Chemistry Summer Assignment

1. Scientific principles are accepted laws governing natural phenomena. How are scientific principles used to develop scientific theories?

- **A.** Scientific principles and scientific laws are unrelated.
- **B.** Scientific principles and scientific theories are different words for the same thing.
- **C.** Scientific principles provide results that allow researchers to avoid developing research questions.
- **D.** Scientific principles are used to predict certain outcomes, helping shape scientific theories.

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2. Why is scientific argumentation an important part when reviewing results and explanations?

- **A.** Disinterest in the subject matter is created after scientific argumentation.
- **B.** The scientists realize that the experiment should not have been carried through after scientific argumentation.
- **C.** Strength and usefulness of claims are evaluated through scientific argumentation.
- **D.** The report should be printed in a different color after scientific argumentation.

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3. Annie wants to find out if having a substance dissolved in water changes the temperature at which the liquid boils. She prepares two samples of water with equal volumes. She dissolves 3.0 grams of salt in the first sample, and uses the second sample of pure water for a control group. She then heats each sample until it boils and records the temperature while it is boiling.

Which of the following is the dependent variable in this experiment?

- **A.** the temperature at which the liquid boils
- **B.** the volume of the water samples
- **C.** the type substance dissolved in the water
- **D.** the boiling point of pure water

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4. How can a scientific hypothesis be used to answer a specific question about an observed phenomenon?

○ **A.** A hypothesis can offer an explanation for an observed phenomenon that is supported by extensive data.

○ **B.** A hypothesis can suggest an explanation for an observed phenomenon that can later be tested through experimentation.

○ **C.** A hypothesis can offer an explanation for an observed phenomenon that is considered to be universally true.

○ **D.** A hypothesis can suggest an explanation for an observed phenomenon that will always be proven as fact.

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5. Rotifers are microscopic animals that feed on algae, protozoa, organic wastes, and dead bacteria.

To investigate the effects of light intensity on the feeding response of rotifers, a student placed 100 newly-hatched rotifers in an environmentally-controlled tank and introduced a quantified amount of algae. After ten minutes, she counted the number of rotifers that exhibited a positive feeding response (i.e., algae were found in their guts).

The student repeated the procedure for various light intensities while holding all other factors constant, including the temperature, which was kept at 25°C.

The data from her investigation is shown below.

Light Intensity	**Number of Rotifers with Positive Feeding Response**
100,000 lx (direct sunlight)	97

10,000 lx (sunny day)	96
1,000 lx (cloudy day)	98
500 lx (sunrise)	94
1 lx (full moon)	97

What is the independent variable in this investigation?

- **A.** the number of rotifers with a positive feeding response
- **B.** the amount of algae
- **C.** water temperature
- **D.** light intensity

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6. Janice was researching combustion. During her research, she came across two different hypotheses—proposed at different times in history—that both attempted to explain why certain objects burn.

Hypotheses:

I. Burning is the chemical reaction of a substance with oxygen gas present in the air. The reaction produces water vapor and releases heat energy.
II. Certain objects are made from a combination of the elements water and fire. Applying heat to these objects separates the fire from the water.

To see which hypothesis better explained the process of combustion, Janice designed and performed an experiment.

Experiment:

1. A small candle was lit with a match.
2. The candle was allowed to burn for one minute.
3. The candle was covered by a glass beaker.

Observations:

- The flame of the candle was very hot.
- Shortly after being covered, the flame diminished and soon went out.
- After the flame went out, water droplets formed on the inside of the beaker.

Which of Janice's observations is explained by Hypothesis I but not by Hypothesis II?

- **A.** The flame of the candle is hot.
- **B.** Water condenses on the inside of the flask.
- **C.** The flame goes out when the candle is covered.
- **D.** all of these

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7. In the 1600s, many scientists supported the theory of spontaneous generation. This theory stated that living organisms could come from nonliving matter.

Which of the following experiments led to the dismissal of the theory of spontaneous generation by the scientific community?

