Key Points

Science – modern science tries to understand and explain how the natural world works now and how it got to be that way

A. Facts about science
    1. The study of natural phenomena
    2. Studies what can be observed, measured, and tested by scientific methods
    3. We must use our senses to observe and evaluate
    4. Based on the assumption that the universe is orderly, reasonable, and testable
    5. Used to predict natural events that may occur
    6. Based on physical, mathematical, and conceptual models
    7. Classified into many different fields, topics, or categories for specialized study
    8. The different fields overlap and depend on each other for further knowledge and explanations
    9. A vast body of knowledge that is always changing and expanding, but is does have limitations
    10.Objective, unbiased, and impartial—or it should be

B. Myths about science
    1. A rigid collection of facts that are inflexible
    2. Able to explain the answer to every question (some phenomena are not scientifically testable)
    3. Unorganized, unrelated, or untestable
    4. Based on that which cannot be observed or measured, or that which is outside of our senses to be perceived
    5. Only based on one disciple, field, or topic of knowledge
    6. Subjective, biased, or partial (it should not be)

C.Scientific Explanations – Hypothesis, Theory, or Law
    1. Hypothesis – an educated guess based on observation
        a) Can be given as an explanation for the occurrence of an event or a presumption to guide an investigation
        b) Should be based on some knowledge or research
        c) Must try to answer a scientific question
        d) Must be testable by known scientific methods
        e) Can be supported or refuted through further observation or experimentation
        f) Can be proven wrong; it doesn't have to be right
            (1) A wrong hypothesis only leads to another hypothesis
            (2) A better product, a better clue, a better suspect
        g) Should be stated in such a way that the experiment will collect measureable/quantifiable data if possible
    2. Theory – summarizes a hypothesis or group of hypotheses that have been supported with repeated testing over a wide variety of conditions over time
        a) Are valid as long as no evidence disputes them
        b) Are well-established and highly reliable
        c) Can be used as principles of explanation and prediction for a group of phenomena

d) Can be disproven, modified, or changed with new scientific knowledge, observations, and technology

3. Law – generalizes a body of observations that can be used to describe or predict something universally understood in nature

a) At the time that it is made, no exceptions can have ever been found in a law

b) Laws never explain “why” something happens, only that it will always happen the same way with no exceptions

c) Example – Newton’s Law of Gravity could be used to predict the behavior of a dropped object, but it could not explain why it happened

d) Theories explain “why” something happens; laws predict that it will always happen the same way

D.Six Criteria of Science: CONPTT

1. Consistent – results are based on repeatable observations and/or explanations
2. Observable – limited to the basic human senses or extensions of the senses (microscopes, computers, etc.)
3. Natural – a natural cause must be used to explain why or how; supernatural explanations are not allowed
4. Predictable – the result or observation can be used to make predictions about natural events
5. Testable – the natural cause of the event must be testable through the process of science and/or controlled experiments
6. Tentative – theories are subject to revision and correction, even to the point that the entire theory might be proven wrong

E. Non-Science – an area of science that does not meet the criteria of science or CONPTT