

The cutouts and reference sheets mentioned were compiled using information found at:

http://undsci.berkeley.edu/article/whatisscience_01
<http://www.indiana.edu/~ensiweb/lessons/sun.key.pdf>
<http://scienceornot.net/hallmarks-of-science/>

Reference Key:

Science IS

IS LIMITED TO THE NATURAL WORLD	Science, by its very nature, cannot seek supernatural explanations to any phenomenon. Even when one seeks to understand “supernatural” phenomena, only explanations complying with natural processes can be considered. Supernatural forces, by definition, can operate outside natural processes, and therefore cannot be reliably subjected to critical testing, in which any result could be expected, and attributed to the vagaries of supernatural forces. We can never expect to reliably disprove a supernatural explanation, whereas natural explanations are all potentially disprovable.
IS SUBJECT TO CHANGE	Science is a process for producing knowledge. The process depends both on making careful observations of phenomena and on inventing theories for making sense out of those observations. Change in knowledge is inevitable because new observations may challenge prevailing theories. No matter how well one theory explains a set of observations, it is possible that another theory may fit just as well or better, or may fit a still wider range of observations. In science, the testing and improving and occasional discarding of theories, whether new or old, go on all the time. Scientists assume that even if there is no way to secure complete and absolute truth, increasingly accurate approximations can be made to account for the world and how it works.
IS DURABLE	Although scientists reject the notion of attaining absolute truth and accept some uncertainty as part of nature, most scientific knowledge is durable. The modification of ideas, rather than their outright rejection, is the norm in science,
ABLE TO PROVIDE COMPLETE ANSWERS TO ALL QUESTIONS	There are many matters that cannot usefully be examined in a scientific way. There are, for instance, beliefs that—by their very nature—cannot be proved or disproved (such as the existence of supernatural powers and beings, or the true purposes of life).
BASED ON EVIDENCE	Sooner or later, the validity of scientific claims is settled by referring to observations of phenomena. Hence, scientists concentrate on getting accurate data. Such evidence is obtained by observations and measurements taken in situations that range from natural settings (such as a forest) to completely contrived ones (such as the laboratory).
IS OBSERVABLE	To make their observations, scientists use their own senses, instruments (such as microscopes) that enhance those senses, and instruments that tap characteristics quite different from what humans can sense (such as magnetic fields). Scientists observe passively (earthquakes, bird migrations), make collections (rocks, shells), and actively probe the world (as by boring into the earth’s crust or administering experimental medicines).
IS A BLEND OF LOGIC AND IMAGINATION	Although all sorts of imagination and thought may be used in coming up with hypotheses and theories, sooner or later scientific arguments must conform to the principles of logical reasoning—that is, to testing the validity of arguments by applying certain criteria of inference, demonstration, and common sense.

MADE STRONGER BY DIFFERENT LINES OF EVIDENCE	When evidence comes from different, independent unrelated fields of study, and they all point to the same explanation (theory), this increases credibility and support for the theory immensely. The chances that such agreement would be due simply to coincidence, and not the validity of the theory, are extremely remote.
A SEARCH FOR UNDERSTANDING	This is indeed the goal of science: an understanding of our natural universe, how it works, and why it is the way it is.
BOTH, A BODY OF KNOWLEDGE AND A PROCESS	Science may sometimes seem like a collection of isolated and static facts listed in a textbook, but that's only a small part of the story. Just as importantly, science is also a process of discovery that allows us to link isolated facts into coherent and comprehensive understandings of the natural world.
EXCITING	Science is a way of discovering what's in the universe and how those things work today, how they worked in the past, and how they are likely to work in the future. Scientists are motivated by the thrill of seeing or figuring out something that no one has before.
USEFUL	The knowledge generated by science is powerful and reliable. It can be used to develop new technologies, treat diseases, and deal with many other sorts of problems.
ONGOING	Science is continually refining and expanding our knowledge of the universe, and as it does, it leads to new questions for future investigation. Science will never be "finished."
A GLOBAL HUMAN ENDEAVOR	People all over the world participate in the process of science. And you can too!
BUILT ON THE CONTRIBUTIONS OF SCIENTISTS	Scientific understanding builds up through the contributions of countless scientists over time. In most fields of science, there are some scientists who contribute far more than others. They are acknowledged by their peers as eminent scientists. However, in judging their work it's always the quality of the evidence that matters, not the scientists' status.
FALSIFIABLE	For a model to be regarded as scientific, there must be some way of testing whether it is false. A model remains in contention as long as no falsifying evidence appears from such tests.