- **A.** demonstrations that DNA, the cell's hereditary material, could undergo replication
- **B.** demonstrations that no organisms would grow on sterilized food placed in a sealed container
- **C.** demonstrations that every living organism had two parents
- **D.** demonstrations that all organisms were composed of at least one cell

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8. Science utilizes _____ to determine the best explanations for the natural world.

- **A.** logical arguments
- **B.** guesses or estimates
- **C.** faith and belief
- **D.** all of these

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9. What is useful in constructing scientific questions, methods, and explanations?

- **A.** formaldehyde
- **B.** a large research team
- **C.** a very limited amount of time
- **D.** creativity

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10. In addition to using direct observations made from scientific investigations, research also uses information found in

- **A.** tabloid magazines.
- **B.** newspaper editorials.
- **C.** science fiction novels.
- **D.** scientific literature.

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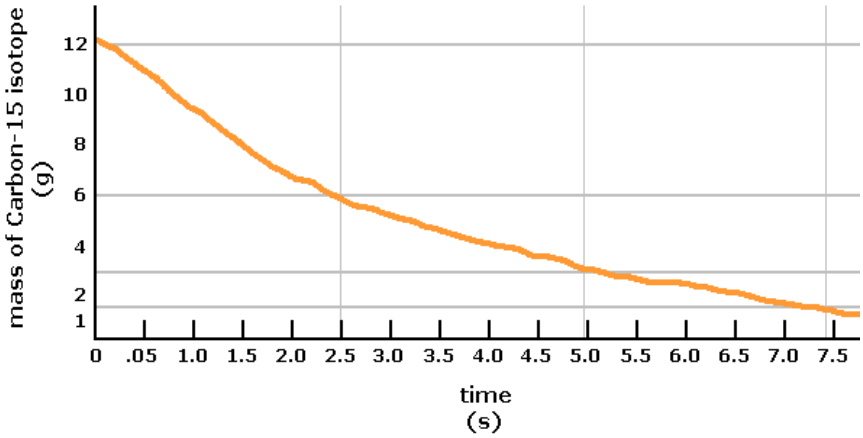
11. Radioactive elements decay over time. The diagram below shows the mass of a sample of radioactive carbon-15 graphed over time.

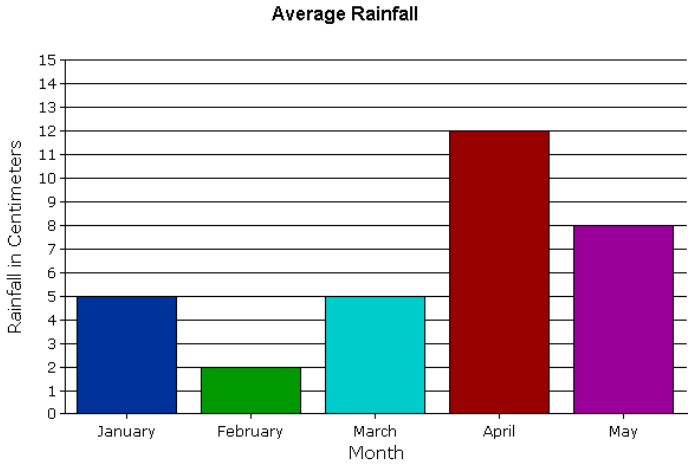
Mass of Carbon-15 Sample Over Time



Based on the information in the graph, which of the following is a true statement about the relationship between the mass of the carbon isotope and time?

- **A.** There is a negative relationship between the mass of the carbon isotope and time.
- **B.** There is not enough information to tell how the two quantities relate.
- **C.** There is a positive relationship between the mass of the carbon isotope and time.
- **D.** There is no relationship between the mass of the carbon isotope and time.

12.



Which of the tables below matches the data presented in the graph?

A.

Jan	Mar	May
6 cm	6 cm	7 cm

B.

Jan	Mar	May
5 cm	2 cm	5 cm

C.

Jan	Mar	May
5 cm	5 cm	7 cm

D.

Jan	Mar	May
5 cm	5 cm	8 cm

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13. A sample of sugar is experimentally analyzed and found to have a mass of 154 grams. If the actual mass of the sugar is 180 grams, what is the percent error?

