ENERGY OF AN ASTRONAUT

Educator Section

Introduction

Astronauts living on the International Space Station (ISS) need balanced meals to meet their energy and health needs while in space. Food scientists and nutritionists at NASA ensure that astronauts eat balanced meals in space by consulting the Nutrition Fact labels and studying the nutritional needs of astronauts before food is packaged for both short and long duration spaceflight. Based on the environment of space and the conditions of microgravity, planning the astronauts dietary needs can be challenging.

Living and working in a reduced gravity environment will change an astronaut's nutritional needs. By studying specific nutritional needs of astronauts on the ISS, food scientists can learn what is needed for good nutrition on long duration space exploration. For example, bone loss caused by the microgravity of spaceflight requires an additional intake of vitamin D during long missions. Food scientists and nutritionists must plan menus that will keep the astronauts' bodies nourished and healthy while working in space. Astronauts help in the planning of their menus by participating in food tasting panels on Earth before their missions to the ISS. This helps the food scientists and nutritionists target astronaut preferences while planning balanced menus.

One of the most popular food items on an astronaut's menu during spaceflight is the flour tortilla. Tortillas contain large amounts of carbohydrates that the body needs to function. In addition, tortillas are easily stored, and do not produce crumbs. Too many crumbs can get into the ISS or space shuttle's equipment or experiments. Floating crumbs can even be dangerous if they float into an astronaut's eyes, nose, or mouth.

Lesson Objectives

- Students will investigate the Food Pyramid as they learn the basic foods of a well balanced diet.
- Students will learn how different foods are categorized in the Food Pyramid.
- Students will examine the Nutrition Facts labels including serving sizes and Calories.
- Students will determine their daily energy needs.
- Students will design a five-day menu based on the Food Pyramid recommendations.

Discovery Lesson

Grade Level: 3-5

Connections to Curriculum: Science and Health

Science Processing Skills: predicting, observing, comparing, gathering, recording data (American Association for the Advancement of Science)

Teacher Prep Time: 30 minutes

Lesson Duration: Three 45-minute sessions

National Education Standards: Science and Health

National Wellness Initiative: This activity supports the federally mandated Local Wellness Initiative and may support your Local Wellness Plan.

Materials Required:

Nutrition Facts labels from corn, flour, and wheat tortillas (1 of each per group of 3)

computer with Internet

painters tape

sentence strips

food packaging from the six food groups

LCD projector or overhead projector

blank sheet of paper

Problem

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

Learning Objectives

The students will:

- investigate the Food Pyramid and the basic foods that make up a balanced diet and their daily energy needs.
- examine a Nutrition Facts labels for serving size and Calories, protein, calcium and vitamins.
- determine their own daily energy needs.
- create a five-day menu based on Food Pyramid recommendations and their own dietary needs.

Materials

Per class:

- computer with Internet access
- LCD projector or overhead projector
- painters tape
- six sentence strips
- food packaging from the six food groups

Per group of 3 students:

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

Per student:

- Energy of an Astronaut Student Handout
- Food Pyramid Data Sheet
- Fit Explorer Personal Five-Day Menu Planner
- blank sheet of paper

Safety

Remind students of the importance of classroom and lab safety. A no tasting rule in the science lab should be strictly enforced.

Pre-lesson Preparation

- Divide class into groups of 3–4 students.
- Prepare the Food Pyramid Data Sheet (Appendix D).
    - Make copies of the Food Pyramid Data Sheet for each student in the classroom.
    - Project the Food Pyramid on a screen or white wall for the whole class to view.
- Make a Floor Food Pyramid.
    - Use painters tape to create a Food Pyramid on the floor.
    - Write Food Pyramid group names on sentence strips. Use the following food group categories for the sentence strips. Write large enough to read the food group name from a distance.
        - Grains
        - Vegetables
        - Fruits

- Milk
- Meat and Beans
- Oils

  Oils is not a food group, but it's important for good health. Get your oils from fish, nuts, and liquid oils such as olive oil, soybean oil, and canola oil.

