# MAP KEY

#### **BENCHMARKS**

9-12

6-8

Scientific investigations usually involve the collection of relevant data, the use of logical reasoning, and the application of imagination in devising hypo. see and explanations to make sense of the collected

are specific learning goals derived mostly from Benchmarks for Science Literacy but also from Science for All Americans and National Science Education Standards. Colored boxes indicate knowledge goals; bordered boxes indicate skill goals. Some benchmarks have been split into two or more ideas which appear in separate boxes. (See page xvi.)

#### **CONNECTING ARROWS**

VALUES IN SCIENCE 12

In matters that can be investigated

indicate that achieving one benchmark contributes to achieving the other. The exact meaning of a connection is not indicated explicitly, but connections can be based on the logic of the subject matter or on cognitive research about how students learn. (See page xviii.)

### **GRADE RANGES**

suggest when most students could achieve these benchmarks. A benchmark's position within a grade range does not indicate the grade in which it should be taught, nor does its position indicate that it should be taught before or after another benchmark unless there is an arrow connecting them. (See page xix.)

## **BENCHMARK CODES**

indicate chapter, section, grade range, and number of the corresponding goal statements in Benchmarks for Science Literacy. Letters, asterisks, and acronyms following the code provide additional information about the benchmark. (See page xvii.)



In science, a new theory rarely gains widespread acceptance until its advocates can show that it is borne out by the evidence, is logically consistent with other principles that are not in question, explains more than its rival theories, and has the potential to lead to new knowledge. 12A/H3\*\* (SFAA) To be useful, a hypothesis should suggest what evidence would suppor it and what evidence would refute it.

Hypotheses are valuable, even if they turn out not to be true, if they lead to fruitful investigations.

Often different explanations can be given for the same observations, and it is not always possible to tell which one is correct. 12A/M3\*

A hypothesis that cannot, in principle, be put to the test of evidence may be interesting, but it may not be scientifically useful. 1B/H9\*\* (SFAA)

The strongly held traditions of science, including its commitment to peer review and publication, serve to keep the vast majority of scientists well within the bounds of ethical professional behavior. Deliberate deceit is rare and likely to be exposed sooner or later by the scientific entreprise itself. When violations of these scientific ethical traditions are discovered, they are strongly condemned by the scientific entrominity, and the violators then have difficulty regaining the respect of other scientists. 1CH17

Accurate record-keeping, openness, and replication are essential for maintaining an investigator's credibility with other scientists and society. 1C/M7

Keep clear and accurate records of investigations and observations, 12A/E1

Exhibit traits such as curiosity, honesty, openness, and skepticis when making investigations and value those traits in others.

12A/H1\*

Curiosity motivates scientists to ask questions about the world around them and seek answers to those questions. Being open to new ideas motivates scientists to consider ideas that they had not previously considered. Skepticism motivates scientists to question and test their own ideas and thos

Science and Society (p. 9) The Scientific Community (p. 7)

when they connect boxes to boxes. Use the Index of Mapped Benchmarks on page 124 to search by benchmark code for

> maps on which a benchmark appears in its full text. (See page xx.)

**OFF-MAP CONNECTIONS** show links to the codes of

closely related benchmarks

when it is not possible

to include the full text of

the benchmark on a map.

Arrows in off-map connections imply the same

benchmarks as they do

relationship between

**CROSS-REFERENCES** 

**TO OTHER MAPS** indicate that the benchmark also appears on the maps that are listed. (See page xx.)

# When people give different descriptions of the same Raise questions about the world and be willing to seek answers to these questions by making careful WHAT'S IN A BENCHMARK CODE? Chapter in Benchmarks Section in Benchmarks common values as applied in science Grade Range in Benchmarks H = High school (9-12)M = Middle school (6-8) 103

ASL = Atlas of Science Literacy, Volume 1

Sometimes scientists have different explanations for the same set of observations. That usually leads to their making more observations to resolve the differences. 1B/E3bc

Benchmark in the grade range 12A/H4\*\*(SFAA) 1B/M1b\*

Sentence in a benchmark a = first sentence

E = Elementary school (3-5) P = Primary school (K-2)

- b = second sentence
- c = third sentence and so on
- Status of a benchmark

\* = edited \*\* = new

- - Source of a new benchmark SFAA = Science for All Americans NSES = National Science Education Standards

help the reader find things in the map and get a sense of the map's content. Strands loosely suggest ideas or skills that develop over time. Strands often interweave and share benchmarks. (See page xix.)

**STRAND LABELS**