that can be forced out of the lungs after you exhale normally is called \_\_\_\_\_.
8. The maximum amount of air that your lungs can hold is called \_\_\_\_\_.

Name \_\_\_\_\_ Date \_\_\_\_\_

### Using our Senses of Sight and Sound

**Background Information:** Senses are the way in which you know the world around you. There are 5 senses. They are the senses of sight, hearing, touch, taste, and smell. The parts of the body responsible for each sense are called sense organs. They include the eyes, ears, mouth, tongue, nose, and the skin.

**Problem Statement:** By using your sense of hearing, can you identify the items in the mystery boxes?

**Materials:** film containers, rice, beans, toothpicks, thread, cotton, dice, paper clips, keys, marbles, pennies, and macaroni

**Procedure:**

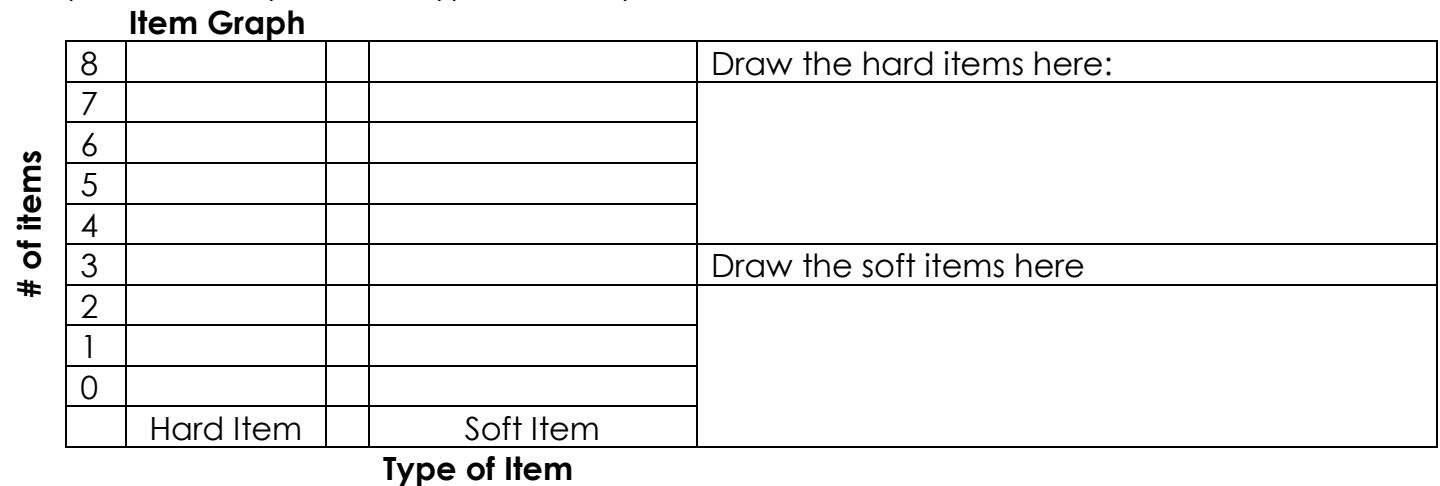
1. Shake each canister and predict what is in it by filling in the prediction column. Remember, a prediction is the same as a hypothesis.
2. After you have made all of your predictions, open the canisters one by one to see if you guessed correctly. Record the results in the Results column. If you guessed correctly, write "yes" in the conclusion column; if you did not, write "no."
3. After you check each film canister, decide whether the item is hard or soft. A hard item can be heard shaking in the container. You might not hear a soft item when you shake the container.

| HYPOTHESIS                                     | RESULTS                         | CONCLUSION               | TYPE OF ITEM              |
|------------------------------------------------|---------------------------------|--------------------------|---------------------------|
| What do you predict is in each film container? | What was in the film container? | Did you guess correctly? | Is the item soft or hard? |
| #1                                             |                                 |                          |                           |
| #2                                             |                                 |                          |                           |
| #3                                             |                                 |                          |                           |
| #4                                             |                                 |                          |                           |
| #5                                             |                                 |                          |                           |
| #6                                             |                                 |                          |                           |
| #7                                             |                                 |                          |                           |
| #8                                             |                                 |                          |                           |
| #9                                             |                                 |                          |                           |
| #10                                            |                                 |                          |                           |
| #11                                            |                                 |                          |                           |

Count how many items you wrote "yes" next to. How many did you guess correctly? Write your answer in a complete sentence.

