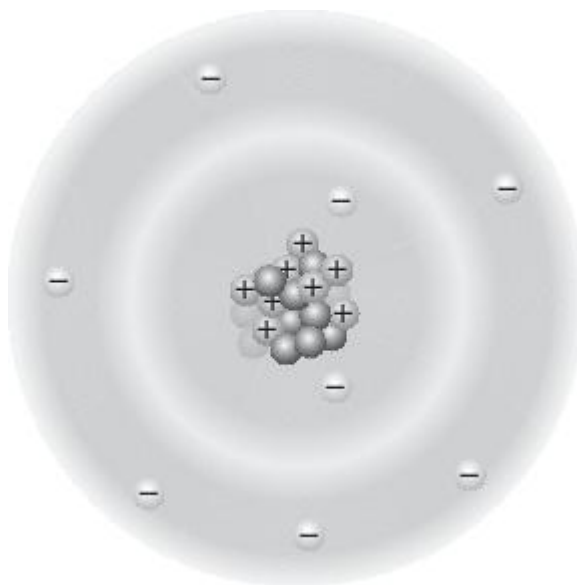


**Directions:** Please choose the best answer choice for each of the following questions.

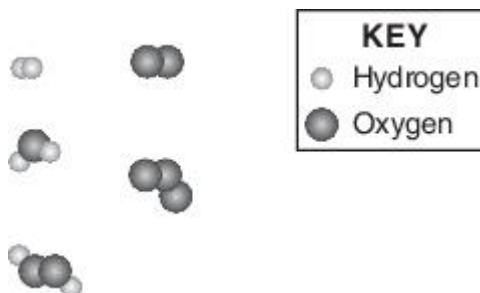
1. Which of the following could be a molecule BUT not a compound?
  - A. a pair of atoms of the same element
  - B. a collection of atoms that make up a solid substance
  - C. a group of atoms that are each of a different element
  - D. two kinds of atoms bonded together in a repeating pattern
2. What do elements, compounds, and molecules all have in common?
  - A. They are all made of atoms.
  - B. They can exist only in a solid form.
  - C. All of them are chemically the same.
  - D. All of them can be chemically broken down.
3. A molecule of ozone ( $O_3$ ) has how many different types of atoms?
  - A. 1
  - B. 2
  - C. 3
  - D. 4

4. Susan uses a diagram of an atom to describe its characteristics.



Which of these characteristics of the atom can be observed from this diagram?

- A. The atom consists mostly of protons.
  - B. The atom consists mostly of empty space.
  - C. The atom contains the electrons in the center.
  - D. The atom contains more electrons than protons.
5. The diagram below shows some ways that hydrogen and oxygen atoms can combine.

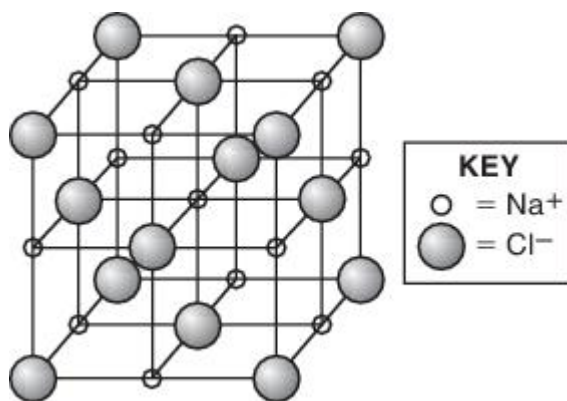


How many of these combinations of atoms are compounds?

- A. 1
- B. 2
- C. 3
- D. 5

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6. Which substance is a compound?
- $\text{NO}_2$  (nitrous oxide)
  - $\text{O}_3$  (ozone)
  - $\text{Br}_2$  (bromine)
  - He (helium)
7. When 2 elements form a compound, they
- can be separated physically.
  - can be separated chemically.
  - will have the same properties as the elements of which they are made.
  - will not react with other compounds.
8. Which statement is true?
- Elements are formed by combining two or more different compounds.
  - Compounds are formed by combining two or more different elements.
  - Molecules are formed by combining two or more different compounds.
  - Compounds are formed by combining two or more different mixtures.
9. In solid sodium chloride ( $\text{NaCl}$ ), a crystal array forms from sodium ions ( $\text{Na}^+$ ) and chloride ions ( $\text{Cl}^-$ ) as shown below.

