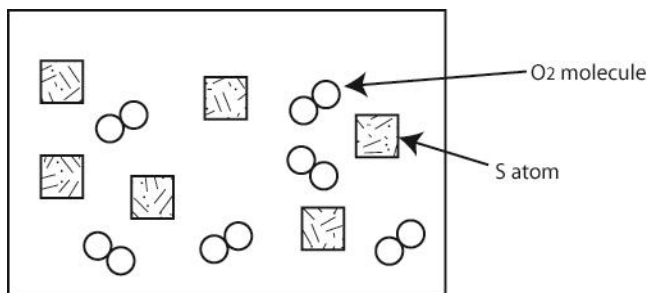


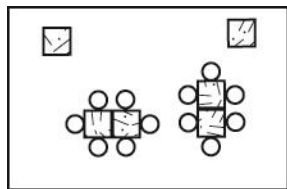
Assessment of Concepts Important in Chemistry

Choose the one best answer for each of the following 30 multiple choice questions.

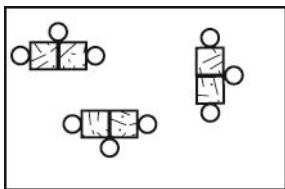
- Which of the following must be the same before and after a chemical reaction?
 - The sum of the masses of all substances involved.
 - The number of molecules of all substances involved.
 - The number of atoms of each type involved.
 - Both (a) and (c) must be the same before and after a chemical reaction.
 - (a), (b) and (c) must all be the same before and after a chemical reaction.
- What is in the bubbles in a beaker of pure water that has been boiling for thirty minutes?
 - air
 - oxygen gas
 - heat
 - oxygen gas and hydrogen gas
 - water vapor
- A glass of iced tea sometimes forms a coat of water on the outside of the glass. How does most of the water get there?
 - Water evaporated from the tea and condensed on the outside of the glass.
 - The glass acts like a semi-permeable membrane and allows the water to pass through it.
 - Water vapor condenses from the air.
 - The coldness of the iced tea causes oxygen and hydrogen from the air to combine forming water.
- What is the weight of a solution made from dissolving one pound of salt into 20 pounds of water?
 - 19 pounds
 - 20 pounds
 - between 20 and 21 pounds
 - 21 pounds
 - more than 21 pounds
- The diagram represents a mixture of S atoms and O₂ molecules in a closed container.



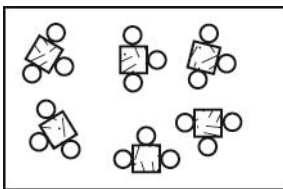
Which diagram shows the results after the mixture reacts as completely as possible according to the equation:
 $2S + 3O_2 \rightarrow 2SO_3$?



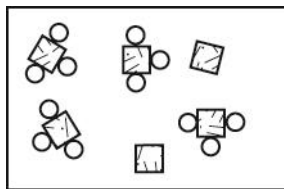
(a)



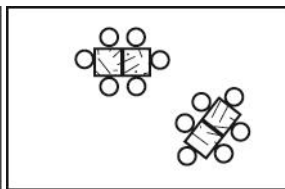
(b)



(c)

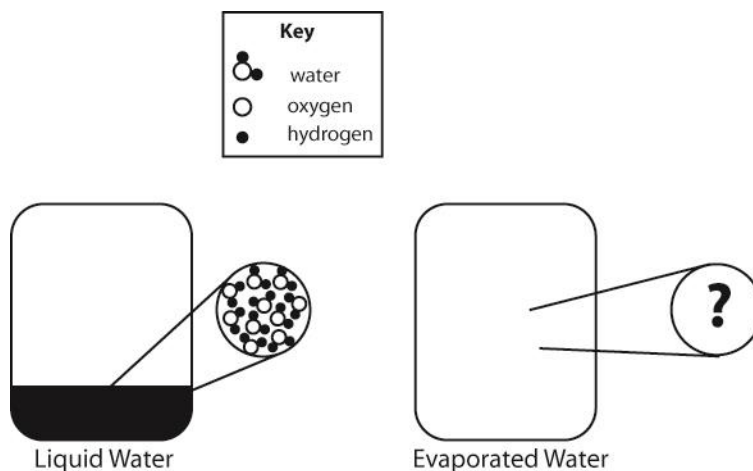


(d)

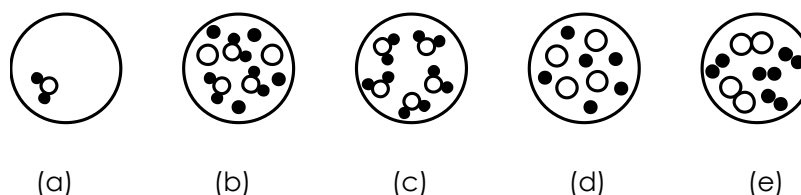


(e)

6. The circle on the left shows a magnified view of a very small portion of liquid water in a closed container.



What would the magnified view show after the water evaporates?