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Graph how many of each type of item you had.



Sit outside very still with your eyes closed for 5 minutes. Listen carefully to the world around you. When you open your eyes, write down everything that you heard.

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Use your eyes and use your sense of sight to list the things you see. Use complete sentences.

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Draw the sense organ used for each sense below:

|         |  |       |  |
|---------|--|-------|--|
| Sight   |  | Smell |  |
| Hearing |  | Taste |  |
| Touch   |  |       |  |

**Write about it:** On a separate sheet of paper, respond to the following prompt: The five senses of seeing, hearing, smelling, tasting, and touching are very useful from day to day. Explain how you use each of these senses everyday.

NAME: \_\_\_\_\_ DATE: \_\_\_\_\_

### HOW ARE HUMANS AND PLANTS SIMILAR?

BACKGROUND INFORMATION: Plants and humans have similar functions. Plants and humans both need food, nutrients, water, and sunlight to survive. Humans get their food from plants and animals. Plants make their own food in a process known as photosynthesis. Most of photosynthesis takes place in the leaves of plants. **Carbon dioxide** enters the stomates. Plant leaves use **chlorophyll** to trap the light from the sun and make their food. During photosynthesis, oxygen is produced. Plants get energy from the sun and humans need the sun in order to survive. Both plants and humans **reproduce**. Humans reproduce through a process known as **fertilization**. Plants reproduce through **pollination**. During pollination, pollen grains move from the stamen to a pistil. Colorful and fragrant petals attract insects. The insect brushes up against the pollen grains on the **stamen**. Some pollen grains stay on the insect and as it moves from one flower to another, the grains stick to the flower's **pistil**. Both humans and plants are made up of **cells** that carry out functions needed for life.

TELL WHAT YOU ALREADY KNOW ABOUT CELLS:

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**PROBLEM STATEMENT:** Are human cells and plant cells similar in appearance?

**HYPOTHESIS:**

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**MATERIALS:** onions skin, slides, cover slips, cotton swabs, safety goggles, iodine, droppers, microscopes, paper towels, rubber gloves

TELL WHAT YOU WILL DO IN ORDER TO BE SAFE IN THE LAB TODAY:

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### PREPARING A WET MOUNT SLIDE: CHEEK CELLS

**PROCEDURE:**

1. Use a cotton swab to gently scrape the inside of your cheek.
2. Rub the swab onto a clean slide.
3. Put a drop of iodine on top of the specimen.
4. Touch one edge of the droplet with the cover slip and carefully drop it on the slide.
5. Blot any leaks and place the slide on the stage of the microscope.

### PREPARING A WET MOUNT SLIDE: ONION SKIN

#### PROCEDURE:

1. Place a small piece of onion skin on the slide.
2. Put a drop of iodine on top of the specimen.
3. Touch one edge of the droplet with the cover slip and carefully drop it on the slide.
4. Blot any leaks and place the slide on the stage of the microscope.

Next, view each side and sketch it in the boxes below.

| ONION CELLS | CHEEK CELLS |
|-------------|-------------|
|             |             |

**RESULTS:** (Were the plant cells and human cells similar in appearance?)

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**CONCLUSION:** (Tell whether your hypothesis was correct and why.)

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How did your team work together during this lab? Would you do anything different next time? Tell what you learned in lab today.

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NAME \_\_\_\_\_ DATE \_\_\_\_\_

**HOW ARE HUMANS AND PLANTS SIMILAR**  
**MATCH THE PHRASE ON THE LEFT WITH THE WORD ON THE RIGHT**

- |                                                                          |                   |
|--------------------------------------------------------------------------|-------------------|
| 1. Plants reproduce through _____.                                       | A. leaves         |
| 2. Photosynthesis takes place in the _____.                              | B. cells          |
| 3. Plants use _____ to trap light from the sun and make food.            | C. sun            |
| 4. The process of human reproduction is known as _____.                  | D. stomates       |
| 5. During photosynthesis, carbon dioxide enters the _____.               | E. photosynthesis |
| 6. The food making process in plants is known as _____.                  | F. chlorophyll    |
| 7. In both humans and plants, _____ carry out functions needed for life. | G. fertilization  |
| 8. Both plants and humans depend on the _____ to survive.                | H. pollination    |
| 9. During pollination, pollen grains move from the stamen to the _____.  | I. pistil         |