- Prepare a working space for each group containing group materials.
- Print the Fit Explorer Personal Five-Day Menu Planner (Appendix F).

Lesson Development

To prepare for this activity, the following educator background information is recommended:

- Read and learn about the Food Pyramid and students' basic needs at the following website: http://www.choosemyplate.gov/global_nav/media_archived.html.
- Read about the energy needs of astronauts in the Space Nutrition Newsletter found at: http://www.nasa.gov/centers/johnson/pdf/511989main_vol4iss2.pdf.
- Read how to calculate energy needs here: http://www.nasa.gov/centers/johnson/pdf/511989main_vol4iss2.pdf.
- Read how to calculate the amount of Calories students should eat per day at: http://pediatrics.about.com/library/bl_calorie_calc.htm.
- Read how the space environment affects Calorie requirements here: http://spaceflight.nasa.gov/spacenews/factsheets/pdfs/food.pdf.
- Read the following text taken from the Observation Section of the Energy of an Astronaut Student Handout.

  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 in quick-release energy molecules [ATP]. ATP (adenosine triphosphate) molecules easily lose their third phosphate group. With the loss of this phosphate group, ATP –as it becomes ADP- release a lot of energy which is available for the many needs of the body (working, exercising, walking, sleeping, eating, breathing, and growing). 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 to be prepared 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 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.

- If needed, additional research can be done on the following topics:
  - nutritional requirements in space
  - space exploration
  - spaceflight countermeasures
  - energy needs of humans

Instructional Procedure

Throughout this lesson, emphasize the steps involved in the scientific method. These steps are identified in ***bold italic*** print throughout the Instructional Procedure Section.

1. Review the scientific investigation rubric with your class. This performance rubric is located in Appendix G at the end of the educator section.
2. Introduce the lesson objectives and learning objectives to the students.
3. Remind your students that they will act like NASA nutritionists as they research and plan meals that meet the required daily energy needs of astronauts (and students like themselves who may one day become astronauts).
4. Review the ***problem*** with the students, "How can Nutrition Fact labels be used to determine how much food I need for one day?"
5. Review the *Energy of an Astronaut* Glossary with your class. (Appendix C)
6. Have the students read the Background Section in their *Energy of an Astronaut* Student Handout and discuss what they read in their groups. Use your own technique to check for comprehension of the observation section.
7. Have the students discuss with their group what they know about energy needs in Calories by completing the first two columns in the KWL (KNOW/WANT TO KNOW/LEARNED) chart in the *Energy of an Astronaut* Student Handout. Use the KWL chart to help students organize prior knowledge, identify interests, and make real world connections. As students suggest information for the KNOW column, ask them to share how they have come to know this information.
8. Ask the students if they have predictions relating to this activity and the ***problem*** question. Help them refine their predictions into hypotheses***.*** In the student handout, they should re-state the problem based upon what they know, the materials they will be using, and predictions about what they will be learning. As they formulate a hypothesis, encourage students to include verbs from their page 1 bulleted learning objectives. Have students share their hypotheses in their groups.
9. Students will ***test*** their hypotheses following this procedure.

   *These steps w*ere take*n from the Energy of an Astronaut Student Handout.* Educator specific comme*nts are in italics.*

Let's Investigate the Food Pyramid

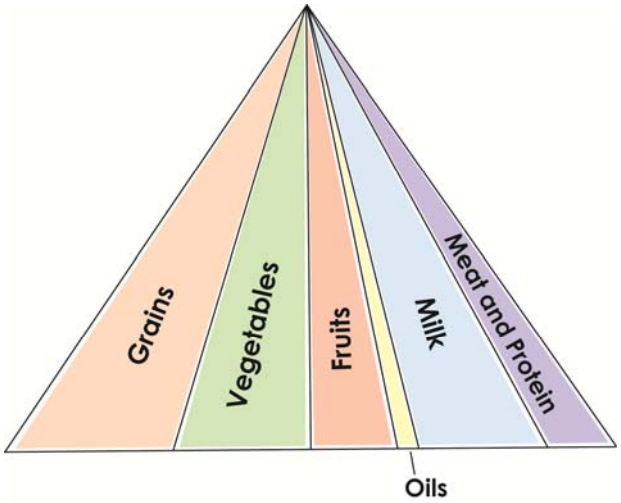
1) On a blank sheet of paper, write down what you ate for breakfast, lunch, and dinner yesterday. Include any snacks you had during the day.
2) As a class, investigate the Food Pyramid by going to http://www.choosemyplate.gov/global_nav/media_archived.html.

