



# High School Science Proficiency Review #12

## Nature of Science: Scientific Inquiry

High School Science Proficiency Exam-Style Items from [http://rpd.net/sciencetips\\_v3/](http://rpd.net/sciencetips_v3/)

### Critical Information to focus on while reviewing Nature of Science Scientific Inquiry

**N.12.A.1 Students know tables, charts, illustrations and graphs can be used in making arguments and claims in oral and written presentations. E/S**

- Given a choice of several graphs, select the one most appropriate to display a collection of data or to illustrate a concept or conclusion.
- Interpret a graph, table, or chart and analyze the data display to reveal information.
- Predict (extrapolate and interpolate) from a data display. (See also P.12.B.1.)

**N.12.A.2 Students know scientists maintain a permanent record of procedures, data, analyses, decisions, and understandings of scientific investigations. I/S**

- Recognize proper data collection and recording procedures in scientific investigations.

**N.12.A.3 Students know repeated experimentation allows for statistical analysis and unbiased conclusions. E/S**

- Explain that repeated trials and increased sample size increase the validity of experimental results.
- Explain the importance of independent replication of experimental results.
- Given two or more sets of data among which there is some disagreement, discuss conclusions that can or cannot be supported based on the combined data.

**N.12.A.4 Students know how to safely conduct an original scientific investigation using the appropriate tools and technology. E/S**

- Explain the use of proper experimental controls and control groups in experimental designs.
- Recognize a testable question.
- Describe proper and appropriate use of lab equipment.
- Explain safety considerations in lab procedures.
- Analyze an experimental design.

**N.12.A.5 Students know models and modeling can be used to identify and predict cause-effect relationships. I/S**

- Describe how models are used in science.
- Use models and modeling to illustrate relationships and predict outcomes.
- Evaluate the appropriateness of a model.

**N.12.A.6 Students know organizational schema can be used to represent and describe relationships of sets. E/S**

- Recognize that each branch of science has developed classification systems based on observable characteristics.
- Explain that scientists use various classification systems to organize information.
- Explain that classification systems can be modified over time to account for new information.

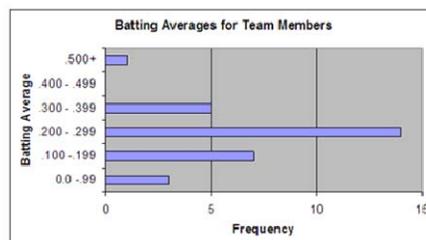
### Sample Proficiency-Style Questions Related to Scientific Inquiry

1. Use the chart to answer the following question.      2. Use the graph to answer the following question.      3. Use the graph to answer the following question.

Height of Drop (cm)	Height of Bounce (cm)
5	4
10	6
15	11
20	13
25	16
30	21

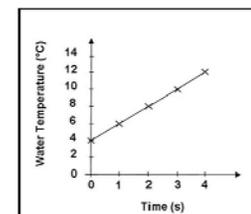
Which of the following graphs would BEST represent this data?

- A. Bar graph
- B. Pie chart
- C. Histogram chart
- D. Line graph



How many players on the team have a batting average between .300 - .399?

- A. 1
- B. 5
- C. 7
- D. 9



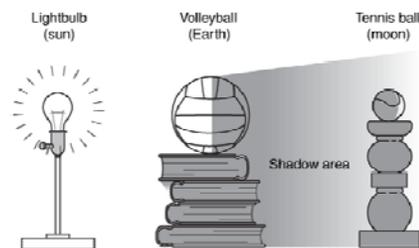
Based on the trend shown above, at what time will the water temperature reach 16 degrees?