NAME \_\_\_\_\_ DATE \_\_\_\_\_

**HOW ARE HUMANS AND PLANTS SIMILAR**  
**MATCH THE PHRASE ON THE LEFT WITH THE WORD ON THE RIGHT**

- |                                                                          |                   |
|--------------------------------------------------------------------------|-------------------|
| 1. Plants reproduce through _____.                                       | A. leaves         |
| 2. Photosynthesis takes place in the _____.                              | B. cells          |
| 3. Plants use _____ to trap light from the sun and make food.            | C. sun            |
| 4. The process of human reproduction is known as _____.                  | D. stomates       |
| 5. During photosynthesis, carbon dioxide enters the _____.               | E. photosynthesis |
| 6. The food making process in plants is known as _____.                  | F. chlorophyll    |
| 7. In both humans and plants, _____ carry out functions needed for life. | G. fertilization  |
| 8. Both plants and humans depend on the _____ to survive.                | H. pollination    |
| 9. During pollination, pollen grains move from the stamen to the _____.  | I. pistil         |

Name\_\_\_\_\_Date\_\_\_\_\_

## CELLS

Every living thing is made up of cells. Within each cell, processes important to life take place. The outside boundary of a cell is called a cell wall. Only plant cells have cell walls. The cell wall is sturdy, giving the cell its shape. Human cells have a cell membrane that hold the cell together. The cell membrane is not sturdy nor rigid like a cell wall in plants. Cells also have a nucleus. The nucleus contains special material that controls all the cell's activities. Inside of each cell is filled with a clear, jellylike fluid called cytoplasm. Cytoplasm is mostly water, but suspended in the water are substances and structures necessary for cells to survive. As cells grow, they divide and form new cells. The process of cell division is called mitosis. In the nucleus of cells are threadlike structures called chromosomes. Chromosomes contain all the information necessary to direct the activities of a cell. Chromosomes are made up of two identical threadlike parts connected at their center. When the cell divides, half of the chromosomes go to each new cell. The new cell then grows and the half chromosomes rebuild their missing part.

Look at the slides at your table. Draw the slides listed below and write one sentence to explain your slide.

|              |                   |                   |
|--------------|-------------------|-------------------|
|              |                   |                   |
| CHEEK CELLS: | Zygote:           | Metaphase:        |
|              |                   |                   |
| Anaphase:    | Telophase humans: | Telophase plants: |

## Quiz Cells

1. In the nucleus of cells are threadlike structures called \_\_\_\_\_. They contain all the information necessary to direct the activities of a cell.
2. Human cells have a \_\_\_\_\_ that hold the cell together.
3. Every living thing is made up of \_\_\_\_\_.
4. Inside of each cell is filled with a clear, jellylike fluid called \_\_\_\_\_.
5. As cells grow, they divide and form new cells. The process of cell division is called \_\_\_\_\_.
6. The outside boundary of a cell is called a \_\_\_\_\_. Only plant cells have this.
7. The \_\_\_\_\_ contains special material that controls all the cell's activities.
8. Write a paragraph telling something you learned today that you did not already know.

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Name\_\_\_\_\_

Date\_\_\_\_\_

**THE HEART AND CIRCULATION**

Background Information: The heart is the most powerful muscle in the body. Pulse is a measure of a heartbeat. Each throb of the pulse represents one beat of the heart. The heart pumps blood throughout the circulatory system of veins, arteries, and capillaries. Every second, the heart pumps 70 ml of blood. The total number of throbs in one minute is called the pulse rate.

PROBLEM STATEMENT: Which of the following activities will be the most strenuous on the heart? Walking in place, or jumping jacks?

HYPOTHESIS:

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PROCEDURE:

1. Sit very still for three minutes, then to find your pulse.
2. Record the number of beats for ten seconds and multiply that number by 6 to get the number of beats per minute.
3. Walk in place for one minutes. At the end of one minute, find your pulse again.
4. Repeat step three for jumping jacks.
5. Record your results on the Heart Rate graph.

