

1 The most massive particles inside an atom are

- A protons and electrons.
- B protons and neutrons.
- C neutrons and electrons.
- D electrons.

2 Energetic particles that move in all directions around the nucleus of an atom are called

- A neutrons.
- B protons.
- C elements.
- D electrons.

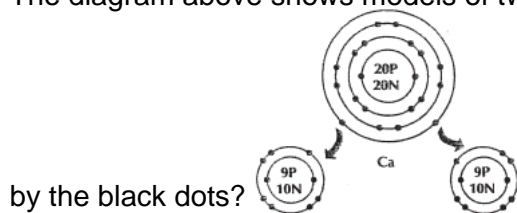
3 Which of the following types of particle found in an atom has no charge?

- A electron
- B nucleus
- C neutron
- D proton

4 Which of the following describes a particle that could be an atom?

- A has 0 protons, 2 neutrons, and 0 electrons
- B has 2 protons, 2 neutrons, and 0 electrons
- C has 2 protons, 2 neutrons, and 2 electrons
- D has 2 protons, 0 neutrons, and 0 electrons

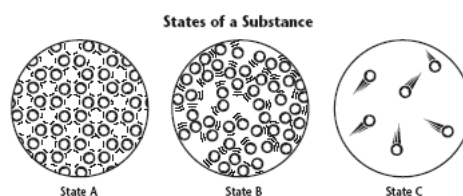
5 The diagram above shows models of two different atoms. Which subatomic particles are represented



- A protons
- B neutrons
- C electrons
- D nuclei

- 6 According to the model of atoms we now use,
- A an atom cannot be broken down into smaller pieces.
 - B an atom consists of a sphere of positive electricity in which negative electrons are embedded like raisins in a raisin muffin.
 - C an atom consists of a nucleus of positive charge surrounded by electrons that orbit the nucleus in well-defined orbits.
 - D an atom consists of a nucleus containing protons and neutrons. The nucleus is surrounded by electrons that move around the nucleus in orbitals defined by probability distributions.
- 7 Which of the following forms when two atoms combine?
- A atom
 - B chemical bond
 - C electron cloud
 - D mixture
- 8 Many familiar substances are compounds made of two or more elements. Which of the following is true of compounds?
- A They always contain the same elements in the same ratio.
 - B They can be separated easily.
 - C They contain only one type of atom.
 - D They retain the properties of each element.
- 9 Which of the following is an example of a compound?
- A carbon (C)
 - B helium gas (He)
 - C oxygen gas (O₂)
 - D water (H₂O)

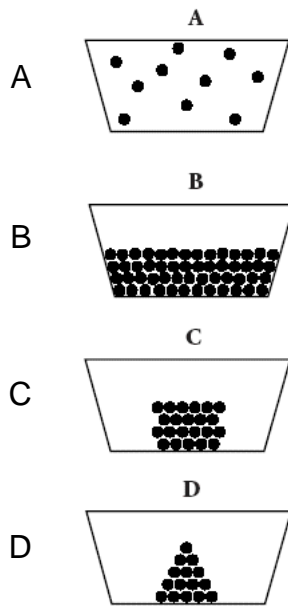
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Which of the states represents a liquid?

- A State A
- B State B
- C State C
- D States A and B

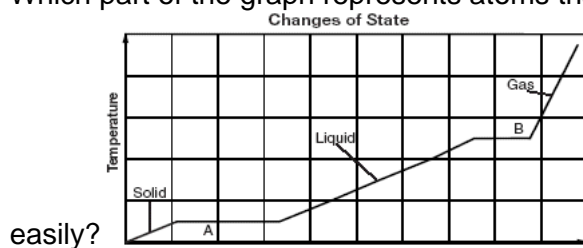
11 Which container holds a gas?



12 A block of ice melts into liquid water. Which *best* describes how the water molecules change?

- A They become locked in place.
- B They break apart into atoms.
- C They move more quickly.
- D They move more slowly.

13 Which part of the graph represents atoms that are far apart and move around



easily?

- A A
- B liquid
- C B
- D gas

14 The atoms in a solid

- A move around freely.
- B are far apart.
- C do not move easily.
- D have more kinetic energy than those in a gas.

