

**Directions:** Choose the letter that corresponds to the correct answer.

1. Which of these is an example of a chemical change?
  - A. Methane is burned in air.
  - B. Solid gold is melted to make jewelry.
  - C. A bar of copper is stretched into a long copper wire.
  - D. Iron is coated with bronze to prevent rusting
  
2. Which particles are found in the nucleus of an atom?
  - A. protons and neutrons
  - B. neutrons and electrons
  - C. protons and electrons
  - D. protons
  
3. What is the approximate mass of 1.50 moles of ammonia ( $\text{NH}_3$ )?
  - A. 10.0 grams
  - B. 15.0 grams
  - C. 17.0 grams
  - D. 25.5 grams
  
4. One of the most important properties of mixtures is that they
  - A. are very reactive and unstable
  - B. may have different proportions of their components
  - C. have fixed proportions of their components
  - D. can be separated only by chemical means

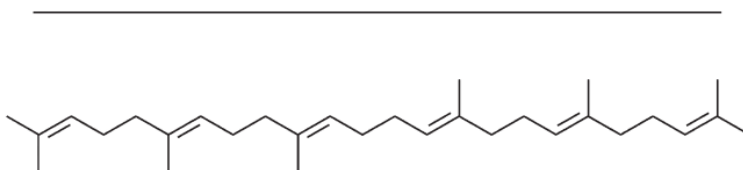
5. What is the percent composition by mass of sulfur in ammonium sulfate,  $(\text{NH}_4)_2\text{SO}_4$ ?

- A. 6.7%
- B. 24%
- C. 28%
- D. 32%

6. Which of these is a base?

- A.  $\text{LiOH}$
- B.  $\text{BaCl}_2$
- C.  $\text{KI}$
- D.  $\text{KNO}_3$

7. The compound shown below is a



- A. triglyceride
- B. trinucleotide
- C. tripeptide
- D. trisaccharide
- E. triterpene

8. Which one of the following is a strong acid?
- A.  $\text{HNO}_3$
  - B.  $\text{CaSO}_4$
  - C.  $\text{NH}_3$
  - D.  $\text{NaOH}$
9. Which of the following terms used as a measure of the average kinetic energy of the particles in a sample?
- A. temperature
  - B. chemical energy
  - C. volume
  - D. pressure
10. Which characteristic of an exothermic reaction differs from that of an endothermic reaction?
- A. An exothermic reaction absorbs heat as the reaction progresses.
  - B. The activation energy is higher in an exothermic reaction.
  - C. An exothermic reaction releases heat as the reaction progresses.
  - D. The products in exothermic reactions have more potential energy than the reactants.
11. Chlorine atom is in an excited state. When an electron in this atom jumps from the fourth to the third shell, energy is
- A. absorbed
  - B. converted to electricity
  - C. released
  - D. disappeared

12. Which element has the highest electronegativity?

- A. nitrogen
- B. iodine
- C. fluorine
- D. selenium

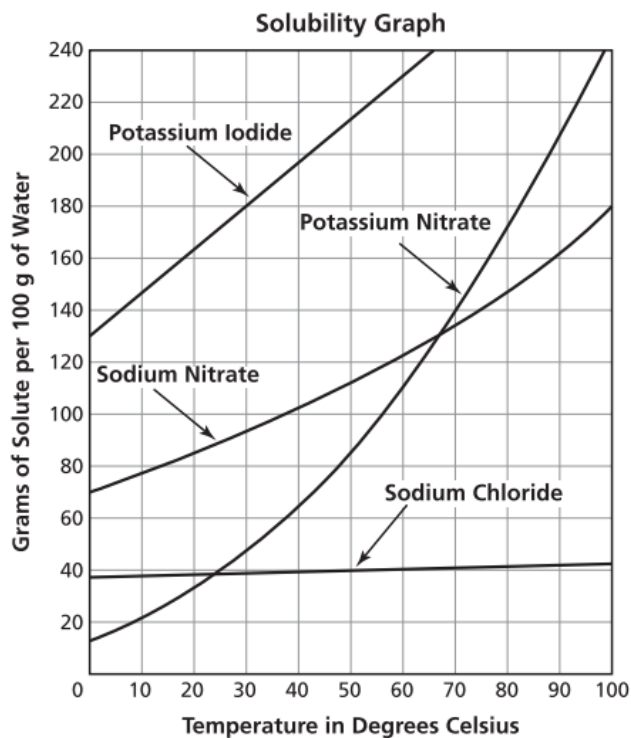
13. If the formula for potassium chlorate is  $\text{KClO}_3$  and the formula for magnesium fluoride is  $\text{MgF}_2$ , then what is the formula for magnesium chlorate?

- A.  $\text{MgClO}_3$
- B.  $\text{Mg}_2\text{ClO}_3$
- C.  $\text{Mg}(\text{ClO}_3)_2$
- D.  $\text{Mg}_2(\text{ClO}_3)_3$

14. Which part of an atom is most directly involved in chemical bonding?

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

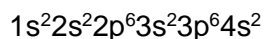
15. The graph below shows the solubilities of four compounds.



A supersaturated solution at 50 degrees Celsius contains 41 g of solute in 100 g of water. Which compound does the supersaturated solution contain?

- A. Potassium Iodide
- B. Potassium Nitrate
- C. Sodium Nitrate
- D. Sodium Chloride

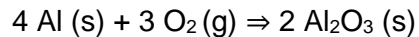
16. The electron configuration of a neutral atom of calcium is shown.



How many valence electrons are in the atom?

- A. 2
- B. 4
- C. 8
- D. 20

For questions 17 and 18, consider the following reaction:



17. The reaction can be classified as which one of the following types?

- A. precipitation
- B. decomposition
- C. synthesis
- D. double displacement

18. How many moles of  $\text{Al}_2\text{O}_3$  can be produced from the reaction of 10.0 g of Al and 19.0 g of  $\text{O}_2$ ?

- A. 0.581 mol
- B. 0.371 mol
- C. 0.185 mol
- D. 0.396 mol

19. Isotopes of an element have different numbers of

- A. protons
- B. neutrons

C. electrons

D. positrons

20. Which of the following equations represents sublimation?

A.  $\text{CH}_4(\text{l}) \rightarrow \text{CH}_4(\text{g})$

B.  $\text{CH}_3\text{OH}(\text{g}) \rightarrow \text{CH}_3\text{OH}(\text{l})$

C.  $\text{Hg}(\text{l}) \rightarrow \text{Hg}(\text{s})$

D.  $\text{CO}_2(\text{s}) \rightarrow \text{CO}_2(\text{g})$

21. For elements in the left-most column of the periodic table, properties that have increasing values as the atomic number increases include which of the following?

I. