

Activity 2.2: Reading Nutrition Labels Handout

The cells of animals, plants, and decomposers are all made mostly of:

- Water, and
- Large organic molecules: Fats, proteins, and carbohydrates

Here's how to use nutrition labels to find out about different kinds of cells. We'll use carrots as an example.

Calories measure the amount of energy in the bonds of the carrot's organic materials.

Cholesterol, sodium (in salt), vitamins, and minerals all add up to less than 1% of the carrot.

About 1% of the carrot is protein.

Carrots	
Nutrition Facts	
Serving Size (100g)	
Servings Per Container	
Amount Per Serving	
Calories 40	Calories from Fat 0
% Daily Value*	
Total Fat 0g	0%
Saturated Fat 0g	0%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 70mg	3%
Total Carbohydrate 10g	3%
Dietary Fiber 3g	12%
Sugars 5g	
Protein 1g	
Vitamin A 330% • Vitamin C 10%	
Calcium 4% • Iron 2%	
*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:	
	Calories: 2,000 2,500
Total Fat	Less than 65g 80g
Saturated Fat	Less than 20g 25g
Cholesterol	Less than 300mg 300mg
Sodium	Less than 2,400mg 2,400mg
Total Carbohydrate	300g 375g
Dietary Fiber	25g 30g
Calories per gram:	
Fat 9 • Carbohydrate 4 • Protein 4	

Since the serving size is 100 g, 1 g = 1%.

This part of the label tells us that carrots are 0% fat.

Carbohydrates include:

- Dietary Fiber, like cellulose: 3%
- Starch (not listed): (10%-5%-3%) = 2%
- Sugars like glucose: 5% of the carrot.

What does the nutrition label tell you about what cells are made of?

Here are some things you can learn by reading the nutrition label carefully:

What are the main organic molecules in cells?

Large organic molecules, including carbohydrates, proteins, and fats, do all the work of cells. These organic materials are made mostly of carbon, hydrogen, and oxygen atoms and have high-energy bonds.

- Carbohydrates include:
 - Sugars such as glucose that all cells use as a source of energy. Sugars are small organic molecules (5 or 6 carbon atoms, plus hydrogen and oxygen atoms).
 - Starches are large organic molecules (hundreds or thousands of carbon atoms plus hydrogen and oxygen atoms). Most plants store food in starch molecules.
 - Fiber such as cellulose molecules (thousands of carbon atoms, plus hydrogen and oxygen atoms). Fiber molecules make up the cell walls of plant cells, making stems stiff and wood hard.
- Proteins are large organic molecules (usually hundreds of carbon atoms, plus hydrogen, oxygen, nitrogen, and other atoms) found in every cell. They do much of the cell's work, such as movement of materials and making new molecules.
- Fats are large organic molecules (usually 50-100 carbon atoms, plus hydrogen and oxygen atoms) found in every cell. They are essential molecules in the membrane that encloses every cell, and some animals and plants use fats to store energy; they have lots of C-C and C-H bonds.

So this is what the nutrition label tells us about carrots:

- Fat: 0 g or 0% of the mass
- Carbohydrates (sugar, starch, fiber): 10 g or 10% of the mass
- Protein: 1 g or 1% of the mass

What about other molecules: cholesterol, vitamins, and minerals?

Look at the label carefully. It also includes other materials that cells need in small amounts (less than 1% of the cell's mass) to do their work. These include vitamins (vitamin A and vitamin C), cholesterol, and minerals (sodium and iron).

What about water?

All plant and animal bodies and most foods are made mostly of organic materials and water. You can figure out how much water is in a food by subtracting the mass of the organic materials from the total mass of the food (100 g for this label).

If you add up all the materials on the carrot label, here is what you get:

- Fat: 0 g or 0% of the mass
- Cholesterol, sodium, vitamins, and minerals: less than 1 g or 1% of the mass
- Carbohydrates (sugar, starch, fiber): 10 g or 10% of the mass
 - 5 g of fiber
 - 3 g of sugar
 - 2 g ($10 - 5 - 3 = 2$) of starch
- Protein: 1 g or 1% of the mass
- **Total for all organic materials and minerals: about 12 g or 12% of the mass**
- **This means that the other 88% of the mass of the carrot is WATER!**

What about chemical energy?

Scientists use "calories" to measure how much chemical energy is found in the C-C and C-H bonds of cells' organic molecules. The label shows that there are 40 calories of chemical energy in every 100 grams of carrots.

