

Human Metabolism

Real World Energy
Learner Activity Instructions
Grade Level: 9-12



What you will learn:

You will investigate the composition of a variety of food items through a variety of tests. You will also observe a test that finds the heat content (energy) of food items.

What you will need:

For both parts of this activity, you will need to print the learner worksheet and backgrounder (or ask your educator to print it for you).

Part 1:

Children's thermometers (with the glue strip on the back) or Aquarium thermometers (one for each learner pair group).

Background

Part 1:

Muscles store glycogen for later use as a source of energy. During exercise and the metabolic process, heat energy is released. To get a more visible change in temperature, use the triceps in the investigation.

Part 2:

The body is a balance between energy consumed through food and energy used through normal daily activities. To find the balance between the amount of calories taken in must be determined, as well as the amount of calories used in daily activities. To keep the balance, intake calories should equal the calories used. Another factor that affects the body balance is metabolic rate. Metabolic rate refers to the speed at which energy is released by the body.

How to do it

Part 1:

1. Choose a partner to work with on this investigation.
2. Obtain materials from the list above.
3. Select one learner to record observations and one to do the physical activity.
4. Remove the paper strip from the back of the thermometer and place it on the back part of the upper arm (triceps). Place it on a part that has the least amount of hair.
5. Record the resting temperature.
6. Have the learner complete intense physical activity for 10 minutes (jumping jacks, running on the spot, standing push-ups against a wall, etc., increasing and decreasing the speed in intervals).
7. After 10 minutes, measure the temperature of the triceps and record it.
8. Continue to record the temperature in 5-minute intervals for 15 minutes after the physical activity. Record the temperature at each interval.
9. When you have completed your observations, gather your equipment and return it to your instructor.

Part 2:

1. List what you ate in the last two days. Remember to include the amount of each food you ate (e.g., three pieces of toast).
2. Compare what you ate to the recommended servings outlined in the Canada Food Guide.

3. Compare what you ate to what is considered a balanced diet.
4. Investigate the areas that need changes to make sure you have a balanced diet.
5. Use the charts below to recommend a balance between calories coming into your body through eating and calories going out from doing daily activities.

Calories used per minute	
Activity	Estimated calories used (cal./min.)
Sleeping	1.2
Watching TV	1.5
Class work (sitting)	1.5
Talking	1.2
Driving car	2.0
Eating	2.5
Standing	2.5
Walking	3.0
Driving motorcycle	3.0
Baseball	3.5
Golf	5.0
Dancing (fast)	5.5
Cycling (14 kph)	7.0
Running slow	10.0
Football	12.5
Jogging	12.5
Hockey	14
Running fast	14.5
Skiing (fast)	17.0

Source: Adapted from the University of Saskatchewan's food nut program.

Calories for common foods per serving		
Food Item	Serving Size	Calories per Serving
Milk	250 mL / 1 cup	160
Skim milk	250 mL / 1 cup	90
Soy milk	250 mL / 1 cup	81
Apple juice	250 mL / 1 cup	115
Ice cream	125 mL / 1/2 cup	135
Low-fat yogurt	175 g / 3/4 cup	139
Margarine	10 g / 2 tsp	73
Light cream cheese	30 g / 2 tbsp	65
Mayonnaise	15 mL / 1 tbsp	100
Cheddar cheese	50 g	200
Mozzarella cheese	50 g	150

Peanut butter	30 g / 2 tbsp	95
Jam	15 mL / 1 tbsp	50
Pita bread	1 pita	170
White bread	1 slice	65
Whole wheat bread	1 slice	70
Bagel	1	200
Bran type cereal	2 tbsp / 30 g	90
Eggs	1	80
Banana	1	105
Orange	1	60
Apple	1	80
Peach	1	35
Carrots (raw)	1 carrot	30
Celery	1 stalk	5
Cucumber	6 large slices	5
Lettuce	1 wedge	20
Tomato	1 tomato	25
Potato	1 baked potato	220
Rice (brown)	1 cup	230
Rice (white)	1 cup	225
Beef (cooked)	1 piece	325
Steak	3 oz.	240
Ground Beef	3 oz.	245
Ham	2 slices	105
Bacon	3 medium slices	110
Bologna	2 slices	180
Salami	2 slices	145
Chicken drumstick	1 drumstick	195
Roasted chicken breast	1 piece	140
French fries	10 strips in oil	160
French fries	10 strips in oven	110
Chocolate bar	1 bar	150
Cheesecake	1 piece	280
Italian salad dressing	1 tbsp	80
McDonald's Cheeseburger	1 burger	320
McDonald's Big Mac	1 burger	560
McDonald's large fries	1 large fries	450
Arby's Beef n' Cheddar	1	507
KFC Chicken Breast	1	400

Source: Nutrition Essentials and Diet Therapy, by Nancy J. Peckenpaugh, Charlotte M. Poleman, and Maura Connor, Philadelphia: Saunders, 1991.