Part 1: Before you use the models

You will use models to learn about cellular respiration at the atomic-molecular scale.

Introduction

In order for animals to move, they need energy. Animals get energy from chemical energy either in their food (like carbohydrates), or stored in molecules (like fats) in their bodies.

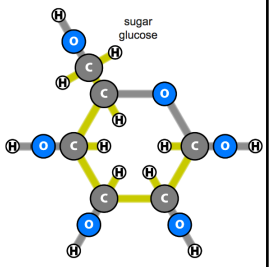
Carbohydrates and fats contain chemical energy stored in high-energy bonds: C-C and C-H bonds.

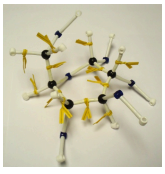
When animals use energy from carbohydrates or fats, they use oxygen (O_2) in the air from breathing to produce carbon dioxide (CO_2) and water (H_2O). Since carbon dioxide and water have only low-energy bonds (C-O and H-O), the chemical energy is released as motion and heat. Use the molecular models to show how this happens.

Answer Checkpoint 1 on your worksheet and check answers on wall.

Part 2: Building the reactants

1. Use the bonds to make models of a sugar molecule ($C_6H_{12}O_6$) and 6 oxygen molecules (O_2, with a double bond)
2. Identify the **high-energy bonds** (C-C and C-H) by putting twist ties on them. How many high energy bonds does a molecule of sugar have?
3. Compare your molecules to the pictures below. Are they the same?

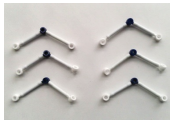
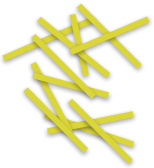




Answer Checkpoint 2 on your worksheet and check answers on wall

Part 3: Show the chemical change

1. Take the sugar and some of the oxygen molecules apart and recombine them into carbon dioxide (CO_2) and water (H_2O) molecules. Put these molecules on the *product* side of the Molecular Models Placemat.
2. Energy lasts forever, so move the twist ties to the *product* side of the Molecular Models Placemat. Carbon dioxide and water have only low-energy bonds (C-O and H-O), so what forms does the chemical energy change into?
3. Compare your molecules to the pictures below. Are they the same?

Answer Checkpoint 3 on your worksheet and check answers on wall

Part 4: Clean up and questions

1. Take apart your molecules – they should be completely separated! Put all atoms, bonds and twist ties back in your bag
2. Answer ***Checkpoint 4***