15 Which of these is true of the particles in a gas?

- A They form a regular, repeating pattern.
- B They are completely motionless.
- C They stay in about the same position but vibrate.
- D They move in all directions.

16 In chemical reactions, what does the principle of conservation of mass mean?

- A Matter is not created or destroyed.
- B The total mass of the reactants is greater than the total mass of the products.
- C The total mass of the reactants is less than the total mass of the products.
- D Matter is not changed.

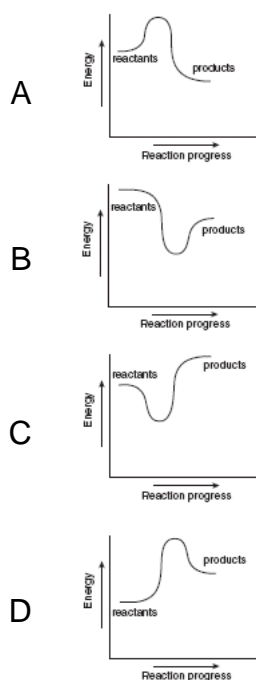
17 In a chemical reaction, the total mass of the reactants is

- A less than the total mass of the products.
- B greater than the total mass of the products.
- C exactly equal to the total mass of the products.
- D unrelated to the total mass of the products.

18 The class watched a video of a log burning. The log became a pile of ashes. The mass of the ashes was less than the mass of the log before it burned. What can the class conclude based on the law of conservation of mass?

- A The chemical reaction created matter.
- B The chemical reaction destroyed matter.
- C Not all of the products and reactants could be measured because the chemical reaction took place in an open system.
- D The chemical reaction did not work as expected because it took place in a closed system.

19 Line graphs are used to represent the energy changes that occur during a chemical reaction. Which of the following graphs *best* represents the energy changes that occur during an endothermic reaction?



20 A chemical reaction that absorbs energy in the form of heat will

- A go faster as temperature increases.
- B go more slowly as temperature increases.
- C be unaffected by temperature.
- D not occur.

21 Which of the following is an exothermic reaction?

- A frying an egg
- B baking bread
- C burning wood
- D freezing water

22 Halite is a mineral formed by the evaporation of a solution. Which type of process is evaporation?

- A physical
- B chemical
- C experimental
- D technological

23 Which of the following is an example of a physical change?

- A burning
- B melting
- C rusting
- D corroding

24 Water vapor in the air turns to liquid water in the form of rain. This is an example of a

- A physical change.
- B chemical change.
- C chemical equation.
- D chemical formula.

25 When water freezes, it undergoes

- A a physical change.
- B a chemical change.
- C vaporization.
- D sublimation.

26 Which statement is true of a physical change?

- A Burning is one example.
- B It alters the form or appearance of a substance.
- C It changes a substance into a different substance.
- D More than one substance must be present.

27 David stirs a spoonful of sugar into a glass of lemonade. As he stirs, the sugar disappears. What type of change is occurring?

- A chemical change
- B creation of matter
- C destruction of matter
- D physical change

28 To which group of elements in the periodic table do neon and other nonreactive elements belong?

- A metals
- B nonmetals
- C noble gases
- D transition elements

29

Periodic Table of the Elements (Top Section)

1	2																	18
3	4	5	6	7	8	9	10	11	12									

Where are nonmetals located on the periodic table?

- A to the left of the zigzag line
- B to the right of the zigzag line
- C in rows 3 and 4
- D in Groups 1 through 4

30 The elements in Groups 3 through 12 in the periodic table are known

Periodic Table of the Elements (Top Section)

1	2																	18
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as

- A metalloids.
- B nonmetals.
- C inert gases.
- D transition metals.

31 What information in the periodic table indicates the number of protons in an atom?

- A the position of the element in its column
- B the element's chemical symbol
- C the element's atomic number
- D the element's atomic mass

32

36
Kr
Krypton
83.8

How many protons does a krypton atom have?

- A 18
- B 36
- C 72
- D 83.8

33 The element shown has a mass number of 40. How many protons, electrons, and neutrons are in

18
Ar
Argon
40.0

the element shown?