   Display a picture of the Food Pyramid for the entire class to see. Give each student a Food Pyramid Data Sheet.

3) Fill out the Food Pyramid Data Sheet. Label each food group and write examples of food that would represent each group.

Briefly discuss the food groups. For example, have them write grains in the appropriate category. Then ask the students what type of food would be considered grains and write one answer in the grain category. Repeat this process for the other food groups.

Use the Food Pyramid graphic provided below to check for placement accuracy of the food pyramid categories. Keep in mind we need more servings of certain food groups than others.



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.

Have several types of food items available for students to place in the appropriate category on the Floor Food Pyramid.

6) Continue until all available food is placed in a category.

7) Discuss with your class the importance of healthy, balanced meals.

Lead a discussion with the students about the importance of healthy, balanced meals.

8) Revisit *Yesterday's Meal Plan*. Have one student at a time read off their food choices from *Yesterday's Meal Plan.*

9) Answer the following questions about your food choices on the back of your paper.

Discuss these questions with the class.

- Do you believe you made good food choices?
- What are some healthy food choices that you made?
- Why is it important to eat healthy?
- 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 class.

- What is a Calorie?
- How are Calories are units of 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 Calorie and energy needs on the back of the Food Pyramid Data Sheet.

Have students use a method to calculate their Daily Calorie Requirements using the handout with the same name (Appendix E).

Let's Investigate Food Labels

Divide students into groups.

13) As a group, inspect three different types of tortilla packages including flour, wheat, and corn.

14) As a group, investigate the Nutrition Facts label on the tortilla package.

15) Record your data on the Tortilla Nutrition Fact Sheet.

Display the Tortilla Nutrition Fact Sheet on the white board or computer for the students to see. Include the answers to the questions. The students will be able to see the information broken down for each type of tortilla.

Students will refer to the Nutrition Facts label on the tortilla packages to complete their Tortilla Nutrition Fact Sheet.

16) Place tortillas in order from most nutritious to least nutritious. Record on the Tortilla Nutrition 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 number of servings and correct serving size for your meal will prevent consuming extra Calories. Serving sizes and Calorie counts are the same on Earth as in space.

Answer the following questions about Calories.

- What do serving sizes have to do with energy needs?

  Your energy in Calories comes from the food you eat. The Nutrition Facts labels tell you how many Calories are in a serving and how many servings are in a package. To determine the total Calories you consumed, figure out how many servings you ate and multiply that by the Calories per serving.

  In other words, consuming multiple servings results in more Calories of energy (which may be used or get stored as fat).

- What happens if you eat too many Calories?

  Excess Calories eaten will be stored in the body as fat.

- What happens if you eat too few Calories?

If too few Calories are eaten, then your body will not have the proper energy to perform daily tasks. You may feel tired, weak, or dizzy.

Ask these additional open-ended questions about food to the groups.

- *Will it matter if you eat more or less than the serving amount on the label? Why?*

  A variety of foods leads to a healthy diet. In addition, eating more than one serving of a food will raise your Caloric intake. Too many Calories consumed, and not enough physical activity may result in being overweight.

- *How will knowing the serving size for flour tortillas help you make food decisions?*

  Serving sizes are considered the normal amount to eat, but sometimes you know you need more energy because you skipped a meal or worked or played twice as long as usual. And sometimes you're hungry because you're growing and producing more body tissues (bones, muscles, etc.). It is smart to ask yourself if you're hungry before you eat, instead of just eating extra servings because they're there. It's wise to think about what and how much you eat-especially if you're training like an astronaut!

