

Ideas Ia

Science and Its Limitations

People today have been conditioned to believe that science has a solution for all problems and is a benevolent giver of all gifts. It is neither of these things. Science is far more limited in what it can do than most people realize.

Directions: Study each of the following numbered statements; then look over the list of lettered choices. From the discussion in your textbook, decide which choice (or choices) best applies to the statement. In some cases only a single limitation is involved. In others, more than one may be involved.

Although more than one answer applies to most of the items, you may wish to hold the students responsible for only one correct answer per item. Use the students' correct alternative answers as points for discussion. It is possible that a student may be able to justify an answer in addition to the ones listed. You may wish, as an alternate idea, to use the entire exercise as a review lesson to be done in class rather than as an individual assignment. This often works well by allowing students time to work on their own or in groups of two or three and then discussing their responses.

- a. Science deals only with the physical universe.
- b. Science is not able to prove a universal negative.
- c. Science is not able to make value judgments.
- d. Science is not able to make moral judgments.
- e. Science is not able to produce final answers.
- f. Science is fallible and prone to error.
- g. Science is often forced to deal with models rather than with reality.
- h. Science is limited by certain God-ordained restrictions.
- i. Science is influenced by the observer's prejudices.
- j. The statement is a scientific statement.

e, f, g, i

1. At one time it was believed that the sun received its energy from the burning of meteorites that fell into it.

h

2. Medical science is unable to prolong a person's life indefinitely.

c, d, i

3. Scientists sometimes disagree among themselves concerning the appropriateness of using higher animals for scientific experiments.

a, h

4. Modern science has done nothing to further man's knowledge of angels and demons.

e, f, g

5. The details of the structure of Jupiter's interior are still hotly debated among astronomers.

j

6. The elements that make up pure table salt are sodium and chlorine.

b, e, f, g

7. No one can explain how matter changes into heat and light in an atomic explosion.

b, e

8. Although scientists have not seen any solar systems other than our own, they cannot rule out the possibility that one might exist somewhere in the universe.

e, f, g, i

9. The estimated age of the earth has been gradually increasing since the turn of the century.

d, e, j

10. Some of the latest medical procedures may be morally wrong.

j

11. Green plants contain chlorophyll.

e, f, i

12. Certain fossils that had once been considered to be millions of years old have now been dated as only thousands of years through the use of radiocarbon dating.

b, e

13. No one can fully explain how the earth's pull is able to keep the moon in its orbit.

Observation

Observation is one of the most important aspects of any branch of science. In this exercise you will make several observations, using as many of your senses as possible.

Goal

Use your senses to observe.

Materials

balance or scale
metric ruler
Oreo cookie

Procedures and observations

Observe the cookie. Examine it carefully and record as many facts as you can about it.

Observation Activity Record Sheet

- Give a visual description of the object.
 - General visual description (state, color, shape, etc.): _____

 - Measurement (diameter, height, thickness of layers, etc.): _____

- Describe the odor. _____
- Weigh the object (give total weight and weight of separate parts). _____

- Describe the taste. _____
- Other observations or comments (texture, etc.): _____

- Do your observations give any clues to the origin of the object? _____
Explain. _____

- Your instructor will read the label of the package to you. It will contain information such as the location of the processing plant that baked the cookie. Do your observations give you reason to doubt this? _____
Explain. _____

- Make a sketch of the cookie here.

In the absence of good balances, make a simple balance and compare to a standard (e.g., coins).

Top View

Side View

Ideas 1a

Geocentric and Heliocentric Theories

Part 1

Directions: Read each of the following phrases carefully and decide which solar-system theory it best describes. Then place the number of the phrase under the proper theory.

- | | |
|---|---|
| 1. View held today | 12. Sun, Mercury, Venus, Earth, . . . |
| 2. Earth, moon, Mercury, Venus, . . . | 13. Backward loops of the planets as a result of the earth's passing by |
| 3. Stationary earth | 14. Very accurate model |
| 4. Very simple model | 15. Doctrine incorporated by the Roman Catholic church during the Middle Ages |
| 5. Very inaccurate model | 16. Spinning earth |
| 6. Atmosphere dragged along by the earth | 17. Sun at the center |
| 7. Earth at the center | 18. Planets that move around in small circles called <i>epicycles</i> |
| 8. Crystal sphere around the earth called the <i>deferent</i> | 19. Theory taught by Galileo and Copernicus |
| 9. Theory formulated during the Renaissance | 20. Theory that is also named after its promoter, Ptolemy |
| 10. Very complex model | |
| 11. Theory formulated during ancient times (B.C.) | |

Geocentric

- 2
3
5
7
8
10
11
15
18
20

Heliocentric

- 1
4
6
9
12
13
14
16
17
19

Part 2

Directions: In the spaces below, define the terms *geocentric* and *heliocentric*.

Geocentric Answers will vary but should indicate that the earth is at the center and everything revolves around it.

Heliocentric Answers will vary but should indicate that the sun is at the center and everything revolves around it.

The Earth's Rotation

Directions: Use the following statements to choose the right words for the blanks in the puzzle. All of the words pertain to the rotation of the earth.

1. The sun, moon, planets, and stars all (1) in the east.
2. In the Northern Hemisphere, stars appear to move (2) around the North (3).
3. The (4) pendulum was constructed by a French physicist in 1851.
4. The earth's surface is moving faster at the (5) than at the poles.
5. (6) is the tendency of moving matter to keep moving in the same direction.
6. If you positioned a Foucault pendulum over the North Pole, you would be able to see the earth turn at a rate of (7) degrees per hour.
7. The (8) wind (9) occur because the rotating earth deflects the wind.
8. As the earth rotates, it (10) the atmosphere with it.
9. When (11) such as bullets, cannon balls, or missiles take off from the spinning earth, allowances must be made for deflection, or they may miss their target.
10. If the earth did not rotate, we would have half a year of continuous daylight and half of continuous (12).
11. The (13) of the earth is slightly flat at the poles and bulging at the equator.

| | | | | | | | | | | | | | | | | |
|-----|-----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1. | R | I | S | E | | | | | | | | | | | |
| 2. | C | O | U | N | T | E | R | C | L | O | C | K | W | I | S | E |
| | 3. | S | T | A | R | | | | | | | | | | | |
| 4. | F | O | U | C | A | U | L | T | | | | | | | | |
| 5. | E | Q | U | A | T | O | R | | | | | | | | | |
| | 6. | I | N | E | R | T | I | A | | | | | | | | |
| 7. | F | I | F | T | E | E | N | | | | | | | | | |
| | 8. | D | I | A | G | O | N | A | L | | | | | | | |
| 9. | P | A | T | T | E | R | N | S | | | | | | | | |
| | 10. | D | R | A | G | S | | | | | | | | | | |
| | 11. | P | R | O | J | E | C | T | I | L | E | S | | | | |
| 12. | N | I | G | H | T | | | | | | | | | | | |
| | 13. | S | H | A | P | E | | | | | | | | | | |