- A 18 protons, 40 electrons, 18 neutrons
- B 40 protons, 40 electrons, 22 neutrons
- C 18 protons, 18 electrons, 22 neutrons
- D 18 protons, 18 electrons, 18 neutrons

34 Which of the following properties of matter can be used to identify a specific type of matter?

- A density
- B mass
- C volume
- D weight

35 Why do you need to know more than the melting point of a substance in order to accurately identify it?

- A The melting point of a substance changes over time.
- B Many substances have the same melting point.
- C All substances have the same melting point.
- D The melting point of a substance cannot be determined accurately.

36 Elements that are shiny, are good heat conductors, and can be reshaped are called

- A isotopes.
- B solids.
- C gases.
- D metals.

37 What information about a substance do you get by measuring its density?

- A how much the material weighs
- B amount of matter per volume
- C what size the object is
- D how much matter weighs

38 What changes if a substance's volume decreases but its mass remains the same?

- A height
- B color
- C density
- D state of matter

CA Physical Science Benchmark Test 1

- 39 Raul measures a rock with a balance and then finds its volume. What can he calculate using these two measurements?

A density
B hardness
C melting point
D weight

- 40 A 10 mL sample of a liquid has a mass of 8.7 grams at 20°C. What is the liquid?

DENSITIES OF VARIOUS SUBSTANCES	
Substances	Density at 20°C (g/mL)
ethyl alcohol	0.79
kerosene	0.82
turpentine	0.87
water	0.998

A ethyl alcohol
B kerosene
C turpentine
D water

- 41 A block of metal has a length of 3 centimeters, a width of 5 centimeters, a height of 10 centimeters, and a mass of 3,000 grams. Find the density of the metal in g/cm^3

A 20 g/cm^3
B 50 g/cm^3
C 0.5 g/cm^3
D 0.02 g/cm^3

- 42 What is the volume of an object with a mass of 12 grams and a density of 2 g/mL?

A 6 g
B 6 mL
C 24 g
D 24 mL

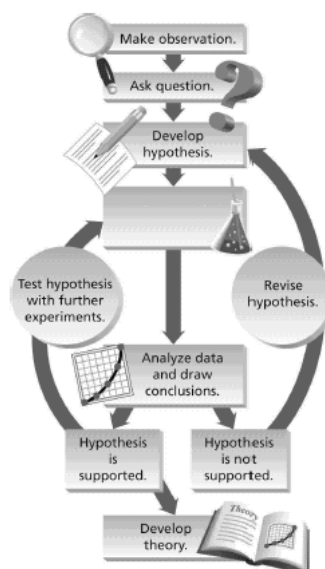
- 43 What is the first step of the scientific process?

A Gather equipment for an experiment.
B Plan an experiment.
C Formulate a testable hypothesis.
D Make a chart.

44 Inez repeated an experiment to test her hypothesis three times. None of the trials supported her hypothesis. What should she do?

- A Repeat the experiment again.
- B Have someone watch her do the experiment.
- C Revise her hypothesis and test the new hypothesis.
- D Use her friend's data because it supports her hypothesis.

45



What should be in the blank to complete the diagram?

- A Communicate the hypothesis.
- B Develop an explanation based on the hypothesis.
- C Test the hypothesis with an experiment.
- D Draw conclusions based on the hypothesis.

46 Lydia helped as the timer in the school's track meet. The chart shows the results of a race she timed. Given this information, Lydia predicts that Tony will win the next race. From a scientific point of view, the major weakness of this prediction is that

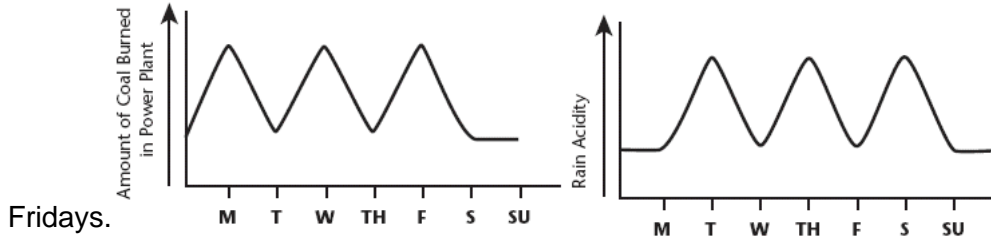
Race Times	
Raul	10.20 sec
Mark	10.22.sec
Tony	10.18.sec

- A Lydia may like Tony better than the others.
- B Lydia should have a better stopwatch.
- C Lydia's prediction does not match the data.
- D Lydia's data is not valid after only one trial.

