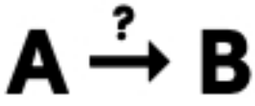
CROSSCUTTING CONCEPTS

PATTERNS

A pattern is a set of repeating things or events. Scientists observe patterns in their data. Patterns lead to questions about relationships and ideas about what causes these relationships.

CAUSE AND EFFECT

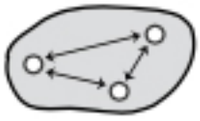


Events have causes. If "A" causes "B" to happen, they have a cause-and-effect relationship. A major activity of science is to explain how this happens. Sometimes the causes are simple and sometimes they are complex. Sometimes both A and B occur, but one does not cause the other.

SCALE, PROPORTION, AND QUANTITY

Scientific phenomena occur at various scales of size, time, and energy. Phenomena observed at one scale may not be observable at another scale. Scientists use proportional relationships to compare measurements of objects and events. They often use mathematical expressions and equations to represent these relationships.

SYSTEMS AND SYSTEM MODELS



A system is a group of interacting objects or processes. Describing a system, including its components, interactions and boundaries, and making models of that system helps scientists and engineers understand phenomena and test ideas.

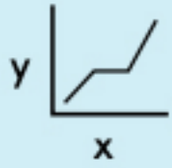
ENERGY AND MATTER

Tracking changes of energy and matter into, out of, and within systems helps scientists understand the systems' possibilities and limitations. Many cause and effect relationships result from changes of energy and matter.

STRUCTURE AND FUNCTION

The structure (shape, composition, construction) of an object or living thing determines many of its properties and functions (what the structure can do).

STABILITY AND CHANGE



For natural and built systems alike, conditions are sometimes stable (the same or within a range), and sometimes they change. Scientists study what conditions lead to either stability or change.

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