A. 26%

B. 14%

C. -26%

D. -17%

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14. Dr. Morgan wants to determine the growth rate of a tree. She decides to measure the height of the tree every week for a year and record her measurements. Which of the following units should Dr. Morgan use to report the height of the tree?

- **A.** degrees
- **B.** meters
- **C.** liters
- **D.** grams

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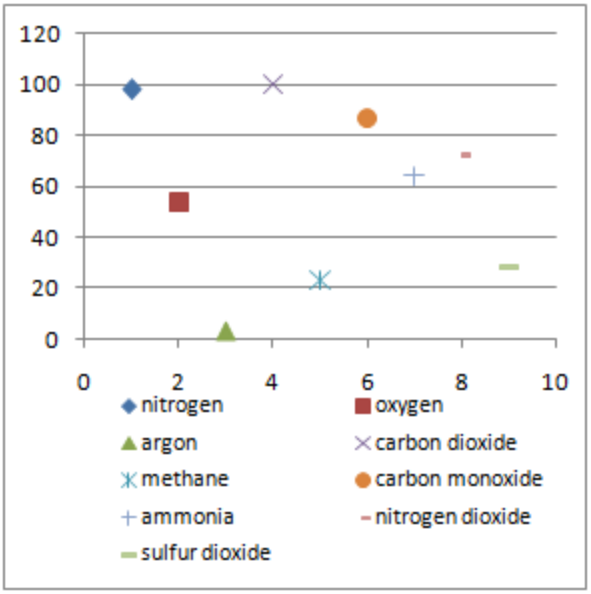
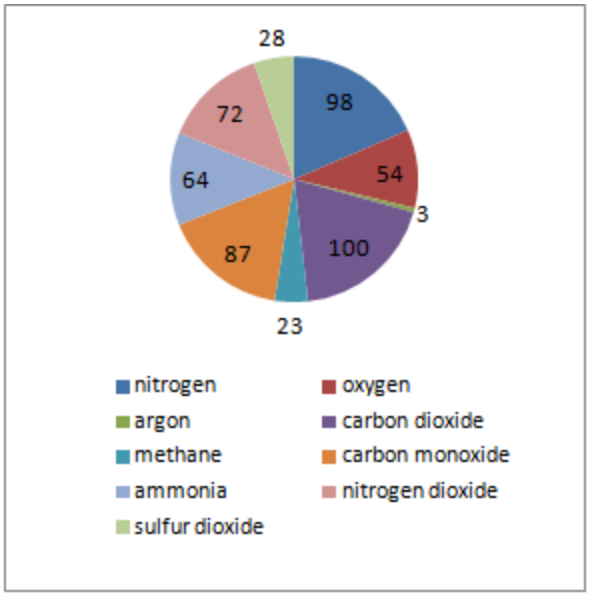
15. Paula is studying the gases emitted by a shield volcano in Hawaii. She has constructed the frequency table below to show how often each type of gas appears in 100 samples she took over the course of a year.

Type of Gas	Frequency
nitrogen	98
oxygen	54
argon	3
carbon dioxide	100
methane	23
carbon monoxide	87
ammonia	64
nitrogen dioxide	72
sulfur dioxide	28

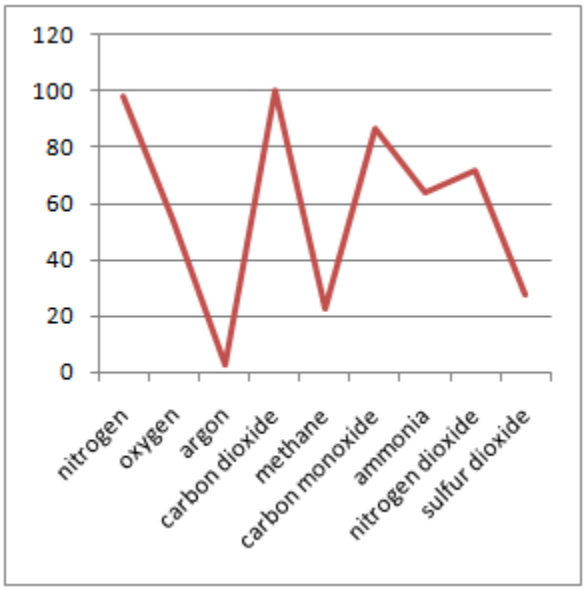
Which of the following types of graphs best organizes Paula's data?



