**STUDENT ASSESSMENT** Name_____

Date_____ Hour_____

**Directions:** Match each definition with the correct vocabulary term.

**VOCABULARY TERMS**

| | | |
|---|---|---|
| A. growing season | E. climograph | I. abiotic factor |
| B. data | F. scientific model | J. carbon footprint |
| C. weather | G. biotic factor | K. biotic factor |
| D. climate | H. climate change | |

1. **C, weather** The state of the atmosphere, at any given time, with regard to temperature, precipitation, atmospheric pressure, wind, humidity, and cloudiness.

2. **H, climate change** The change in long-term weather patterns in a specific area or globally, as a result of changes in average temperature.

3. **D, climate** Weather patterns that are characteristic of a region over a long period of time, usually at least 30 years.

4. **J, carbon footprint** The amount of carbon dioxide ($CO_2$) created by people's everyday actions.

5. **I, abiotic factors** A non-living part of an ecosystem that influences or affects the ecosystem and the organisms in it.

6. **A, growing season** The time of year when the range of temperatures and other environmental factors allow a plant to photosynthesize and grow.

7. **E, climograph** A graph that shows the annual (yearly) cycle of temperature and precipitation for a geographic location.

8. **B, data** Measured values or other information collected by a researcher.

9. **K, biotic factor** A living part of an ecosystem that influences or affects the ecosystem and the organisms in it.

10. **F, scientific model** A physical, conceptual, mathematical, or visual representation of a real phenomenon.

**Directions:** Choose the best answer for each of the following multiple choice questions.

11. Which of these cities is most likely to have the longest growing season?
    A. Detroit, Michigan
    B. Marquette, Michigan (in the Upper Peninsula)
    C. Anchorage, Alaska
    **D. Atlanta, Georgia**

12. What type of tree has modified leaves called needles that it keeps year-round?
    A. Deciduous trees
    B. Tropical trees
    **C. Coniferous trees**
    D. Mangrove trees

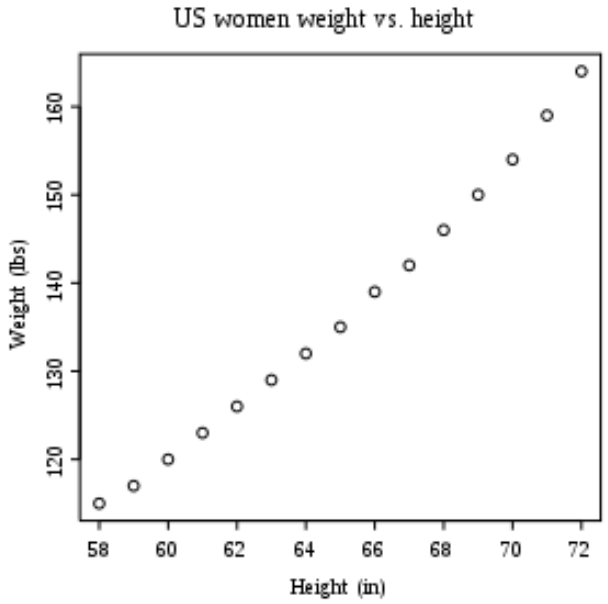
13. Which of the following best describes the relationship between temperature and tree growth?
    A. There is no relationship between temperature and tree growth
    B. Tree growth always increases as temperature increases
    **C. The relationship between temperature and tree growth depends on tree species**
    D. Tree growth always decreases as temperature increases

14. Which of the following is a piece of evidence that confirms climate change is happening?
    A. Thermometer readings are decreasing in the oceans, air, and soil
    B. Flowers are blooming later in the year
    **C. Glaciers and polar ice caps are melting and shrinking**
    D. Droughts and other extreme weather events are less common

15. The "greenhouse effect" refers to:
    A. How pollution causes acid rain
    **B. How certain gases in the atmosphere trap heat**
    C. The protective effects of earth's ozone layer
    D. How plants grow

16. Which of the following gases is a "greenhouse gas"?
    A. Oxygen
    B. Hydrogen
    C. Helium
    **D. Carbon dioxide**