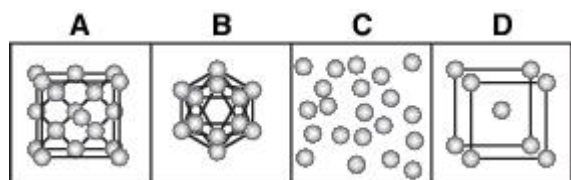


Which statement BEST describes sodium chloride?

- a molecule and a compound
- a compound but not a molecule
- a molecule but not a compound
- neither a molecule nor a compound

10. After a phase change occurred, the water molecules that were close together were moving very fast and independently of one another. Which of these physical processes had probably taken place?
- ice melting
  - water boiling
  - water freezing
  - steam condensing
11. Yoshi was given a plastic jar and several hundred marbles. How can he use these objects to make a model that will demonstrate movement of molecules in a solid?
- He can pack the jar with marbles and not move it.
  - He can fill the jar with marbles and vibrate it slightly.
  - He can place a few marbles in the jar and shake it rapidly.
  - He can fill the jar halfway with marbles and turn it over and over.
12. Which of these *most closely* resembles the movement of molecules in a liquid?
- cars stopped in a traffic jam
  - musicians marching in a straight line
  - shoppers in a crowded grocery store
  - a few children running around in a playground
13. Which of these statements *best* describes the molecules of a solid?
- The molecules are vibrating against one another.
  - The molecules are joining to form one large molecule the size of the solid.
  - The molecules are quickly moving around independently of one another.
  - The molecules are gaining energy to stay in a solid phase.

14.



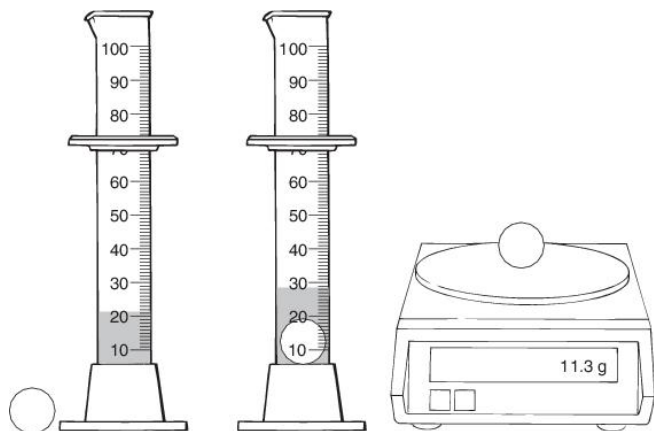
Which substance shown is least likely a solid?

- A. A
- B. B
- C. C
- D. D

15. Robin studies the effect of increasing temperature on water atoms. What happens to the water atoms when the water boils?

- A. The size of the atoms decreases.
- B. The speed of the atoms decreases.
- C. The atoms move closer to each other.
- D. The atoms move farther away from each other.

16. The pictures below show a graduated cylinder with water, an electronic balance, and a small metal ball. The graduated cylinder had **21 milliliters (mL)** of water. After the ball was placed in the cylinder, the water level went up to **28.6 mL**.



Which of these numbers is the BEST estimate of the density of the metal ball?

- A. 0.67 mL/g
- B. 1.49 g/mL
- C. 3.70 mL/g
- D. 85.9 g/mL

17. Paula identifies the following activities as examples of physical changes.

- Boiling water
- Chopping a carrot
- Dissolving sugar in water

Why are these activities considered physical changes?

- A. The components undergo a phase change.
- B. The components undergo chemical reactions.
- C. The components retain their original properties.
- D. The components combine to form new substances.

18. Which statement reflects a chemical property of the substance?

- A. When water boils it becomes a gas.
- B. Aluminum does not conduct heat.
- C. Sodium does not react with ammonia.
- D. Chlorine is a gas at room temperature and has a strong odor.

19. Toshio has to demonstrate examples of physical changes to his class. Which example can he include in his demonstration?