7. True or False? When a match burns, some matter is destroyed.

- a. True b. False

8. What is the reason for your answer to question 7?

- a. Fire destroys matter.
b. This chemical reaction destroys matter.
c. Burning is not a chemical reaction.
- d. The atoms are not destroyed, they are only rearranged.
e. The match weighs less after burning it.

9. Heat is given off when hydrogen burns in air according to this equation: $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$

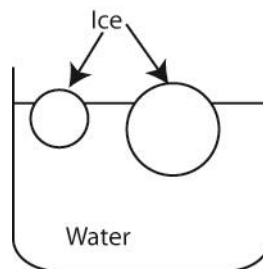
Which of the following is responsible for the heat?

- a. Breaking hydrogen bonds releases energy as heat.
- b. Breaking oxygen bonds releases energy as heat.
- c. Forming hydrogen-oxygen bonds releases energy as heat.
- d. Both (a) and (b) are correct.
- e. (a), (b) and (c) are all correct.

10. Two ice cubes are floating in water:

After the ice melts the water level will be:

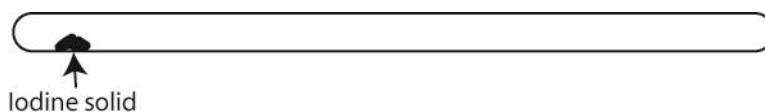
- higher.
- lower.
- the same.



11. What is the reason for your answer to question 10?

- a. The weight of water displaced is equal to the weight of the ice.
- b. Water is denser in its solid form.
- c. Water molecules displace more volume than ice molecules.
- d. The water from the ice melting changes the water level.
- e. When ice melts, its molecules expand.

12. A 1.0 gram sample of solid iodine is placed in a tube and the tube is evacuated (air is removed) and sealed. The tube and the solid iodine together have a mass of 27.0 grams.



The tube is heated until all of the iodine evaporates and the tube is filled with iodine gas. The mass after heating will be:

- a. less than 26.0 grams
- b. 26.0 grams
- c. 27.0 grams
- d. 28.0 grams
- e. more than 28.0 grams

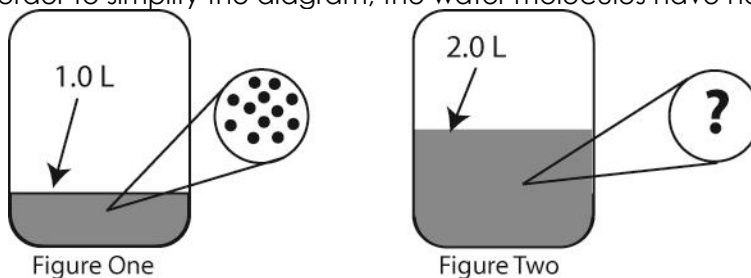
13. What is your reason for your answer to question 12?

- a. A gas has less mass than a solid.
- b. Mass is conserved.
- c. Iodine gas is less dense than solid iodine.
- d. Gases rise.
- e. Iodine gas is lighter than air.

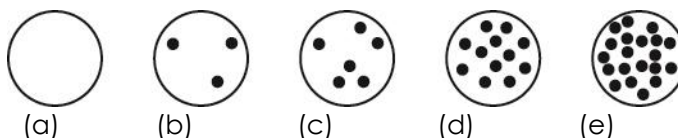
14. What is the approximate number of carbon atoms it would take placed next to each other to make a line that would cross this dot: •

- a. 4
- b. 200
- c. 30,000,000
- d. 6.02×10^{23}
- e. 1×10^{25}

15. Figure One represents a 1.0 L solution of sugar dissolved in water. The dots in the magnification circle represent the sugar molecules. In order to simplify the diagram, the water molecules have not been shown.



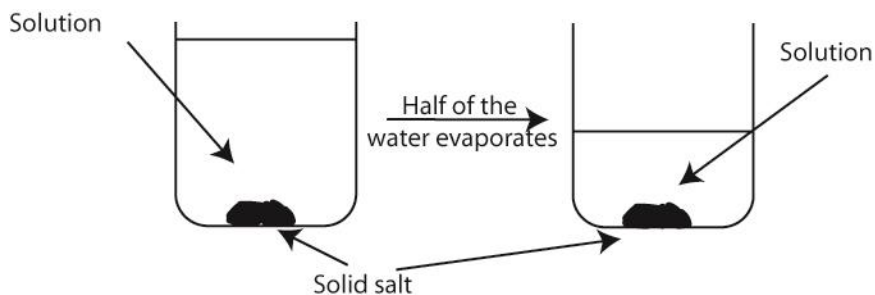
Which response represents the view after 1.0 L of water was added (Figure Two).



16. 100. mL of water at 25°C and 100. mL of alcohol at 25°C are both heated at the same rate under identical conditions. After 3 minutes the temperature of the alcohol is 50°C. Two minutes later the temperature of the water is 50°C. Which liquid received more heat as it warmed to 50°C?