Science is not

<p>BASED ON PROOF</p>	<p>A common misconception, perhaps based on the use of mathematics in science, and that mathematical concepts ARE subject to “proof”. “Proof” carries with it the connotation of finality and certainty which is NEVER a proper feature of science. All too often, seemingly foolproof explanations have, upon closer scrutiny or new techniques, been shown to be wrong. In science, every effort is made, in fact, to DISPROVE concepts, to subject such ideas to severe critical analysis to find any weaknesses or flaws. If none are found, we simply say the concept is strengthened. Someday, someone may indeed discover a fatal flaw (as has happened numerous times), so we can never say a concept is “proven”, a closed case.</p>
<p>RIGID</p>	<p>Scientists want to do things in a clear, repeatable and definitive way. This may give people the sense that science is generating (or pretending to generate) perfect and complete knowledge all the time. That is not the case.</p>
<p>BASED ON BELIEF</p>	<p>Belief typically implies merely a feeling (perhaps a strong feeling, but nevertheless a feeling). One may believe something simply as a result of being told of this in a very compelling fashion. One may even have an experience which could be interpreted as the result of some abstract cause, not something one can actually see. In other words, a belief does not require objective evidence for confirmation. In contrast, scientific concepts DO require such objective evidence.</p>
<p>BASED ON FAITH</p>	<p>see Belief</p>
<p>BASED ON AUTHORITY</p>	<p>Scientific facts or theories come from observation, and can change with new observations. Individual scientists might become “experts” with experience, and considered world proponents of certain established scientific concepts “authorities”. But time and again, some of those concepts have eventually been found to be in error, often shifting the “authority” label to another. Again, critical observation and analysis is primary, not any one authority or dogma.</p>
<p>DECIDED BY DEBATE OR LAW</p>	<p>Scientific concepts are properly decided on the basis of critical observation and analysis, not by any compelling oratory or selective twisting of facts.</p>
<p>A SEARCH FOR TRUTH</p>	<p>“Truth” can mean different things to different people. It can apply to what one believes, what someone has said, what is said in a highly revered document, or what is “right” or “best”, none of which need be based on observation and critical analysis. Science is more properly a “search for understanding about the natural world”, seeking as objective a perception of reality as our subjective minds will allow, providing us with a picture of how the natural world works, which can enable us to live in harmony within that natural world.</p>
<p>CERTAIN</p>	<p>Because well-established, highly acclaimed concepts (explanations) can be (and have been) found to incorrect, we must recognize that nothing in science is certain or absolute. Science has given us many excellent explanations (theories) which work beautifully, and to the extent that they DO WORK, and have practical applications, they are properly accepted. But sometimes, given changing circumstances, those theories must be modified, or replaced entirely, giving us an even better (more useful) insight to the real world.</p>

FAIR	There is nothing in science which guarantees “fairness”. Whatever is, IS (for the time being, at least), as indicated by the critical analysis of careful observations. Again, fairness is a very subjective trait, something science tries to avoid.
ABLE TO ANSWER ALL QUESTIONS	The realm of science is limited strictly to solving problems about the natural world. Science is not properly equipped to handle the supernatural realm (as such), nor the realm of values and ethics.
A COLLECTION OF FACTS	Although scientific facts (critically confirmed observations) are the basis for science, they are NOT the focus of science. The primary goal of science is the understanding (explanation) of natural phenomena, ultimately in the form of theories (the closest thing to scientific facts that concepts can be).
DEMOCRATIC	Scientists do not vote on which theory is best. Competing theories are not considered of equal standing, and are not selected on the basis of what (or who) is most popular. There are specific objective criteria to which competing theories must be subjected, and which ultimately determines which theory survives. Such criteria include the “Fair Test”, “Multiple Independent Lines of Evidence”, absence of conflicting lines of evidence, and the overall weight of evidence.
ABSOLUTE	see Certain
BASED ON CLAIMS OF SUPERNATURAL PHENOMENA	see Science is limited to the natural world
A PROCESS THAT CAN IGNORE RULES	Science must follow certain rules; otherwise, it's not science (just as soccer is not soccer if its rules are not followed).
OBJECTIVE	<p>In a sense, science is the pursuit of objectivity. An unattainable goal, but one worth pursuing nonetheless, because of the wonderful things that are revealed along the way. Scientists are human beings and tend to create hypotheses that fit their own cognitive biases. But good scientists who discover that their cherished hypothesis cannot be supported or verified by empirical evidence will be willing to move on and find a better hypothesis, and maybe modify their own cognitive bias in the process to become that little bit more objective.</p> <p>It might be said that anyone who seeks to understand the world rather than merely interact with it according to instinct and physical need is a scientist, though perhaps not in a formal sense of the word.</p>