**Use the graph below to answer Questions 17-19**




17. Which variable is the independent variable on the graph above?
    **A. Height**
    B. Weight
    C. Neither

18. Which variable is the dependent variable on the graph above?
    A. Height
    **B. Weight**
    C. Neither

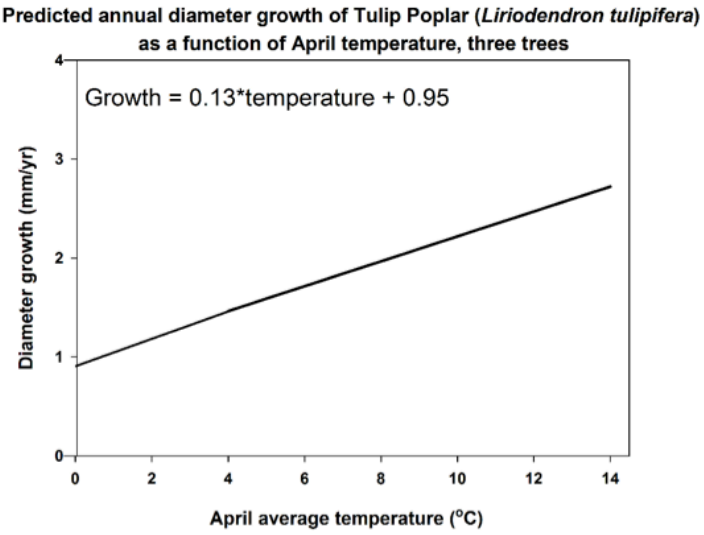
19. What type of relationship does this graph show between Weight and Height?
    A. Negative
    B. No relationship
    **C. Positive**
    D. None of the above

20. What can forest ecologists measure to determine tree growth?
    A. Noise pollution
    B. Precipitation
    **C. Diameter-at-breast-height (DBH)**
    D. Temperature

21. Which of the following is true about scientific models?
    A. Scientific models calculate the likelihood of every possible outcome
    B. Scientific models are used to understand only complex ideas
    **C. Scientific models show relationships between different variables**
    D. Scientific models can only be used to understand the past

22. Complete the following sentence, "Scientific models ... "
    A. provide a detailed description of a place or event.
    B. share an idea or principle through a story.
    C. are events with clear causes.
    **D. represent part of the real world.**

**Use the graph below to answer Question 23 and Question 24.**



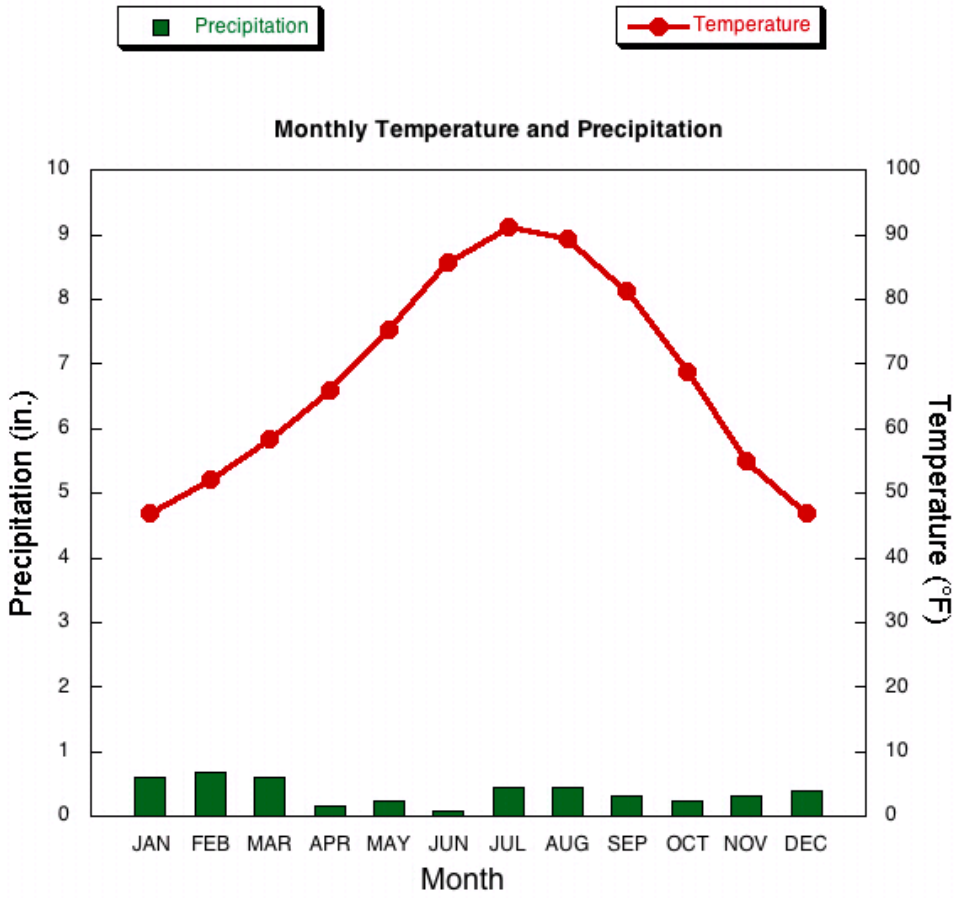

23. What does 0.13 represent in the equation shown in the graph above?
    A. The y-intercept of the line
    B. The y value (dependent variable)
    **C. The slope of the line**
    D. The x value (independent variable)