- a. The water
- b. The alcohol
- c. Both received the same amount of heat
- d. It is impossible to tell from the information given.

17. What is the reason for your answer to question 16?
- Water has a higher boiling point than the alcohol.
 - Water takes longer to change its temperature than the alcohol.
 - Both increased their temperatures 25°C .
 - Alcohol has a lower density and vapor pressure compared to water.
 - Alcohol has a higher specific heat so it heats faster than water.
18. Iron combines with oxygen and water from the air to form rust. If an iron nail were allowed to rust completely, one should find that the rust has:
- less mass than the nail it came from.
 - the same mass as the nail it came from.
 - more mass than the nail it came from.
 - it is impossible to predict the change in mass
19. What is the reason for your answer to question 18?
- Rusting makes the nail lighter
 - Rust contains iron and oxygen.
 - The nail flakes away.
 - The iron from the nail is destroyed
 - The flaky rust weighs less than iron.
20. Salt is added to water and the mixture is stirred until no more salt dissolves. The salt that does not dissolve is allowed to settle out. What happens to the concentration of salt in solution if water evaporates until the volume of the solution is half the original volume? (Assume temperature remains constant.)



The concentration of salt dissolved in water:

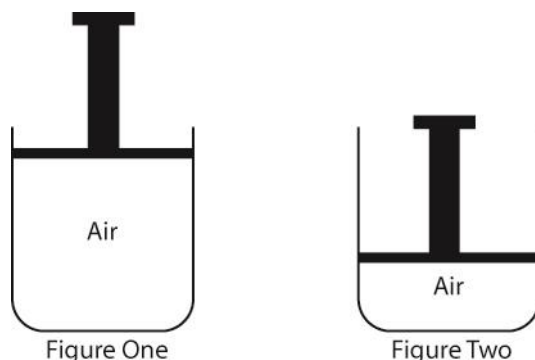
- increases
 - decreases
 - stays the same
21. What is the reason for your answer to question 20?
- There is the same amount of salt in less water.
 - More solid salt forms.
 - Salt does not evaporate and is left in solution.
 - There is less water.
22. A large beaker of water is at room temperature and a thermometer is placed in the beaker. The water is heated and the thermometer rises. At 100°C the water boils. Which statement best describes what will occur next while the water continues to be heated:
- The water will boil and the temperature will continue to rise.
 - The water will boil and the temperature will remain constant.
 - The water will boil and the temperature will decrease.
 - The water will stop boiling.
23. Following is a list of properties of a sample of solid sulfur:
- Brittle, crystalline solid.
 - Melting point of 113°C .
 - Density of 2.1 g/cm^3 .
 - Combines with oxygen to form sulfur dioxide.

Which, if any, of these properties would be the same for one single atom of sulfur obtained from the sample?

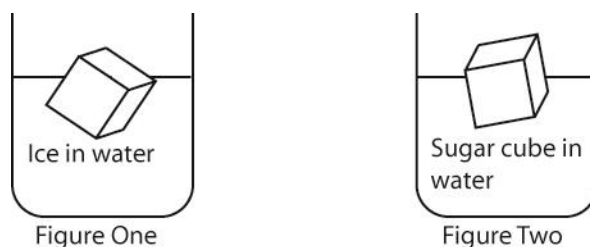
- i and ii only
- iii and iv only
- iv only
- All of these properties would be the same.
- None of these properties would be the same.

24. A small (2cm X 2cm X 2cm) ice cube of frozen water is placed in a freezer that has a constant temperature of -15°C . The temperature of the ice after several hours will most likely be:
- 0°C , the freezing point of water
 - -15°C
 - Between 0°C and -15°C

Use the following diagram for the next three questions:



25. What happens to the volume of air as the plunger is moved from the position in Figure One to the position in Figure Two? The volume of air:
- increases
 - decreases
 - stays the same.
26. What happens to the mass of air as the plunger is moved from the position in Figure One to the position in Figure Two? The mass of air:
- increases
 - decreases
 - stays the same.
27. What happens to the pressure of the air as the plunger is moved from the position in Figure One to the position in Figure Two? The pressure of the air:
- increases
 - decreases
 - stays the same.
28. A piece of ice was placed into one beaker of water and a sugar cube was placed in another.



Both the ice cube and the sugar cube were observed to disappear in water after awhile. Therefore:

- Melting has occurred in both beakers
 - Melting occurred in one beaker and dissolution occurred in the other
 - Dissolution occurred in both beakers
 - Melting and dissolution occurred in both beakers
29. A child blows up a balloon to a volume of about 2L. What happens to the volume of the balloon if it is put into a freezer? The volume:
- decreases
 - increases
 - stays the same
30. What is the reason for your answer to question 29? The molecules of gas:
- get smaller as they are cooled
 - expand as they are cooled
 - are not affected by changes in temperature
 - have an increased amount of kinetic energy
 - have a decreased amount of kinetic energy