**Scientific Method and Technology Engineering Design Questions**

**Multiple Choice**

*Identify the choice that best completes the statement or answers the question.*

\_\_\_\_ 1. **SPI 0607.Inq. 1 Nate designed an experiment to measure how much heat energy different colors of soil captured. He chose two soil types to study: light sand and dark dirt. He measured heat with a thermometer before and after sunlight exposure.**

**Out of this experiment, which is the dependent variable:**

|  |  |  |  |
| --- | --- | --- | --- |
| a. | soil type | c. | temperature of the soil before experiment |
| b. | color of the soil | d. | temperature of the soil at the end of the experiment |

\_\_\_\_ 2. **SPI 0607.Inq. 1 Dr. D.’s sixth grade class conducted a study on birds. Their question was, “Does Weather affect the number of birds in the schoolyard?” They recorded how many birds they spotted in the schoolyard on a sunny day, a rainy day, and a stormy day. Based on the data on the table what answer is supported:**

|  |  |
| --- | --- |
| Weather | Number of birds spotted in the school yard at 2 pm |
| Sunny | 14 |
| Rainy | 6 |
| Stormy | 3 |

|  |  |  |  |
| --- | --- | --- | --- |
| a. | Birds like sunny weather best | c. | More birds were spotted in the schoolyard in sunny weather |
| b. | More birds are visible in the sun | d. | More birds were spotted in the schoolyard in rainy weather |

\_\_\_\_ 3. **SPI 0607. T/E.3 Coal-burning power plants emit chemicals that form acidic compounds in the atmosphere. They may be carried hundreds of miles by the wind before falling to Earth in acid rain. Where acid rain builds up in lakes and streams, fish and aquatic plant populations decrease.**

**Since the purpose of the power plants was to produce electricity/power, what would the result of acid rain be called?**

|  |  |  |  |
| --- | --- | --- | --- |
| a. | an intended benefit | c. | the intended conclusion |
| b. | an unintended consequence | d. | the hypothesis |

\_\_\_\_ 4. **SPI 0607. Inq 3 In a science lab, a group of students puts a beaker of water in the freezer. Every 20 minutes during a double class period, they take the beaker out and check the water temperature. They recorded their readings on a chart. Over what period of time did the water change from liquid to sod?**

**Remember -** 0ºC = 32ºF (Freezing)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 20ºC | xxxxxx |  |  |  |  |  |  |  |  |
| 10ºC | xxxxxx |  |  |  |  |  |  |  |  |
| 0ºC | xxxxxx | xxxxxx | xxxxxx | xxxxxx |  |  |  |  |  |
| -10ºC | xxxxxx | xxxxxx | xxxxxx | xxxxxx | xxxxxx |  |  |  |  |
| -20ºC | xxxxxx | xxxxxx | xxxxxx | xxxxxx | xxxxxx | xxxxxx |  |  |  |
| -30ºC | xxxxxx | xxxxxx | xxxxxx | xxxxxx | xxxxxx | xxxxxx | xxxxxx | xxxxxx | xxxxxx |
|  | 0 | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
|  |  |  |  |  |  |  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| a. | Between 0 and 60 minutes | c. | Between 20 and 100 minutes |
| b. | Between 20 and 60 minutes | d. | Between 80 and 140 minutes |

\_\_\_\_ 5. **SPI 0607.T/E 3 Which of the following strategies would NOT help conserve/protect the environment.**

|  |  |  |  |
| --- | --- | --- | --- |
| a. | Reduce pesticide use | c. | Protect habitats |
| b. | Develop alternative energy sources | d. | Increase the number of landfills |

\_\_\_\_ 6. **SPI 0607. Inq. 1 Corbin and Ella conducted an experiment to see which brand of paper towels were the most absorbent. The steps to their expeiment were:**