DATA TABLE:

|                  | PULSE<br>RATE FOR<br>10<br>SECONDS |     |   | PULSE RATE FOR<br>1 MINUTE |
|------------------|------------------------------------|-----|---|----------------------------|
| sitting          |                                    | X 6 | = |                            |
| walking in place |                                    | X 6 | = |                            |
| jumping jacks    |                                    | X 6 | = |                            |

# GRAPH YOUR RESULTS:

Round each number to the nearest 20

|                  |     |         |         |              |  |
|------------------|-----|---------|---------|--------------|--|
| Beats per minute | 260 |         |         |              |  |
|                  | 240 |         |         |              |  |
|                  | 220 |         |         |              |  |
|                  | 200 |         |         |              |  |
|                  | 180 |         |         |              |  |
|                  | 160 |         |         |              |  |
|                  | 140 |         |         |              |  |
|                  | 120 |         |         |              |  |
|                  | 100 |         |         |              |  |
|                  | 80  |         |         |              |  |
|                  | 60  |         |         |              |  |
|                  | 40  |         |         |              |  |
|                  | 20  |         |         |              |  |
|                  |     | SITTING | WALKING | JUMPIN JACKS |  |

## RESULTS:

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## CONCLUSION:

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Name\_\_\_\_\_ Date\_\_\_\_\_

### Show What You Know About the Heart

1. The heart pumps blood throughout the \_\_\_\_\_ system.
2. Every second, the heart pumps \_\_\_\_\_ of blood.
3. The \_\_\_\_\_ is the most powerful muscle in the body.
4. The pulse is a measure of a \_\_\_\_\_.
5. The circulatory system is made up of \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.
6. Each throb of the pulse represents one \_\_\_\_\_ of the heart.
7. The total number of throbs in one minute is called the \_\_\_\_\_.

Name\_\_\_\_\_ Date\_\_\_\_\_

Show What You Know About the Heart  
ANSWER KEY

1. The heart pumps blood throughout the circulatory system.
2. Every second, the heart pumps 70 ml of blood.
3. The heart is the most powerful muscle in the body.
4. The pulse is a measure of a heartbeat.
5. The circulatory system is made up of arteries, veins, and capillaries.
6. Each throb of the pulse represents one beat of the heart.
7. The total number of throbs in one minute is called the pulse rate.

Name\_\_\_\_\_ Date\_\_\_\_\_ #\_\_\_\_\_

# **SOUND**

BACKGROUND INFORMATION: Sound travels in the form of vibrations or waves. A vibration is a repeated back and forth motion. Vibrating objects make the air around it vibrate. These sound vibrations pass through the air to our ears, strike our eardrum and cause them to vibrate. Bones in the middle ear transfer the vibrations of the eardrum to the fluid filled inner ear. The movement of the fluid in the inner ear causes hair like nerve receptors in the inner ear to move. These receptor carry the message to the brain and the brain perceives these signals as sound. Although sound can travel through all different types of material, it travels better through some than others.

| Sounds we have heard.... | Ways to make sound.... |
|--------------------------|------------------------|
| 1                        | 1                      |
| 2                        | 2                      |
| 3                        | 3                      |
| 4                        | 4                      |
| 5                        | 5                      |
| 6                        | 6                      |
| 7                        | 7                      |
| 8                        | 8                      |
| 9                        | 9                      |
| 10                       | 10                     |

Use the tuning fork to listen to sounds. Describe the difference you hear between the long one and the short one.

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What happens after the hair like receptors in the air start to move?

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Tell two ways that you can cause damage to your ears and how you can prevent the damage from occurring.

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Close your eyes and listen to the world around you for five minutes. When you open your eyes, tell about what you heard. List the items you heard in the box below and then write them in paragraph form.

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Name\_\_\_\_\_ Date\_\_\_\_\_

### TESTING FOODS FOR FAT AND PROTEIN

Background Information: All foods contain chemical substances called nutrients. Nutrients have different jobs in the body. Some are fuel for the body and some are used for growth and repair of tissues. Nutrients are also involved in carrying on chemical reactions in cells. Fat and protein are two nutrients found in foods. Fats are important in fueling the body and proteins are used in building tissues. Some foods contain large amounts of some nutrients and smaller amounts of others. A brown paper bag will be used as an indicator for fat. If the food leaves a wet greasy spot on the bag, it will "indicate" that the food has fat.

**PROBLEM STATEMENT:** Which foods contain fat?

**HYPOTHESIS:** Circle the foods that you think will contain fat:

Corn egg white cooking oil peanut butter mayonnaise tuna cheese

**MATERIALS:**

Corn, egg white, cooking oil, peanut butter, mayonnaise, tuna, cheese, brown lunch bag, paper towels

**PROCEDURE FOR TESTING FOR FAT:**

1. Cut open a brown paper bag and lay it flat on the table.
2. Draw 7 circles and label each one with the foods being tested.
3. Smear each food in the circle with the name of the food and wipe it off with a paper towel.
4. Hold the bag up to the light and see which one makes a translucent greasy spot on the other side of the bag.
5. Record the items that left a grease spot on the other side of the bag. Those items contained fat.

