Chemical Reactions

Different energy levels are associated with different configurations of atoms and molecules. Some changes of configuration require a net input of energy, whereas others cause a net release.
Energy producing & consuming reactions
Flow of Energy

An enormous variety of biological, chemical and physical phenomena can be explained by changes in the arrangement and motion of atoms and molecules.
States of Matter

An atom's electron configuration, particularly the outermost electrons, determines how the atom can interact with other atoms. Atoms form bonds to other atoms by transferring or sharing electrons.
Atoms & Molecules

The configuration of atoms in a molecule determines the molecule's properties. Shapes are particularly important in how large molecules interact with others.
Atoms & Molecules
Cell Functions

Some atoms and molecules are highly effective in encouraging the interaction of others.
Cell Functions

The nucleus, a tiny fraction of the volume of an atom, is composed of protons and neutrons, each almost two thousand times heavier than an electron. The number of positive protons in the nucleus determines what an atom's electron configuration can be and so defines the element.
Atoms & Molecules

A system usually has some properties that are different from those of its parts, but appear because of the interaction of those parts.
Macro & Micro Properties
Atoms & Molecules
States of Matter

At the atomic level, electric forces between oppositely charged electrons and protons hold atoms and molecules together and thus are involved in all chemical reactions.

The rate of reactions among atoms and molecules depends on how often they encounter one another, which is affected by the concentration, pressure and temperature of the reacting materials.
Movement of particles

Atoms are made of a positive nucleus surrounded by negative electrons.
Atoms & Molecules

Atoms may stick together in well-defined molecules, or may be packed together in large arrays. Different arrangements of atoms into groups compose all substances.
Particle theory
Chemical reactions
States of Matter
Atoms & Molecules
Conservation of Matter
Flow of Matter Flow of Energy

Energy appears in different forms. Arrangements of atoms have chemical energy.

Atoms and molecules are perpetually in motion. Increased temperature means greater energy of motion, so most substances expand when heated.
Movement of particles
Particle theory
States of Matter

All matter is made up of atoms, which are far too small to see directly through a microscope.
Particle theory
States of Matter
Atoms & Molecules
Conservation of Matter

There are groups of elements that have similar properties, including highly reactive metals, less-reactive metals, highly reactive non-metals and some almost completely non-reactive gases.
Atoms & Molecules

When substances interact to form new substances, the elements composing them combine in new ways. In such recombinations, the properties of the new combinations may be very different from those of the old.
Physical & chemical change
Chemical reactions
Natural & processed materials

The temperature and acidity of a solution influence reaction rates. Many substances dissolve in water, which may greatly facilitate reactions between them.

About 100 different elements have been identified, out of which everything is made.
Chemical reactions
Atoms & Molecules

A lot of different materials can be made from the same basic materials.
Chemical reactions
Atoms & Molecules

When new material is made by combining two or more materials, it has properties that are different from the original materials.
Chemical reactions
Natural & processed materials
Atoms & Molecules

Many kinds of changes occur faster under hotter conditions.

Objects can be described in terms of the materials they are made of (clay, cloth, paper etc) and their physical properties (colour, size, shape, weight, texture, flexibility etc)
Atoms & Molecules
Conservation of Matter

Things can be done to materials to change some of their properties but not all materials respond the same way to what is done to them.
Natural & processed materials
States of Matter
Conservation of Matter

basic ingredients ***changing properties*** ***reaction rates***

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