47 A student conducting an experiment wants to make sure his results are reliable. What should he do?

- A Repeat the experiment several times and average the results.
- B Repeat the experiment several times and use the fastest results.
- C Repeat the experiment using a different dependent variable.
- D Repeat the experiment using a different manipulated variable.

- 48 Predict the appearance and accuracy of the lower graph (rain acidity) if data had been collected only on Mondays, Wednesdays, and



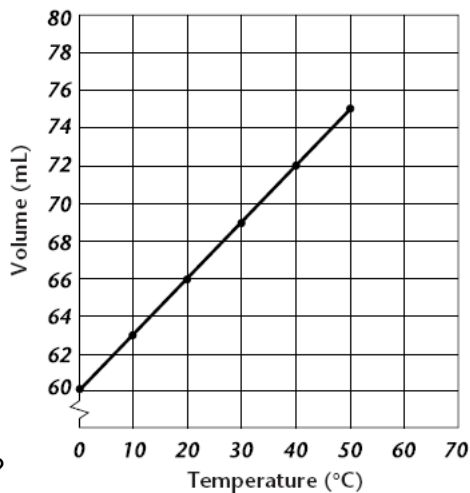
- A The graph would accurately show a straight line indicating a constant high level of acidity.
 - B The graph would not change in appearance or accuracy.
 - C The graph would inaccurately show a straight line indicating a constant low level of acidity.
 - D The graph would accurately show reversed high and low levels of acidity.
- 49 In an experiment, which is the variable that is changed to test a hypothesis?
- A responding variable
 - B independent variable
 - C dependent variable
 - D operational definition
- 50 An experiment involves measuring the time it takes for heat to be conducted along the lengths of several bars made of different substances. The bars have the same length and the same cross-sectional area. What is the independent variable in this experiment?
- A the length of each bar
 - B the time during which heat is conducted
 - C the substance of which each bar is made
 - D the cross-sectional area of each bar
- 51 A student hypothesizes that water containing sugar freezes at a lower temperature than water without sugar. In an experiment to test this hypothesis, which of the following will be the independent variable?
- A amount of water
 - B amount of sugar
 - C temperature of water
 - D freezing point of water

52 What information does the slope of a line on a graph provide?

- A how much x changes for every change in y
- B how much y changes for every change in x
- C how much the manipulated variable changes with the responding variable
- D how much the independent variable changes with the dependent variable

53 A scientist heated an expandable rubber container. As the container was heated, the gas inside expanded. The scientist measured the container's size at every temperature increase of 10 degrees and then graphed the data as shown. What would be the size of the container if the temperature

**How Temperature Affects
Gas Volume**

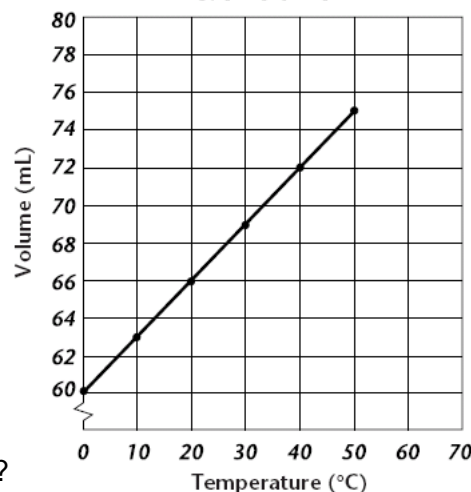


were 60°C?