**1. Cut a 5 x 5 cm square from 3 types of paper towels**

**2. Add one drop of water to each square**

**3. Continue to add drops until the paper towel can no longer can absorb the water**

**4. Record your observations in a data table**

**5. Repeat the experiment three more times**

**In this experiment what is the independent variable?**

|  |  |  |  |
| --- | --- | --- | --- |
| a. | the water | c. | how much water the towel could hold |
| b. | the type of paper towels | d. | the dropper |

\_\_\_\_ 7. **SPI 0607.Inq 1 Sandy wants to find out which brand of fertilizer will make plants grow fastest. She collects four different brands of fertilizer and four different plants. She places Brand 1 on a pepper plant, Brand 2 on a broccoli plant, Brand 3 on a corn plant, and Brand 4 on a strawberry plant. After running the experiment, she observes that the corn plant grew the most. So she concludes that Brand 3 makes plants grow the fastest.**

**What was the student’s mistake in the design of this experiment?**

|  |  |  |  |
| --- | --- | --- | --- |
| a. | She tested more than one variable at a time. | c. | All brands of fertilizers are exactly alike |
| b. | She would have only used vegetable plants | d. | The plants did not grow at the same rate |

\_\_\_\_ 8. **SPI 0607.Inq 1 Tim conducts an experiment to determine how changes in outside air temperature affect a person’s body temperature. What is the independent variable in this experiment?**

|  |  |  |  |
| --- | --- | --- | --- |
| a. | outside air temperature | c. | person’s size |
| b. | person’s body temperature | d. | amount of time exposed to outside air |

\_\_\_\_ 9. **SPI 0607.T/E 2 An Automobive company has decided to make a new car that is more environmentally friendly than the cars it is currently making. The engineers are in the early stages of the design process. They have decided to focus on reducing carbon emissions in the exhaust.**

**What is the next step for the company?**

|  |  |  |  |
| --- | --- | --- | --- |
| a. | manufacture and sell the new car | c. | create a prototype |
| b. | research other low-emissions automobiles currently being sold | d. | seek feedback on their design from other car companies |

\_\_\_\_ 10. **SPI 0607.T/E 1 An engineer develops a prototype for a new product. After testing the prototype, the engineer determines that there is a flaw in its design.**

**What should the engineer do next?**

|  |  |  |  |
| --- | --- | --- | --- |
| a. | abandon the project | c. | continue testing the prototype |
| b. | change the prototype | d. | fix the prototype and test it again |

\_\_\_\_ 11. **SPI 0607.T/E 2 What is the first step in the technological engineering design processs?**

|  |  |  |  |
| --- | --- | --- | --- |
| a. | building and testing the product | c. | deciding if a product meets its goals |
| b. | identifying a problem or need | d. | identifying any problems with the product |

\_\_\_\_ 12. **SPI 0607.Inq 4 Much of Alaska is a tundra biome. Suppose scientists in Alaska discover fossils of several organisms that they know lived only in warmer climates. Which conclusions about the climate of Alaska in the past would this discovery best support?**

|  |  |  |  |
| --- | --- | --- | --- |
| a. | The climate of Alaska was once warmer than it is today | c. | The climate of Alaska has not changed |
| b. | The organisms also lived in cold climates | d. | Alaska used to be located near the equator |

\_\_\_\_ 13. **SPI 0607.T/E 4 A respirator is a mechanical device that helps people breathe when their lungs are unable to do so.**

**Which type of bioengineered product is a respiratot?**

|  |  |  |  |
| --- | --- | --- | --- |
| a. | biofuel | c. | assistive device |
| b. | adaptive devise | d. | prototype |

\_\_\_\_ 14. **SPI 0607.T/E.3 Which of the following statements about technology is not true?**

|  |  |  |  |
| --- | --- | --- | --- |
| a. | Once a prototype has been built, testing and evaluation can begin | c. | Technology solutions have many benefits and no known risks |
| b. | Technology has both benefits and risks | d. | Technological design is similar to designing an experiment |

