

**PRACTICE OF SCIENCE STUDY GUIDE**

1. Study the following vocabulary terms:
  - Analyze - *To methodically examine data for the purpose of explanation or interpretation*
  - Confirmation - *The process of ensuring consistent and predictable results through repetition and replication*
  - Data - *Information gathered through observation or measurement*
  - Evidence - *Data that has been analyzed and used to support a scientific claim*
  - Hypothesis - *A possible explanation for a natural event based on what is known or observed*
  - Prediction - *To make a statement or claim about what will happen based on past experience or evidence*
  - Repetition - *The practice of repeating trials during a scientific investigation (multiple trials) to ensure consistent and predictable results*
  - Replication - *The practice of replicating, or copying, another scientist's investigation to ensure consistent and predictable results*
  - Variable - *Any factor that can change which may affect the results of an investigation*
2. What kind of question does an effective research question ask ("How does...")?  
***"How does (the independent variable) affect (the dependent variable)?"***
3. What two things characterize a controlled experiment?  
***The identification and control of variables.***
4. How can you identify the independent variable (*test variable*) in an experiment (*what does the researcher do to it*)?  
***It is the thing being tested (or manipulated) to see what effect it has on another variable.***  
How can you identify the dependent variable (*outcome variable*) in an experiment (*what does the researcher do to it*)?  
***It is the thing being measured (or observed) to see how it is affected by the independent variable.***  
How can you identify controlled variables (*constants*) in an experiment (*what does the researcher do to them*)?  
***These variables are kept constant (the same) so they do not affect the outcome.***
5. Why is it important to control all variables except for the independent variable?  
***It is important to make sure that the only thing affecting the outcome is the independent variable. If other factors are changing (other than the I.V.), it is impossible to tell if they caused the outcome or if it was the I.V..***
6. How do scientists use predictions?  
***Scientists use predictions to test their hypothesis.***
7. How are a hypothesis and a prediction related (*think about your "If → Then" statement*)?  
***If the hypothesis is correct, then the prediction will be observed.***  
***The prediction is a statement about the expected outcome assuming the hypothesis to be true.***
8. What is the difference between "data" and "evidence" (*how does data become evidence*)?  
***Data consists of any and all observations or measurements made during an investigation. Evidence, however, is data that has been analyzed and used to support a specific claim. Evidence is data that has been given meaning.***
9. What are some ways to analyze data?  
***The important words are COMPARE and CALCULATE.***  
***You compare data to discover patterns or relationships. A great way to do this is to organize data into tables, graphs, charts, or diagrams. You may need to calculate specific values using the data in order to accomplish this.***
10. What is the purpose of repetition and replication in science?  
***Repetition and replication are both forms of scientific confirmation. Their purpose in science is to ensure that data is consistent and predictable, which affects its reliability.***

11. Identify the three parts of a scientific argument and briefly describe each one.

***Claim – your answer to the guiding question***

***Evidence – analyzed data which supports the claim, highlighting the patterns and relationships that resulted in the claim***

***Justification – relevant scientific concepts that explain the results***

12. Why shouldn't we use words such as "prove", "proof", or "proven" in science?

What phrase(s) should we use instead of these words?

***Using words such as "proven" suggest that there is no possibility that the explanation will change in the future. It suggests that nothing new will be learned about the topic that may cause us to change the way we think about it or understand it. These things violate the TENTATIVE nature of science, that science is always OPEN TO CHANGE in light of new information that doesn't fit with our current understanding.***

***Instead of "prove", we can say "support".***

***Instead of "proof", we can use "evidence".***

***Instead of "proven", we can say "supported with evidence" or "the data suggests".***