- A 72 mL
- B 75 mL
- C 78 mL
- D 80 mL

54

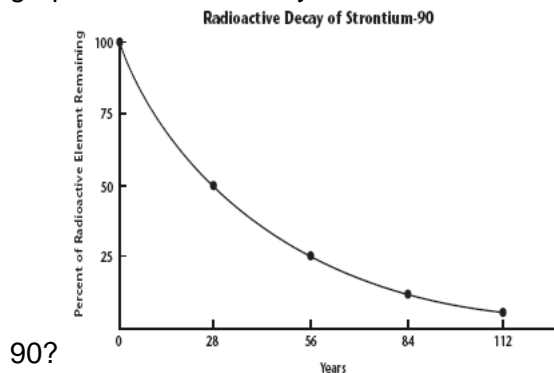
**How Temperature Affects
Gas Volume**



What is the slope of the line?

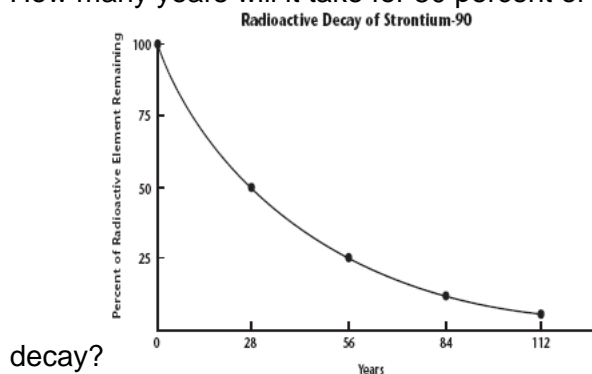
- A 0.3°C/mL
- B $0.3\text{ mL}^{\circ}\text{C}$
- C 3°C/mL
- D $3\text{ mL}^{\circ}\text{C}$

- 55 Strontium-90 is a radioactive form of the element strontium that undergoes radioactive decay. The graph shows the decay of strontium-90 over time. What is the half-life of strontium-



- A 25 years
- B 28 years
- C 50 years
- D 56 years

- 56 How many years will it take for 50 percent of a sample of strontium-90 to



- A 28 years
- B 56 years
- C 84 years
- D 112 years

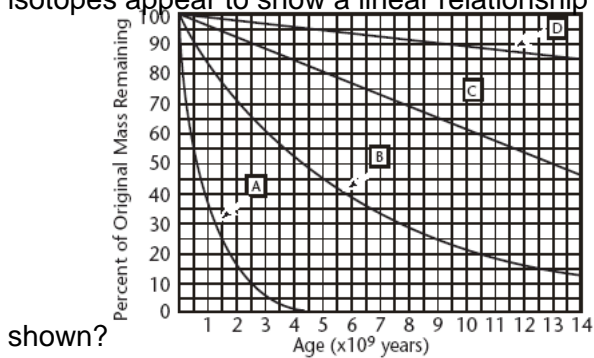
- 57 What percent of a sample of strontium-90 will remain after 84 years?

- A 6.25%
- B 12.5%
- C 16%
- D 25%

58 A scientist's data show a linear relationship between two variables. How would you expect this data to appear on a graph?

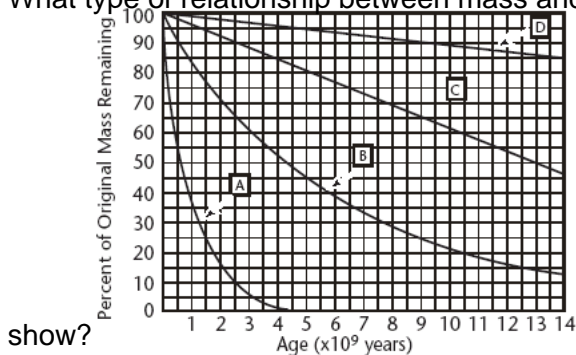
- A curved line
- B horizontal line
- C straight line
- D vertical line

59 The graph above shows the rate of decay of four radioactive isotopes found in nature. Which two isotopes appear to show a linear relationship between age and remaining mass over the time period



- A A and B
- B A and D
- C B and C
- D C and D

60 What type of relationship between mass and age does the graph for isotope A



- A equivalent
- B linear
- C nonlinear
- D no relationship