DATA TABLE: Record each item and write yes or no to tell if it left a translucent spot.

| Item being tested | Translucent spot yes or no | Does the item have fat? |
|-------------------|----------------------------|-------------------------|
|                   |                            |                         |
|                   |                            |                         |
|                   |                            |                         |
|                   |                            |                         |
|                   |                            |                         |
|                   |                            |                         |
|                   |                            |                         |

Graph how many items contained fat and how many did not.

FAT GRAPH

|                 |   |     |        |
|-----------------|---|-----|--------|
| Number of items | 6 |     |        |
|                 | 5 |     |        |
|                 | 4 |     |        |
|                 | 3 |     |        |
|                 | 2 |     |        |
|                 | 1 |     |        |
|                 | 0 |     |        |
|                 |   | Fat | No fat |

## Fat content

**RESULTS:** Summarize your results by telling which items contained fat and which did not.

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Tell three things you learned today that you did not already know.

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Draw the items that had fat below:

**TESTING FOR CARBOHYDRATES IN FOODS**

**BACKGROUND INFORMATION:** **Sugar** and **starch** are two important substances in food. They are both **carbohydrates**. Carbohydrates are **nutrients** that are present in many of the foods we eat. Carbohydrates are fuel for our body. Tests can be done to determine whether sugar or starch are present. The simplest test for sugar is the use of chemically treated paper. The chemical on the paper is an **indicator** of sugar. When the paper is put in a sample that contains sugar, the paper will change color. Iodine is an indicator of starch. If starch is present, the iodine will change from red to blue or black.

**PROBLEM STATEMENTS: Which of the following items contain sugar?**

corn syrup, honey, milk, apple juice, candy water, ripe banana, green banana, sweet potato, white potato, lima beans, bread

**Which of the following items contain starch?**

corn syrup, honey, milk, apple juice, candy water, ripe banana, green banana, sweet potato, white potato, lima beans, bread

**HYPOTHESIS:**

I predict the following items contain sugar:

I predict the following items contain starch:

**MATERIALS:** corn syrup, honey, milk, apple juice, candy water, ripe banana, green banana, egg whites, white potato, lima beans, bread, gloves, test tubes, indicator paper

**PROCEDURE: TESTING FOR SUGAR**

1. Put small samples of the food types in separate dishes.
2. If the food is a liquid, test it for sugar by putting the chemical treated paper in each dish. Use a separate piece of treated paper for each dish.
3. Note the color on the test strip to determine if sugar is present. Record your results on the table.
4. If the food is not a liquid, add a small amount of water to the food and mash it gently to make it pasty. Then test the food and record your results on the table.

**TESTING FOR STARCH**

1. Place small amounts of the food in a test tube.
2. Add three drops of iodine to each. Use extreme caution when using the iodine.
3. If your sample changes to a blue or black color, starch is present.

## TESTING FOR CARBOHYDRATES

| FOOD                   | COLOR OF PAPER TOUCHED TO FOOD | SUGAR PRESENT? YES OR NO | COLOR OF IODINE ADDED TO FOOD | STARCH PRESENT? YES OR NO |
|------------------------|--------------------------------|--------------------------|-------------------------------|---------------------------|
| corn syrup             |                                |                          |                               |                           |
| honey                  |                                |                          |                               |                           |
| milk                   |                                |                          |                               |                           |
| apple juice            |                                |                          |                               |                           |
| candy water            |                                |                          |                               |                           |
| ripe banana            |                                |                          |                               |                           |
| egg whites             |                                |                          |                               |                           |
| white potato           |                                |                          |                               |                           |
| lima bean              |                                |                          |                               |                           |
| bread                  |                                |                          |                               |                           |
| total testing positive |                                | # _____                  |                               | # _____                   |

**RESULTS:** Tell which foods contained sugar and which contained starch

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**CONCLUSION:** Was your hypothesis correct? How many did you guess correctly in each category (sugar and starch)?

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1. What was used to test for sugar? \_\_\_\_\_

2. What was used to test for starch? \_\_\_\_\_

3. Which foods contained both sugar and starch?

\_\_\_\_\_

4. Sugar and starch are nutrients called \_\_\_\_\_.

5. Iodine is an \_\_\_\_\_ of the presence of starch.