- *How do astronauts meet their energy needs?*

  Astronauts meet their energy needs the same as you do, by maintaining proper nutrition.

- *What happens to food when it enters your body?*

  Some of the energy will be used to keep you warm, some will be used to help you grow new bone and muscle tissue, and some will be used to help you think, work, and play.

- *What does your body use as fuel? Why does your body need this fuel?*

  Your body uses food as fuel. Your body needs fuel to function properly as you participate in physical activities such as running, skating, or playing sports. This fuel (or food) also helps keep you warm when it's cold out.

Let's Plan a Personal Five-Day Menu

10. Have students plan a five-day menu following the Food Pyramid recommendations for their age group according to their Calorie needs.
    - Students will complete the Fit Explorer Personal Five-Day Menu Planner based on the knowledge they have acquired from their food pyramid and food labels investigation.

11. Have students record meals and snacks each day. Ask students the following questions after they have completed their Fit Explorer Personal Five-Day Menu Planner.
    - How can Nutrition Fact labels be used to determine how much food I need for one day?
    - What was your target Calorie consumption for one day?
    - Did you stay within your Calorie target each day? If not what challenges did you face?
    - What was the hardest part of planning your meals for a week?
    - Do you think exercise plays a part in the amount of Calories you need during a week? If so, how?
    - In your meal plan, did you eat foods from the five food groups every day? Was it easy or hard to include food from the five foods groups each day?

- If you were going into space for a week, do you think your menu would change?
- Review a weekly cafeteria menu from your school. Is the cafeteria serving a balanced menu each day? Are you being offered foods from all the groups in the Food Pyramid?

Conclusion

- Discuss the answers to the Study Data questions in the Energy of an Astronaut Student Handout.
- Have students update the LEARNED column in their KWL chart.
- Have students restate their hypotheses and explain how they calculated the amount of energy they take in every day versus the amount of energy they use. How many Calories should they be taking in each day to be healthy students?
- Prompt students to ask questions following the activity.
- Encourage students to design their own two-week menu for a trip into space.
- Have students discuss in their groups what changes they need to make to their diets to be considered fit enough to be future astronauts.

Assessment

- Assess student knowledge through questioning.
- Assess student understanding by administering the Energy of an Astronaut Quiz. (Appendix A)
- Observe and assess student performance throughout the activity using the Scientific Investigation Rubric found in the Energy of an Astronaut Student Handout and Appendix G.

Activity Alignment to National Education Standards

National Science Education Standards (NSES):

Content Standard F: Science in Personal and Social Perspectives

- Personal health (K-8)

National Health Education Standards (NHES) Second Edition (2006):

Standard 1: Students will comprehend concepts related to health promotion and disease prevention to enhance health.

As a result of health instruction in grades 3 through 5, students will:

- 1.5.1 Describe the relationship between healthy behaviors and personal health.

Standard 5: Students will demonstrate the ability to use decision making skills to enhance health.

As a result of health instruction in grades 3 through 5, students will:

- 5.5.1 Identify health related situations that might require thoughtful decision.

Standard 7: Students will demonstrate the ability to practice health enhancing behaviors and avoid or reduce health risks.

As a result of health instructions in grades 3 through 5, students will:

- 7.5.1 Identify responsible personal health behaviors.
- 7.5.2 Demonstrate a variety of healthy practices and behaviors to maintain or improve personal health.

Curriculum Explorations

Language Arts Exploration

Ask students to explain the investigation. How might students improve this investigation? Where might there have been mistakes made? How might these mistakes have affected their results?

National Council of Teachers of English Standards (NCTE):

- Students conduct research on issues and interests by generating ideas, questions, and posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and non-print texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience.

Science Exploration

Have student's explore meal plans for an astronaut on a space shuttle mission. Do they have balanced meals? Are they eating foods from all the food groups in the Food Pyramid? Do astronauts in space require more or less Calories than we do here on earth? You may download a copy of an astronaut menu at: http://www.nasa.gov/pdf/452917main_sts132_menu_antonelli.pdf.