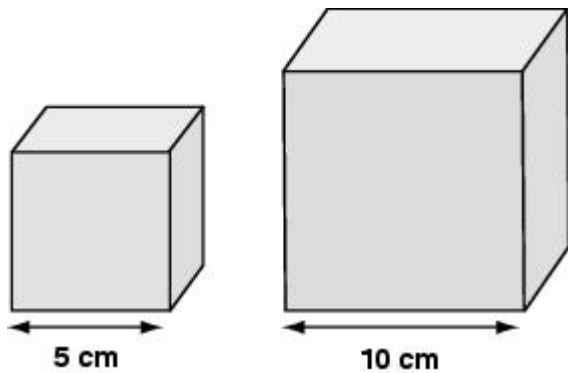
- A. mixing baking soda with vinegar
- B. dissolving an antacid in water
- C. preparing batter for a cake
- D. dissolving salt in water

20. Compound P reacts chemically with another compound, Q. Which of these MOST LIKELY describes the result of this chemical reaction?

- A. a temporary change in the physical characteristics of P and Q
- B. a reversible change in the chemical characteristics of P and Q
- C. formation of a new substance with characteristics identical to P's and Q's
- D. formation of a new substance with characteristics different from P's and Q's

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21. The two solid cubes shown below are made of the same kind of metal.



Which statement describes the properties of the cubes?

- A. The cubes have the same mass and density but different volumes.
- B. The cubes have the same density and volume but different masses.
- C. The cubes have the same density but different masses and volumes.
- D. The cubes have the same volume but different masses and densities.
22. When wood burns, it undergoes a chemical change. Which clue identifies this reaction as a chemical change?
- A. formation of black ashes
- B. formation of light and heat
- C. change in the mass of the wood
- D. change in the weight of the wood
23. Two chemicals react in a sealed container. Which property MOST LIKELY would change because of the reaction?
- A. mass
- B. temperature
- C. kinds of atoms
- D. number of atoms
24. Which activity is not a physical change?
- A. Water vapor condenses on a window pane.
- B. Rock melts to form lava.
- C. A match burns.
- D. Acetate evaporates from a beaker.

25. In a science experiment, Maleeka mixed some substances and recorded her observations in her notebook. Which of these sentences from Maleeka's notebook is the BEST evidence that a chemical reaction occurred?

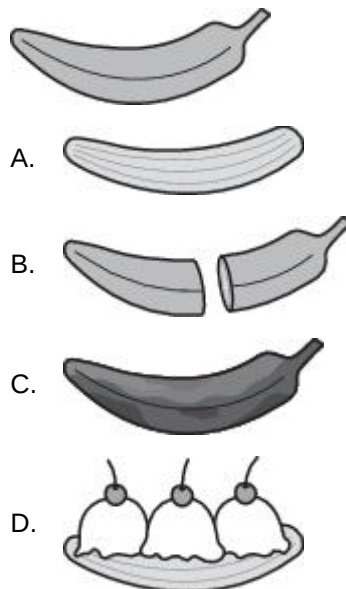
- A. I also used apple cider vinegar, which was a light gold color.
- B. The mixture spilled out of the bowl and made a mess on the counter.
- C. When I mixed the liquids together, the mixture foamed and bubbled.
- D. When I mixed the baking soda into water, the baking soda dissolved completely.

26. Dr. Styer used the example shown as a way to illustrate a certain chemical principle.



Which point is she most likely trying to illustrate?

- A. Carbohydrates and proteins are complex molecules with many uses.
- B. Reactants interact to form products that have different properties from the reactants.
- C. Energy and mass are conserved during chemical reactions.
- D. Heat is required for chemical changes when water vapor is a product.
27. How will this banana look if it undergoes a chemical change?



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28. Paul is cooking dinner. Which activity is a physical change?
- A. The gas of the stove is ignited.
  - B. The water in a stew is boiling off.
  - C. The carrots in a stew are cooking.
  - D. The bottom of a pan is burned.