\_\_\_\_ 15. **SPI 0607.Inq. 2 Tiffany is going to conduct an experiment to determine whether salt affects the temperature at which water boils. Which measuring tools are needed to carry out this experiment?**

|  |  |  |  |
| --- | --- | --- | --- |
| a. | graduated cylinder, thermometer, and stopwatch | c. | measuring spoons, graduated cylinder, and thermometer |
| b. | graduated cylinder, meter stick, and stopwatch,  | d. | measuring spoons, thermometer, and spring scale |

\_\_\_\_ 16. **SPI 0607.T/E 2 A large corporation produced a prototype for a new tennis sneaker for women. What is the next step the company should take in developing this product?**

|  |  |  |  |
| --- | --- | --- | --- |
| a. | manufacture and sell it | c. | test and evaluate its effectiveness |
| b. | determine the need for the shoe and establish a price for it | d. | share the prototype with other companies |

\_\_\_\_ 17. **SPI 0607.Inq 4 The table shows how changing the salt concentration of water affects the boiling point of the water**

**Salt Concentration and Boiling Point**

|  |  |  |  |
| --- | --- | --- | --- |
| **Solution** | **Boiling Point****Trial 1** | **Boiling Point****Trial 2** | **Boiling Point****Trial 3** |
| 1 liter water | 100ºC | 100ºC | 100ºC |
| 1 liter water + 1 tablespoon salt | 102.1ºC | 101.9ºC | 101.6ºC |
| 1 liter water + 2 tablespoon salt | 103.5ºC | 103.4ºC | 103.4ºC |

**Which conclusion is best supported by the data? (Use the table to answer!)**

|  |  |  |  |
| --- | --- | --- | --- |
| a. | Salt concentration had no effect on the boiling point of water | c. | The boiling point of water decreased as the amount of salt in the water increased |
| b. | The boiling point of water increased as the amount of salt added to the water decreased | d. | The boiling point of water increased as the amount of salt added to the water increased |

\_\_\_\_ 18. **SPI 0607.T/E 4 Which is the best example of an adaptive bioengineered product?**

|  |  |  |  |
| --- | --- | --- | --- |
| a. | a fuel for cars made from corn plants | c. | a medicine produced by bacteria in a laboratory |
| b. | a computer that can be operated by voice instead of by typing on a keyboard for a paralyzed person | d. | a corn plant that has been engineered to resist diseases |

\_\_\_\_ 19. **SPI 0607.Inq 1 Broccoli plants were studied to determine how different amounts of fertilizer affected plant growth.**

**Which was the independent variable in this study?**

|  |  |  |  |
| --- | --- | --- | --- |
| a. | amount of fertilizer | c. | amount of water |
| b. | temperature | d. | rate of growth |

\_\_\_\_ 20. **SPI 0607.Inq 5 Brandon investigates whether salt raises the boiling point of water. He puts 2 liters of water at 20ºC and 500g of salt in a pot, heats the solution over a flame, and measures the temperature when the water reaches a rolling boil. He repeats the experiment three times and records the same result each time. He concludes that salt raises the boiling point of the water.**

**Which of the following may cause this conclusion to be incorrect?**

|  |  |  |  |
| --- | --- | --- | --- |
| a. | He did not conduct the trials at the same time | c. | He should have repeated the measurement several more times |
| b. | He waited until the water reached a rolling boil | d. | He did not boil a pot of water without salt to determine the boiling point of unsalted water |

\_\_\_\_ 21. **SPI 0607.T/E. 3 Using cell phones to send text messages is a quick and inexpensive way for people to communicate.**

**Which is a possible risk for this technology?**

|  |  |  |  |
| --- | --- | --- | --- |
| a. | People can get repetitive-motion injuries from too much text messenging | c. | People can communicate with each other more often |
| b. | People can spend less money while using their cell phones | d. | People with hearing problems can use cell phones |