24. What is a characteristic of this graph?
    **A. It shows the relationship between two variables**
    B. It is only useful to scientists
    C. It captures every detail about the world
    D. It can only represent one point in time

25. How is the climate of deserts different from the climate of tropical rainforests?

A. Rainforests have more plants
B. Deserts have more sand
C. Deserts receive more sunlight than rainforests
**D. Deserts receive less rain than rainforests**

**Use the climograph below to answer Question 26.**




26. This climograph represents a desert climate. According to the graph, what is the temperature during the month of August?

A. 75°F
B. 81°F
**C. 89°F**
D. 95°F

**Directions:** Select TRUE or FALSE for each of the following statements.

Which of the following benefits do forests provide?

27. **TRUE** Prevent soil erosion

28. **TRUE** Provide habitat for wildlife

29. **FALSE** Decontaminate nuclear waste

30. **TRUE** Cycle minerals and nutrients like carbon and nitrogen

31. **FALSE** Block radio waves

32. **TRUE** Provide opportunities for research or forest-related careers.

**Directions:** Carefully read and answer the following short answer questions.

33. List four factors that influence plant growth. Be as specific as possible!

**NOTE: OTHER ANSWERS POSSIBLE**

- **Temperature**
- **Precipitation**
- **Sunlight availability**
- **Soil type**
- **Insect pests**
- **Slope of the ground**
- **Competition for resources**

34. What is the main factor climate scientists believe is contributing to current, human-caused climate change?

**Humans burn fossil fuels which releases carbon dioxide ($CO_2$) and other greenhouse gases into the atmosphere and increases the naturally-occurring greenhouse gas effect.**

35. If your friend says, “This winter was colder and snowier than last winter. How can climate change be happening?" What could you say to explain how climate change can still be occurring?

**A colder winter and increased snowfall are both created by day-to-day weather patterns. Climate change takes into account average weather patterns over a long period of time - usually at least 30 years. This means that there can still be cold weather and cold years while on average, and in the long-term, the planet is warming. Therefore, one cold winter with a lot of snow does not disprove climate change.**

**Directions:** The picture below shows an example of a tree core sample. Use the picture to answer Question 36.

36a) How is this tree's growth during the time period outlined by the box different than the rest of its growth during other time periods?

**The period in the box shows decreased growth in those 5-6 years compared to the years right before and after.**

b) What could have caused this difference?

**A change in weather over several years. Examples include: drought (little to no rainfall) that limited photosynthesis so the tree didn't grow as much as in other years; temperature extremes (e.g., too cold/hot temperatures) that limited photosynthesis so the tree didn't grow as much as in other years; a disease or insect pest damaged the tree so its growth decreased for a few years. NOTE: Other answers possible (e.g., competition, fire, other disturbances).**

37. Read Sentences A, B, & C (shown below) carefully. In the space below, rearrange the order of these three sentences to create a paragraph that answers the question, ***How will climate change impact the world's oceans?***

Your paragraph should follow this order:

- Claim - the statement you are going to support with evidence
- Evidence - evidence to support your claim
- Reasoning - explanation of how your evidence supports your claim

Sentence A - If ocean water becomes too acidic, it could make it difficult for small organisms like tiny plankton to survive.
Sentence B - Climate change will impact animals that live in the oceans.
Sentence C - Increased greenhouse gas emissions and climate change makes ocean water more acidic.

**<u>Climate change will impact animals that live in the oceans. Increased greenhouse gas emissions and climate change makes ocean water more acidic. If ocean water becomes too acidic, it could make it difficult for small organisms like tiny plankton to survive.</u>**

38. Read the paragraph below and match each if the three questions with the best possible solution.

Imagine you would like to see how the growth of one tree species (white oak) is related to temperature and precipitation over a 24-year period. You decide to take a tree core sample from 10 different white oak trees and compare past growth to past temperature and precipitation data.

The following three questions ask you how you could strengthen (improve) your study.

How could you,

**C** 1. strengthen your conclusions about white oak as a species?

**A** 2. broaden the scope of your study?

**B** 3. check that your data are accurate?

Solutions:

A. Add more tree species in your study.
B. Measure each individual tree more than once.
C. Include more than 10 white oak trees in your research.

39. How could climate change impact the forest you visited for your *Climate Change and Michigan Forests* field trip?

**Answers will vary.**