Have students review a weekly cafeteria menu from their school. Are they being served a balanced menu during their school day? Are they being offered foods from all the groups in the Food Pyramid? How many Calories are they getting on their school menus?

Career Links

Subject matter experts Dr. Scott Smith, Dr. Sara Zwart, Dr. Michele Perchonok, and Vickie Kloeris contributed to this NASA Fit Explorer activity. Learn more about each of them at the websites below their job descriptions.

Dr. Scott M. Smith is the Scientific Lead for the Nutritional Biochemistry Lab at the NASA Johnson Space Center in Houston, TX.. http://spaceflight.nasa.gov/shuttle/support/people/ssmith.html

Dr. Sara R. Zwart is a Research Scientist at the Nutritional Biochemistry Laboratory at the NASA Johnson Space Center in Houston, TX. http://www.dsls.usra.edu/zwart.html

Dr. Michele Perchonok is the Shuttle Food System Manager and the Advanced Food System Lead at the NASA Johnson Space Center.
http://www.nasa.gov/audience/formedia/presskits/spacefood/biographies.html

Vickie Kloeris is the ISS Food System Manager at the NASA Johnson Space Center.
http://www.nasa.gov/pdf/64770main_ffs_bio_kloeris.pdf

Educator and Student Resources

Web resources:

This online archive of Frequently Asked Questions (FAQs) offers background information on nutrition in space. http://www.faqs.org/nutrition/Smi-Z/Space-Travel-and-Nutrition.html

This NASA educational product is a Space Food and Nutrition Educators Guide.
http://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/Space_Food_and_Nutrition_Educator_Guide.html

This NASA resource from the Nutritional Biochemistry Lab at the NASA Johnson Space Center in Houston, TX provides Space Nutrition Newsletters for kids.
http://www.nasa.gov/centers/johnson/slsd/about/divisions/hacd/education/kids-zone.html

This NASA resource offers a Space Food and Nutrition Gallery. http://www.nasa.gov/audience/formedia/presskits/ffs_gallery_sfn.html

This U.S. Food and Drug Administration website offers an interactive web program to Make Your Calories Count. http://www.cfsan.fda.gov/~ear/hwm/labelman.html

The U.S. Food and Drug Administration offer this Nutrition Facts Label Brochure. http://www.cfsan.fda.gov/~acrobat/nutfacts.pdf

This interactive web site for kids provides nutrition facts. www.SpotTheBlock.com

Kids Health. http://kidshealth.org/kid/

Books:

Liakos Evers, Connie: ***Good for You.*** Disney Learning, 2006.ISBN 0786847484. Ages 6-10. Combines basic health facts and a playful format of games, recipes, quizzes, and trivia designed to assess children's knowledge of proper nutrition and guide them to a lifetime of good health.

Leedy, Loreen: ***The Edible Pyramid, Good Eating Every Day.*** Holiday House, 1994. ISBN 0-8234-1126-5. Ages 4-10. The mustached feline waiter shows his customers the delicious foods available in a brand new restaurant shaped exactly like a pyramid. Each section of the USDA Food Guide Pyramid is explored, with vivid illustrations of pasta, grain, fruit, vegetables, meats, nuts, dried beans, and other goodies.

VanCleave, Janice: ***Food and Nutrition for Every Kid.*** Wiley, John and Sons, Inc., 1999. ISBN: 0-47-117665-6, Age: 8-12 years. Through fun, safe, and easy-to-do experiments, kids learn all about food and nutrition. Each experiment is broken down into a purpose, list of materials, step-by-step instructions, expected results, and explanations that kids can understand. They will explore why different sweeteners vary in sweetness, how to use natural food dyes to dye a T-shirt, and what the Food Pyramid is plus much more.

This hands-on activity was developed in collaboration with the United States Food and Drug Administration Education Team.

Lesson development by the NASA Johnson Space Center Human Research Program Education and Outreach team.

Energy of an Astronaut Quiz

Answer the following questions about the Energy of an Astronaut activity.