- A. 4 seconds
- B. 5 seconds
- C. 6 seconds
- D. 7 seconds



## Nature of Science Review Scientific Inquiry

4. In 1989, two scientists held a news conference to announce that they had observed controlled nuclear fusion in a glass jar better known as cold fusion technology. It was later determined that their findings were false. Of the following which is **NOT** part of the scientific process?
- Peer review of scientific work in research journals.
  - Validation of scientific results through repeated trials.
  - Making unsubstantiated claims about results.
  - Allowing other scientists to review scientific procedures.
5. In her laboratory journal, a microbiologist enters the following information: "Some mold growth was seen on the agar plate that was streaked with bacteria three days ago. Bacterial colonies were observed on the plate, but the area surrounding the mold did not show any bacteria." Which of the following describes the microbiologist's journal entry?
- Prediction
  - Observation
  - Conclusion
  - Hypothesis
6. A student measures the length of a pendulum three times. The measurements were 1.42 meters, 1.43 meters, and 1.45 meters. The actual length of the pendulum was 1.89 meters. What can be said about these measurements? The measurements are
- accurate.
  - precise.
  - aligned.
  - exact.
7. What makes a scientific explanation different from a non-scientific explanation? Scientific explanations are
- based on assumptions.
  - predictable.
  - not able to be changed.
  - testable.
8. In August 2006, the International Astronomical Union removed Pluto's status as a planet and named it a dwarf planet. What prompted the reclassification of Pluto?
- A new telescope introduced in 2006 allowed scientists to see a better view of Pluto.
  - Scientists based their decision on known data from Pluto and other objects in the solar system.
  - A manned mission to Pluto provided evidence to make it a dwarf planet.
  - Scientists were biased to make the solar system have eight planets.
9. Control groups are used in scientific experiments because they
- are easily identified by the experimenter during the investigation.
  - are cheap and relatively easy to maintain throughout the experiment.
  - prevent data collection from being contaminated by other variables.
  - provide a standard of comparison with other data collected.
11. A student is conducting a laboratory investigation and needs to obtain chemicals for his lab station. He should do all of the following **EXCEPT**
- know the names and formulas of the chemicals needed for the investigation.
  - know the quantities of all the chemicals needed for the activity.
  - take all the chemicals to his desk and measure what he needs.
  - carry only what he can safely manage to his desk and then obtain the remaining materials.
12. Collaboration among scientists is an important component of scientific inquiry for all of the following **EXCEPT**
- scientists can learn from each other by sharing ideas and findings.
  - scientists tend to argue during collaboration and fail to generate new ideas.
  - new procedures for problem solving can develop through collaboration.
  - experimental data can be validated by replicating each other's work.
13. The model below is set up to show how a lunar eclipse occurs.



What is the greatest limitation of this model?

- The light bulb is standing straight up instead of tilted on an axis.
- Comparative sizes and distances are inaccurate.
- The shadow is being cast in the wrong direction.
- The heat released is much less than that released by the Sun.



**Critical Information to focus on while reviewing Nature of Science Scientific Inquiry**

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**Sample Proficiency-Style Questions Related to Scientific Inquiry**

1. D, DOK Level 2
2. B, DOK Level 1
3. C, DOK Level 2
4. C, DOK Level 1
5. B, DOK Level 2
6. B, DOK Level 2
7. D, DOK Level 1
8. B, DOK Level 1
9. D, DOK Level 1
10. C, DOK Level 2
11. B, DOK Level 2
12. B, DOK Level 2
13. B, DOK Level 2



# High School Science Proficiency Review #13

## Nature of Science: Science, Technology, and Society

High School Science Proficiency Exam-Style Items from [http://rpd.net/sciencetips\\_v3/](http://rpd.net/sciencetips_v3/)

### **Critical Information to focus on while reviewing Nature of Science: Science, Technology, and Society**

#### ***N.12.B.1 Students know science, technology, and society influenced one another in both positive and negative ways. E/S***

- ♦ Explain with examples how science and technology benefit each other.
- ♦ Explain with examples how scientific events and discoveries have positively and negatively influenced society.
- ♦ Explain with examples how technology has positively and negatively affected society.
- ♦ Explain with examples how societal needs and pressures influence the course of scientific research and technological advances.
- ♦ Explain with examples how technological advances frequently have unintended consequences that are not initially evident.

#### ***N.12.B.2 Students know consumption patterns, conservation efforts, and cultural or social practices in countries have varying environmental impacts. E/S***

- ♦ Identify the benefits and hazards of the environmental impact of human activities (e.g., consumption, conservation, and cultural and social practices).

#### ***N.12.B.3 Students know the influence of ethics on scientific enterprise. E/S***

- ♦ Identify “ethical” and “unethical” practices in scientific research and describe the differences between them (e.g., treatment of test subjects and falsifying data).
- ♦ Identify potential sources of intentional bias in scientific endeavors and explain the motives and consequences (e.g., financial pressures related to funding and choosing experiments most likely to support a favored hypothesis).

#### ***N.12.B.4 Students know scientific knowledge builds on previous information. E/S***

- ♦ Explain that existing theories are modified as new information is added.
- ♦ Explain that occasionally a completely new theory changes the way we interpret information and understand phenomenon.
- ♦ Explain the significance of the history of science in relation to the step-by-step development of our current scientific understanding of the natural world.