**Directions:** Review the content below and answer the questions that follow

**Periodic Table**

**Periodic Table of Elements**

	1 1A	2 2A	3 3B	4 4B	5 5B	6 6B	7 7B	8 8B	9 8B	10 8B	11 1B	12 2B	13 3A	14 4A	15 5A	16 6A	17 7A	18 8A
1	1 H Hydrogen 1.008																	2 He Helium 4.003
2	3 Li Lithium 6.941	4 Be Beryllium 9.012											5 B Boron 10.81	6 C Carbon 12.01	7 N Nitrogen 14.01	8 O Oxygen 16.00	9 F Fluorine 19.00	10 Ne Neon 20.18
3	11 Na Sodium 22.99	12 Mg Magnesium 24.31											13 Al Aluminum 26.98	14 Si Silicon 28.09	15 P Phosphorus 30.97	16 S Sulfur 32.07	17 Cl Chlorine 35.45	18 Ar Argon 39.95
4	19 K Potassium 39.10	20 Ca Calcium 40.08	21 Sc Scandium 44.96	22 Ti Titanium 47.88	23 V Vanadium 50.94	24 Cr Chromium 52.00	25 Mn Manganese 54.94	26 Fe Iron 55.85	27 Co Cobalt 58.93	28 Ni Nickel 58.69	29 Cu Copper 63.55	30 Zn Zinc 65.39	31 Ga Gallium 69.72	32 Ge Germanium 72.59	33 As Arsenic 74.92	34 Se Selenium 78.96	35 Br Bromine 79.90	36 Kr Krypton 83.80
5	37 Rb Rubidium 85.47	38 Sr Strontium 87.62	39 Y Yttrium 88.91	40 Zr Zirconium 91.22	41 Nb Niobium 92.91	42 Mo Molybdenum 95.94	43 Tc Technetium (98)	44 Ru Ruthenium 101.1	45 Rh Rhodium 102.9	46 Pd Palladium 106.4	47 Ag Silver 107.9	48 Cd Cadmium 112.4	49 In Indium 114.8	50 Sn Tin 118.7	51 Sb Antimony 121.8	52 Te Tellurium 127.6	53 I Iodine 126.9	54 Xe Xenon 131.3
6	55 Cs Cesium 132.9	56 Ba Barium 137.3	57 La Lanthanum 138.9	72 Hf Hafnium 178.5	73 Ta Tantalum 181.0	74 W Tungsten 183.8	75 Re Rhenium 186.2	76 Os Osmium 190.2	77 Ir Iridium 192.2	78 Pt Platinum 195.1	79 Au Gold 197.0	80 Hg Mercury 200.6	81 Tl Thallium 204.4	82 Pb Lead 207.2	83 Bi Bismuth 209.0	84 Po Polonium (210)	85 At Astatine (210)	86 Rn Radon (222)
7	87 Fr Francium (223)	88 Ra Radium (226)	89 Ac Actinium (227)	104 Rf Rutherfordium (261)	105 Db Dubnium (262)	106 Sg Seaborgium (263)	107 Bh Bohrium (264)	108 Hs Hassium (265)	109 Mt Meitnerium (268)									

29. Ramar is using the periodic table to identify elements. Where should Ramar look to find the *least* reactive elements?
- on the far left of the periodic table
  - on the far right of the periodic table
  - at the very top of the periodic table
  - at the very bottom of the periodic table
30. Which gas would LEAST LIKELY be part of a chemical reaction?
- Cl
  - H
  - Ne
  - N

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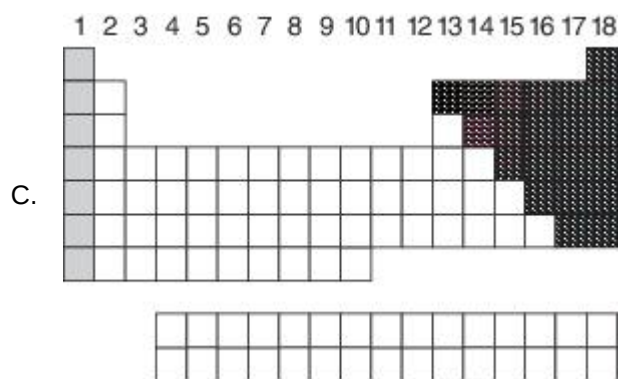
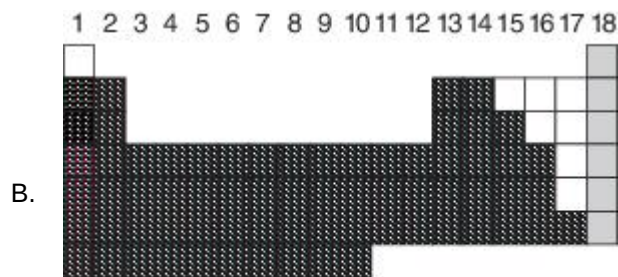
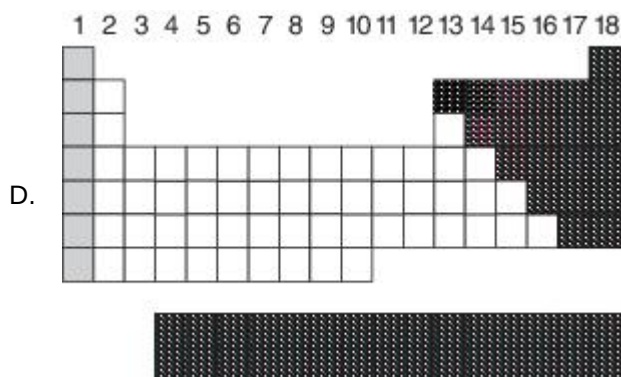
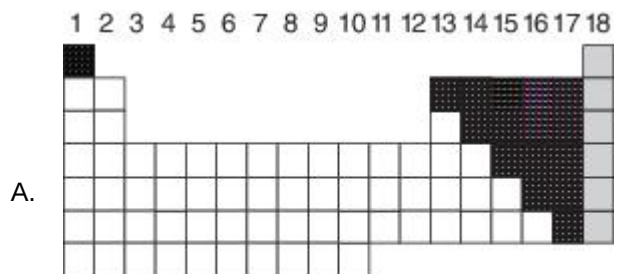
**Directions:** Please choose the best answer choice for each of the following questions.