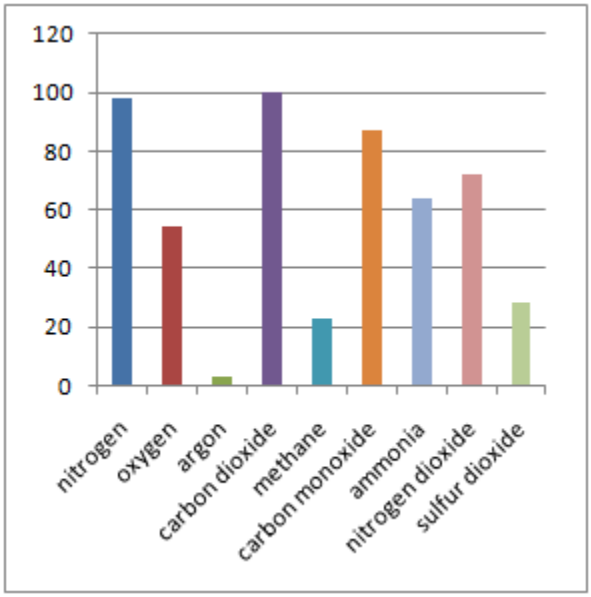
W.



X.



Y.



Z.

- **A.** Z
- **B.** W
- **C.** Y
- **D.** X

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16. Jim left for work at 6:13 am. He arrived at work at 7:57 am. Rounding to the nearest ten minutes, estimate his commute time.

- **A.** 20 min
- **B.** 1 hr 40 min
- **C.** 1 hr 50 min
- **D.** 50 min

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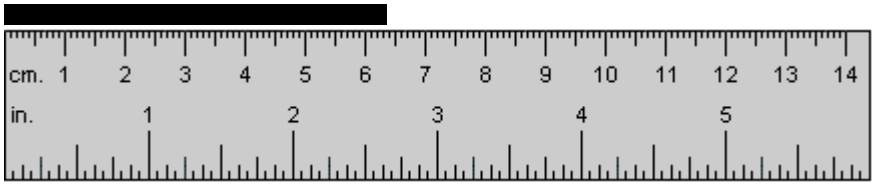
17. Temperature is usually measured in degrees Celsius or degrees Fahrenheit. In order to convert from degrees Fahrenheit to degrees Celsius, the following formula is used.

$$°C = \frac{5}{9}(°F - 32)$$

Which of the following answer choices correctly rearranges the above formula so that degrees Celsius can be converted to degrees Fahrenheit?

- **A.** $°F = \frac{5}{9}(°C - 32)$
- **B.** $°F = \frac{9}{5}°C + 32$
- **C.** $°F = \frac{5}{9}°C + 32$
- **D.** $°F = \frac{9}{5}(°C - 32)$

18.



To the correct number of significant digits, about how long is the black line shown above?

