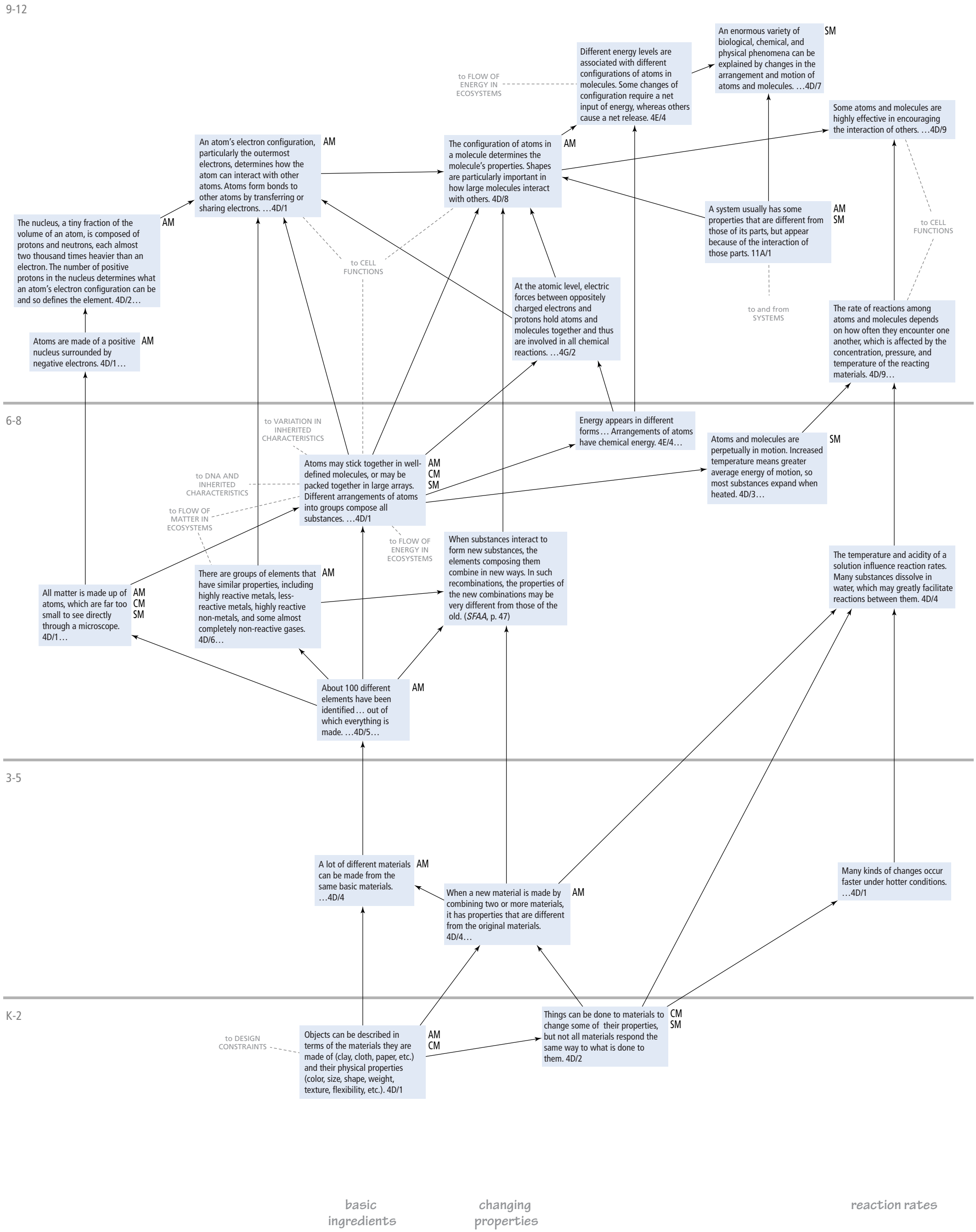
9-12
An enormous variety of biological, chemical, and physical phenomena can be explained by changes in the arrangement and motion of atoms and molecules. …4D/7
SM
Different energy levels are associated with different configurations of atoms in molecules. Some changes of configuration require a net input of energy, whereas others cause a net release. 4E/4
to FLOW OF ENERGY IN ECOSYSTEMS
Some atoms and molecules are highly effective in encouraging the interaction of others. …4D/9
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. …4D/1
AM
The configuration of atoms in a molecule determines the molecule's properties. Shapes are particularly important in how large molecules interact with others. 4D/8
AM
A system usually has some properties that are different from those of its parts, but appear because of the interaction of those parts. 11A/1
AM
SM
to 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. 4D/2…
AM
to CELL FUNCTIONS
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. …4G/2
to and from SYSTEMS
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. 4D/9…
Atoms are made of a positive nucleus surrounded by negative electrons. 4D/1…
AM
6-8
to VARIATION IN INHERITED CHARACTERISTICS
Energy appears in different forms… Arrangements of atoms have chemical energy. 4E/4…
Atoms and molecules are perpetually in motion. Increased temperature means greater average energy of motion, so most substances expand when heated. 4D/3…
SM
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. …4D/1
AM
CM
SM
to DNA AND INHERITED CHARACTERISTICS
to FLOW OF MATTER IN ECOSYSTEMS
to FLOW OF ENERGY IN ECOSYSTEMS
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. (SFAA, p. 47)
The temperature and acidity of a solution influence reaction rates. Many substances dissolve in water, which may greatly facilitate reactions between them. 4D/4
All matter is made up of atoms, which are far too small to see directly through a microscope. 4D/1…
AM
CM
SM
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. 4D/6…
AM
About 100 different elements have been identified… out of which everything is made. …4D/5…
AM
3-5
A lot of different materials can be made from the same basic materials. …4D/4
AM
When a new material is made by combining two or more materials, it has properties that are different from the original materials. 4D/4…
AM
Many kinds of changes occur faster under hotter conditions. …4D/1
K-2
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. 4D/2
CM
SM
to DESIGN CONSTRAINTS
Objects can be described in terms of the materials they are made of (clay, cloth, paper, etc.) and their physical properties (color, size, shape, weight, texture, flexibility, etc.). 4D/1
AM
CM
basic ingredients
changing properties
reaction rates