1. Where do Calories of energy come from? How do our bodies use these Calories?

2. When astronauts are living and working in space they need the proper food and amounts of energy, just as you do when performing your daily tasks and schoolwork on Earth. Are the nutritional requirements of an astronaut on orbit the same as when they are on Earth? Explain.

3. List two things that you can learn from a Nutrition Facts label. How can you use this information when planning menus? How can the scientists in food labs at NASA use this same information?

4. Why is it important to know how many Calories are in a serving size and how many servings you eat?

5. Compare the energy needs of astronauts in space to their energy needs on Earth.

6. What happens when we consume too many Calories? Too few?

7. What recommendations for providing astronauts with proper foods and amounts of energy do you have for NASA? [Hint: Give several healthy food choices.]

Energy of an Astronaut Quiz Answers

1. **Where do Calories of energy come from? How do our bodies use these Calories?**

   Calories come from food. Our bodies use the Calories for physical activity, mental function, and new tissue growth.

2. **When astronauts are living and working in space they need the proper food and amounts of energy, just as you do when performing your daily tasks and schoolwork on Earth. Are the nutritional requirements of an astronaut on orbit the same as when they are on Earth? Explain.**

   The observation portion of the student section may be used as a reference.

3. **List two things that you can learn from a Nutrition Facts label. How can you use this information when planning menus? How can the scientists in food labs at NASA use this same information?**

   Refer to the Nutrition Facts label for various answers.

4. **Why is it important to know how many Calories are in a serving size and how many servings you eat?**

   You need to eat close to the daily recommended Calories of energy each day for your size, age, and gender (boy or girl) so that you'll have enough energy to stay warm, walk, grow, and perform your other daily activities, including: doing sports, helping at home, and doing homework assignments. Even thinking takes energy! If you eat more Calories than you need, these may be stored as fat (we all have some fat in our bodies). If you don't eat enough Calories, you might feel tired, weak, or dizzy. Since you haven't eaten for several hours while you're sleeping (Yes, you burn Calories even sleeping!), it's especially important to eat breakfast every morning.

5. **Compare the energy needs of astronauts in space to their energy needs on Earth.**

   Although scientists are studying nutritional needs of astronauts for long duration space exploration, astronaut's caloric needs are more or less the same on Earth as they are in space.

6. **What happens when we consume too many Calories? Too few?**

   If you eat too few Calories, you will not have sufficient energy. If you eat too many Calories, your body will store them in the form of fat.

7. **What recommendations for providing astronauts with proper foods and amounts of energy do you have for NASA? [Hint: Give several healthy food choices.]**

   Answers will vary.

Energy of an Astronaut Glossary

Calorie	A unit of how much energy food has. Keep in mind that big “C” Calories in food are actually kilocalories, or 1000 little “c” calories. Nutrition facts labels use Calories. Scientist use calories and kilocalories.
energy	The ability to do work. The unit of energy from food is the Calorie.
Nutrition Facts label	The label required on most pre-packaged foods.
portion size	The amount of a single food consumed at any one time. A portion may contain one serving, more than one serving, or less than one serving. This depends on the consumer’s need or want. Selected “portions” are not comparable, but clearly defined “serving sizes” are.
serving size	A standardized amount of a food, such as a cup or an ounce, used in planning menus. Serving size is useful in making comparisons between types of foods.
unit	The amount of something, or the word that goes after a number. Some units of distance or length are inches, feet, centimeters, and meters. Some units of money are dollars and cents. Some units of energy are Calories, calories, and kilocalories.