- **A.** 6.3 cm
- **B.** 6 cm
- **C.** 6.4 cm
- **D.** 6.35 cm

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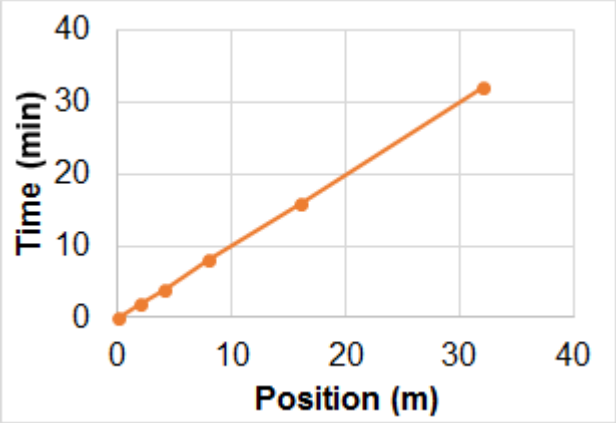
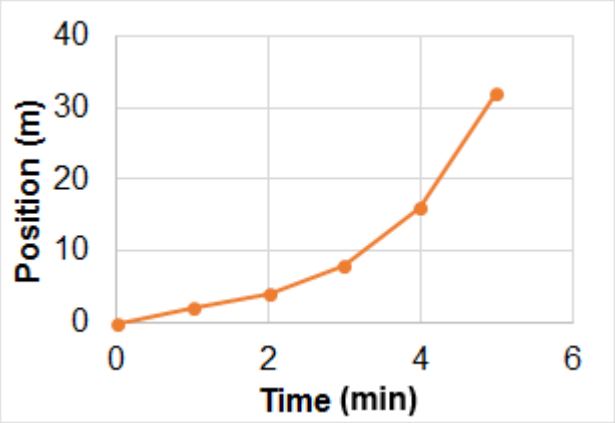
19. Samantha took her dog for a walk outside. The table below shows the distances she traveled in the first five minutes.

Time (minutes)	**Position** (meters)
1	2
2	4
3	8
4	16
5	32

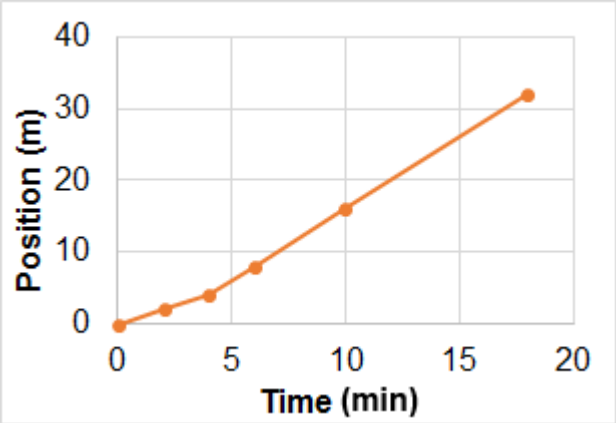
Which of the following corresponds to an accurate position vs. time line graph of the information found in the table above?



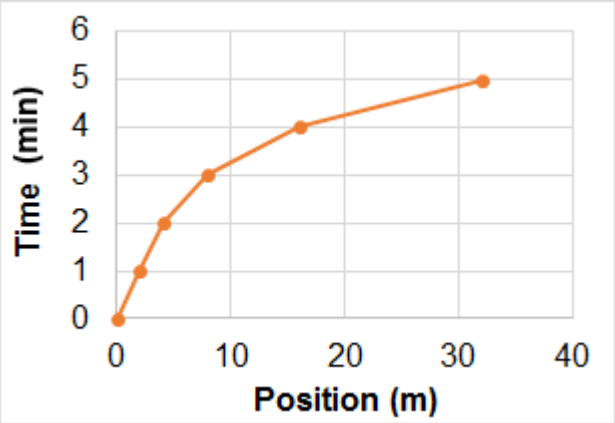
W.



X.



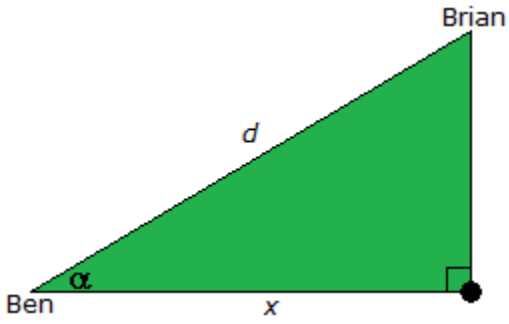
Y.



Z.

- **A.** Z
- **B.** X
- **C.** W
- **D.** Y

20.



Brian and Ben are playing golf and both of their golf balls have landed on a flat portion of the green. The distance, *d*, between Ben's golf ball and Brian's golf ball is 20 feet. If $\alpha = 40°$, then about how far is Ben's golf ball from the center of the hole?

- **A.** 26 feet
- **B.** 13 feet
- **C.** 17 feet
- **D.** 15 feet