31. Monique's teacher gave each student a blank periodic table. She asked the students to shade in regions of metals, nonmetals, and inert gases according to the key shown below. Which of the following tables is MOST accurate?

**Nonmetals:** ■

**Metals (including rare earth):** □

**Inert gases:** ■



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32. One sunny day in winter, the icicles on Anita's house melted. Which statement describes what happened when the ice turned into water?

A. There was a chemical change.  
 B. The mass of the material decreased.  
 C. There was an overall loss of energy.  
 D. The amount of matter remained the same.

33. Lucy measured the mass of a candle, and then lit it. She measured the mass of the candle again after letting it burn for 10 minutes. She found the mass of the candle afterward to be less than the original mass. This is most likely because

A. heat generally causes a loss of mass during reactions.  
 B. mass is not conserved during chemical reactions.  
 C. some mass escaped as smoke and soot.  
 D. the candle changed from a solid into a liquid and a gas.

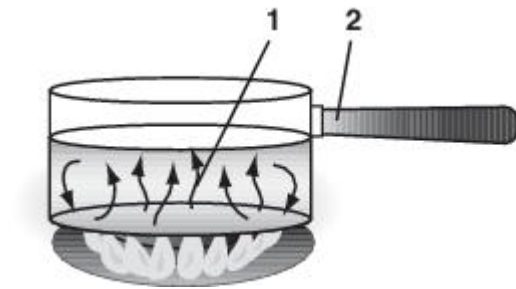
34. If an object is broken into pieces, the total mass of all the pieces will equal

A. the original mass of the object.  
 B. less than the original mass of the object.  
 C. more than the original mass of the object.  
 D. cannot be determined.

35. For a science assignment, Marco is listing different examples of energy transfer by conduction. Which example should he include in his list?

A. cooling down of hot food after a while  
 B. hands getting warmer near a fireplace after a while  
 C. cooling down of a cup of hot chocolate after a while  
 D. spoon in a cup of hot chocolate getting hot after a while

36. The energy transfer taking place at different points in a pan on a stove is shown below.



Which choice correctly shows the process of energy transfer at points 1 and 2?

- A. 1: conduction  
 2: convection  
 B. 1: convection  
 2: conduction  
 C. 1: convection  
 2: radiation  
 D. 1: radiation  
 2: conduction
37. In a certain type of oven, hot air is circulated in order to heat up the food. What type of heat transfer BEST describes this situation?
- A. conduction  
 B. convection  
 C. radiation  
 D. rotation
38. Melinda added some hot water to some cold water in a cup. Which processes allow the cold water to warm up?
- A. insulation and radiation  
 B. radiation and convection  
 C. conduction and insulation  
 D. conduction and convection
39. Scott puts a few ice cubes in a glass of warm water to make it cold. He observes that after some time, all ice cubes melt. Which description explains this phenomenon?
- A. Ice and water react to create cool water.  
 B. Heat flows from hot water to the ice cubes.  
 C. Cold flows from the ice cubes to the hot water.  
 D. Ice cubes expand when placed in the warm water.

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40. Elements in the same vertical column in the Periodic table are expected to have similar:
- A. atomic numbers
  - B. number of neutrons
  - C. chemical properties
  - D. atomic symbols

**Stop! You have finished this exam.**