Energy of an Astronaut Glossary (Continued)

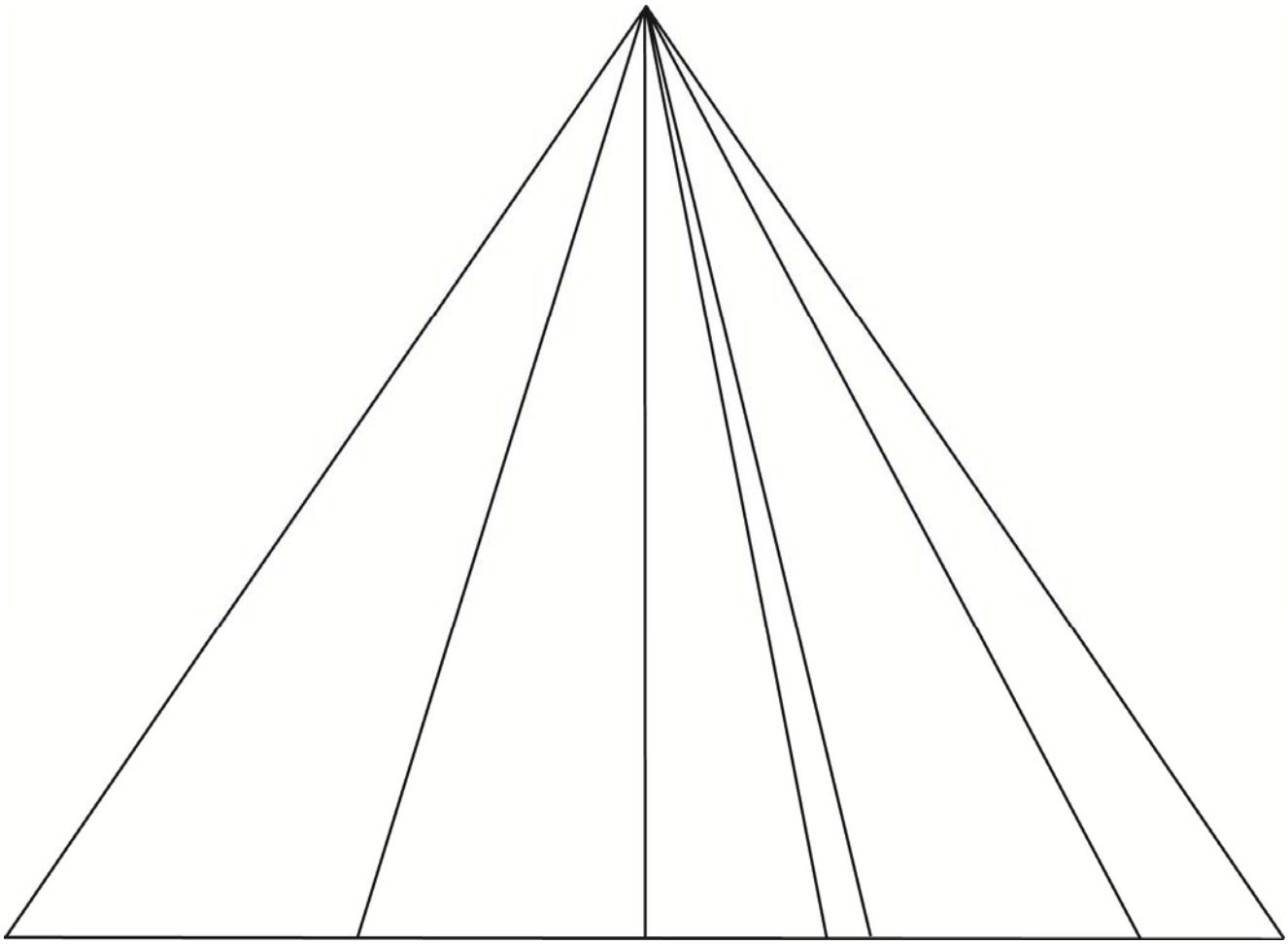
problem	A question to be investigated.
hypothesis	An educated guess to answer a problem/question.
countermeasures	Steps taken (measures) to prevent (counter) something. Eating properly to avoid getting sick is a countermeasure.
microgravity	Very little apparent gravity experienced in space.
Scientific Method	A method of investigation involving observation and theory to test scientific hypotheses.
nutrition	Food or nourishment needed to keep an organism growing, healthy and viable.