### ***Sample Proficiency-Style Questions Related to Science, Technology, and Society***

- When deciding whether or not to implement a new technology, the affected society must always
  - weigh the costs and benefits of the new technology.
  - make a decision based on what the majority of the people in the specific sector of society says.
  - use the most cost effective form of technology available.
  - run sufficient safety tests on the technology to make sure no organisms will be harmed.
- Chlorofluorocarbons (CFCs) were introduced in the 1930s as a successful replacement for hazardous materials used as coolants in refrigerators and as propellants for many aerosol products. CFCs are now banned in the United States and in most of the world. The removal of CFCs from common use is because they damage the ozone layer. This is an example of how
  - science and technology always benefit each other.
  - science, technology, and society operate independently of each other.
  - scientific advances are influenced by the costs and benefits of those advances.
  - science is proven wrong given enough time.
- Which of the following is an example of how the internet has **negatively** impacted society?
  - People can communicate with others quickly and at any time of day.
  - Anyone can put information online whether it is fact or fiction.
  - Information about millions of subjects is available all day long, every day.
  - Using the internet can cut down on the amount of paper being used.
- Video Games have now become a regular part of many US households. Which of the following changes has been influenced by society’s need to become healthier?
  - Quicker game systems have been influenced by society’s need to become healthy.
  - Systems have been connected to the internet to allow players to interact .
  - Systems have incorporated more physical movement to increase exercise .
  - Children of all ages can now play and learn through video games.



## Nature of Science Review Science, Technology, and Society

5. Frozen meals that are cooked with the microwave have created which of the following **negative** consequence?
- Incorrect cooking of the meals is causing food poisoning.
  - Meals are pre-portioned to help with calorie in-take.
  - Meals offer healthier alternative to fast food.
  - Family-size meals encourage families to eat dinner together.
6. The environmental impact of the cultural practice of individual automobile ownership is
- a practice that fosters conservation.
  - resource depletion of petroleum.
  - sustainable energy efforts.
  - realistic energy practices.
7. Consumptive practices refer to
- use of clothing and reference materials by a society.
  - use of another country's resources including satellites.
  - cost of resources among various societal groups.
  - the amount and types of resources are used by a society.
8. The ecological resource consumption practices of the average citizen of the United States
- is less than all other parts of the world.
  - is balanced by recycling plastic items.
  - is greater than most countries in the world.
  - contributes to sustainable living practices.
9. According to ethical guidelines established by the National Academy of Science, which of the following is **INCORRECT** concerning scientific research? Scientific research
- involves collaborating with other scientists.
  - takes place within a broad social and historical context.
  - must not be restricted by the influence of ethical concerns.
  - cannot be done without drawing on the work of other scientists.
10. Patricia A. Bolton suggests deliberate deceit and dishonesty, including forged or fabricated data, falsified or invented results, and plagiarism belongs within the category of
- honest mistakes.
  - noncompliance.
  - scientific misconduct.
  - ethical behavior.
11. Which statement below best describes Darwin's theory of natural selection and Alfred Wegener's theory of continental drift?
- These theories answer all scientific questions about evolution and continental drift.
  - The development of their theories was influenced by many scientists.
  - These theories were a result of a number of planned experiments.
  - These theories are good examples of how scientific theories do not change over time.
12. Accurate estimates of the age of Earth were not possible what discovery was made?
- Earth's molten core cools at predictable and measurable rates.
  - Radioactive decay occurs in certain elements at a constant rate.
  - The oldest fossils are found in layers at the bottom of rock strata.
  - The shrinking diameter of the Sun can be used to infer the age of planets.
13. Watson and Crick used the data from other scientists to construct a model that aided the understanding of how
- cells have the ability to pass on genetic information.
  - cells produce directions for protein formation.
  - living organisms on our planet share a common origin.
  - living organisms have the ability to code for traits.
14. Which statement **BEST** describes the process of science?
- Scientists are objective and free of prejudice.
  - Scientists generally discover new ideas without the help of others.
  - Scientific ideas evolve or change over time.
  - New ideas in science generally result from planned experiments.
15. Today's understanding of how we view the structure and formation of the continents is best explained by
- the theory of plate tectonics.
  - the theory of catastrophism.
  - global warming.
  - worldwide volcanic activity.



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2. C, DOK Level 2
3. B, DOK Level 1
4. C, DOK Level 2
5. A, DOK Level 2
6. B, DOK Level 1
7. D, DOK Level 2
8. C, DOK Level 1
9. C, DOK Level 1
10. C, DOK Level 1
11. B, DOK Level 1
12. B, DOK Level 2
13. A, DOK Level 2
14. C, DOK Level 2
15. A, DOK Level 1