

# The Three Questions

Answer each of the questions (numbered 1-4) below to explain how matter and energy move and change in a system. Note that matter movement is addressed at both the beginning (1) and end (4) of your explanation.

## Question

Where are molecules moving?

**1**

How do molecules move to the location of the chemical change?

**4**

How do molecules move away from the location of the chemical change?

## Matter Movement

### Rules to Follow

All materials (solids, liquids, and gases) are made of atoms that are bonded together in molecules.

**Scale:** The matter movement question can be answered at the atomic-molecular, cellular, or macroscopic scale.

## Evidence

### We Can Observe

Moving solids, liquids, and gases are made of moving molecules.

A change in mass shows that molecules are moving.

## Question

How are atoms in molecules being rearranged into different molecules?

**2**

What molecules are carbon atoms in before and after the chemical change?

What other molecules are involved?

## Matter Change

### Rules to Follow

**Atoms last forever** in combustion and living systems.

**Atoms can be rearranged** to make new molecules, but not created or destroyed.

Carbon atoms are bound to other atoms in molecules.

**Scale:** The matter change question is always answered at the atomic-molecular scale.

## Evidence

### We Can Observe

BTB can indicate CO<sub>2</sub> in the air.

Organic materials are made up of molecules containing carbon atoms:

- fuels
- foods
- living and dead plants, and animals
- decomposers.

## Question

What is happening to energy?

**3**

What forms of energy are involved?

What energy transformations take place during the chemical change?

## Energy Change

### Rules to Follow

**Energy lasts forever** in combustion and living systems.

**Energy can be transformed**, but not created or destroyed.

C-C and C-H bonds have more stored chemical energy than C-O and H-O bonds.

**Scale:** The energy change question can be answered at the atomic-molecular, cellular, or macroscopic scales.

## Evidence

### We Can Observe

We can observe indicators of different forms of energy before and after chemical changes:

- light energy
- chemical energy stored in organic materials
- motion energy
- heat energy.