Name _____

Food Pyramid Data Sheet

Directions:

1. Number from 1 to 6 and fill in the name of each of the 6 food groups (e.g. 1-Grains)
2. Obtain pencils or crayons and color each section a different color.
3. List 3 examples of different foods in each category on either side of the Food Pyramid under the category name.



Daily Calorie Requirements

Use one of the calorie intake calculating methods below. You may choose the method that best fits your student population.

- Calorie Intake suggestions for children from the Institute of Medicine, Food and Nutrition Board: Dietary reference intakes for energy and the macronutrients, carbohydrates, fiber, fat, fatty acids, cholesterol, protein and amino acids, Washington D.C. 2002, National Academy Press.

  Calorie = 1000 calories or 1 kcal

  Most people are referring to Calories, but scientists usually talk about calories or kcal.

Daily Dietary Reference Intakes

	Males (kcal)	Females (kcal)
3-8 years	1742	1642
9-13 years	2279	2071

- The Mifflin formula can be used to calculate daily Calorie needs.

  Daily Calorie Needs of Males =

  10 x weight in kg + 6.25 x height in cm – 5 x age in years + 5

  Daily Calorie Needs of Females =

  10 x weight in kg + 6.25 x height in cm – 5 x age in years – 161

- Below are two references for youth Calorie calculators

  http://www.freedieting.com/tools/calorie_calculator.htm

  http://pediatrics.about.com/library/bl_calorie_calc.htm

Name _____ Appendix F

Fit Explorer Personal Five-Day Menu Planner

My Daily Calorie Requirement: _____

	Breakfast	Lunch	Dinner	Snacks	Daily Calories
Monday					
Tuesday					
Wednesday					
Thursday					
Friday					

1. List several different food servings in each box to create appetizing and nutritious meals and snacks. Use colorful foods that you like, but that are healthy.
2. Make sure you include food choices from all parts of the Food Pyramid every day, if not at every meal."
3. Include the Calories of each serving after the food (check the Nutrition Facts labels). Make a list in pencil of all the food serving Calories each day. Add up the Calories for each day. NOTE: A computer spreadsheet program like Microsoft Excel or Microsoft Works can help make this easy math! For each day, make a table with the kinds of food in column 1 and the Calories in column 2, then use "sum" to add the Calories. Your teacher can show you how to make a spreadsheet. It's fun!
4. Did your total Calories in each day's food servings come within 200 Calories of your daily Calorie requirement?

Scientific Investigation Rubric

Investigation: Energy of an Astronaut

Student Performance Indicator	0	1	2	3	4
Developed a clear and complete hypothesis.	Made no attempt at developing a clear and complete hypothesis.	Made very little attempt at developing a clear and complete hypothesis.	Developed a partial hypothesis.	Developed a complete but not fully developed hypothesis.	Developed a clear, complete hypothesis.
Followed all lab safety rules and directions.	Followed no lab safety rules.	Followed one lab safety rule.	Followed two or more lab safety rules.	Followed most of the lab safety rules.	Followed all of the lab safety rules.
Followed the scientific method.	Followed none of the steps to the scientific method.	Followed one of the steps to the scientific method.	Followed two or more of the steps to the scientific method.	Followed most of the steps to the scientific method.	Followed all of the steps to the scientific method.
Recorded all data on the data sheet and drew a conclusion based on the data.	Showed no record of data and no evident conclusion.	Showed one record of data collection and did not complete the conclusion.	Showed two or more records of data collection and showed a partial conclusion.	Showed most data recorded conclusion-nearing completion.	Showed all data recorded and a complete conclusion.
Asked engaging questions related to the study.	Asked no engaging questions relating to the study.	Asked one engaging question relating to the study.	Asked two engaging questions relating to the study.	Asked three engaging questions relating to the study.	Asked four or more engaging questions relating to the study.
Answered the study data questions following the activity.	Did not answer the study data questions.	Began the study data questions.	Had the study data questions partially completed.	Had the study data questions nearly complete.	Had a completed set of study data questions.
Point Total					

4=Excellent/Complete/Always follows directions/Organized

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

2=Average/About half done/Sometimes/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