



# ENERGY OF AN ASTRONAUT

## Student Handout

Student Name \_\_\_\_\_

This lesson will help you identify healthy food choices to keep your body at a healthy weight and learn how Calorie needs are different on Earth and in space.

During this lesson you will:

- investigate the Food Pyramid as you learn the basic needs of a well balanced diet.
- learn how different foods are categorized in the Food Pyramid.
- examine the Nutrition Facts labels including serving sizes, Calories, protein, calcium and vitamins.
- determine your own daily energy needs.
- design a five-day menu based on the Food Pyramid recommendations and your energy needs.

### Problem

How can Nutrition Fact labels be used to determine how much food I need for one day?

### Background

Good nutrition is essential for astronauts because their bodies are affected by microgravity. Studying the crew's nutritional needs before, during, and after spaceflight is an important part of maintaining astronaut health on long duration space missions. These studies will provide information on the proper food and amount of energy astronauts need to do physical activity in space.

The food you eat gives you energy, which is measured in Calories. Balancing energy from foods you eat with energy your body uses each day is important for good nutrition. Energy comes from the breakdown of larger food particles into smaller particles. A series of chemical reactions starts happening in your body resulting quick-release energy molecules [ATP]. Some foods, such as macadamia nuts, contain nearly twice as much energy as carbohydrates like bread and pasta. Eating enough Calories provides you with energy so you can complete your schoolwork. Without enough Calories, you will be tired and your muscles will not function well. Too many Calories can result in weight gain

### Discovery Lesson

#### Materials

Per class:

- computer with Internet
- painters tape
- six sentence strips
- LCD projector or overhead projector
- food items from various food groups

Per group of 3:

- Nutrition Facts labels from corn, flour, and wheat tortillas

Per student:

- Food Pyramid Data Sheet
- Fit Explorer Personal Menu Planner
- blank sheet of paper

#### Safety

- Review classroom and lab safety rules.
- No tasting or eating is allowed!

which can also be bad for your health. Proper nutrition and physical activity lead to a body that is ready to face day-to-day challenges and for astronauts the ability to face the challenges of living and working in space.

Nutrition Facts labels are great places to learn about the nutrition in the foods you eat. Check the Nutrition Facts label on your favorite packaged foods for information on serving size and the number of servings in each package. The Nutrition Facts label also provides information on the Calories per serving. Nutritionists and food scientists at NASA also consult Nutrition Facts labels for serving sizes, Calories, nutrients like carbohydrates, proteins, fat, vitamins and the mineral, Calcium, and Percent Daily Values (%DV) of the foods the astronauts eat in space.

Brainstorm with your group about energy needs. Calories are units of energy. Make observations about Calories following your teacher's instructions.

Use the first column of this KWL chart to organize your observations about energy in Calories.

Brainstorm with your group what you want to know about energy in Calories, and then record your list in the second column of the KWL chart.

KNOW	WANT TO KNOW	LEARNED

### Problem and Hypothesis

Based on what you know, the materials you will be using, and predictions about what you will be learning answer the problem question with your best guess.

**Problem:** How can Nutrition Fact labels be used to determine how much food I need for one day?

Your hypothesis should be written as a statement.

My Hypothesis: \_\_\_\_\_

### Let's Investigate the Food Pyramid

- 1) On a blank sheet of paper, write down what you ate for breakfast, lunch, and dinner yesterday. Include any snacks you had during the day. Label this page *Yesterday's Meal Plan*.
- 2) As a class, investigate the Food Pyramid by going to [http://www.choosemyplate.gov/global\\_nav/media\\_archived.html](http://www.choosemyplate.gov/global_nav/media_archived.html).
- 3) Fill out the Food Pyramid Data Sheet. Label each food group and write examples of food that would represent each group.
- 4) Use your completed Food Pyramid Data Sheet to help your class complete the Floor Food Pyramid.
- 5) Your teacher will have food items available for the class. Place these food items in the appropriate food group on the Food Floor Pyramid.

- 6) Continue until all available foods are placed in categories.
- 7) Discuss with your class the importance of healthy, balanced meals.
- 8) Revisit *Yesterday's Meal Plan*.
- 9) Answer these questions about your meal plan food choices.
  - Do you believe you made good food choices?
  - What are some healthy food choices that you made?
  - Why is it important to eat nutritious foods?
  - If you were to become an astronaut and go into space, would you need a balanced diet?
  - What would your food menu look like if you traveled to space?

### **Let's Talk About Calories**

- 10) Read and think about the following questions and discuss with your group.
  - What is a Calorie?
  - How are Calories and energy related?
  - Why do some people count Calories in foods?
  - What will happen if we eat too many Calories in one day?
  - Do astronauts in space require more or less Calories than we do here on Earth?
- 11) Calculate the amount of Calories of energy recommended for your particular daily needs using the *Daily Calorie Requirements* handout.
- 12) Record your own energy needs in Calories on the back of the Food Pyramid Data Sheet.

### **Let's Investigate Food Labels**

- 13) As a group, inspect the three different types of tortilla packages including flour, wheat, and corn.
- 14) As a group, examine the Nutrition Facts labels on the tortilla packages.
- 15) Record your data on the Tortilla Nutrition Fact Sheet.
- 16) Place tortillas in order by number of Calories. Record on the Tortilla Calorie Fact Sheet.
- 17) Read the following and discuss with your group.

Food energy is measured in Calories. Energy for your body comes from food. If you eat more Calories than your body needs, the extra Calories are converted into fat. Eating the correct servings in your meals will prevent consuming extra Calories. You need the same food serving sizes and Calories in space that you need on Earth.

Answer the following questions about Calories.

- What do serving sizes have to do with energy needs?
- What happens if you eat too many Calories?
- What happens if you eat too few Calories?

## Record Data

### Tortilla Calories Fact Sheet

Complete the chart below using the Nutrition Facts label.

	Flour	Wheat	Corn
Serving Size			
How Many Servings per Package			
Calories per Serving			

Place tortillas in order of lowest Calories to highest Calories.

Tortillas	Calories

## Study Data

After collecting all data, **study data** by answering the following questions.

1. Which tortilla would be the most nutritious? Least nutritious? Why?
2. Which tortilla do you think is the best choice for a meal in space? Why?
3. If you would go into space what would you put in your tortilla and what type of tortilla would you eat? Why?
4. What else besides Calories of energy should you think about in planning food menus? (Hint: Look at the Nutrition Facts labels on several different types of foods and think about the Food Pyramid.)

## Conclusion

- Fill in the LEARNED column in the KWL chart.
- Give your best complete sentence answer to the problem/question on page 2 based on what you learned in your investigations and menu-planning activities. Does this answer agree with your hypothesis now that you have more information? If not, what is different?

# Scientific Investigation Rubric

**Experiment:** Energy of an Astronaut

Student Name \_\_\_\_\_

Date \_\_\_\_\_

<b>Student Performance Indicator</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
Developed a clear and complete hypothesis.					
Followed all lab safety rules and directions.					
Followed the scientific method.					
Recorded all data on the data sheet and drew a conclusion based on the data.					
Asked engaging questions related to the study.					
Designed a meal plan that followed the recommendations of the food pyramid.					
<b>Point Total</b>					

4 = Excellent/Complete/Always follows directions/Organized

3 = Good/Almost complete/Almost always follows directions/Usually organized

2 = Average/About half done/Sometimes follows directions/Sometimes organized

1 = Poor/Incomplete/Rarely follows directions/Disorganized

0 = No work/Didn't follow directions/Interfered with work of others

**Grading Scale:**

A = 22 - 24 points

B = 19 - 21 points

C = 16 - 18 points

D = 13 - 15 points

F = 0 - 12 points

**Point total from above:** \_\_\_\_\_ **(24 possible)**

**Grade for this investigation** \_\_\_\_\_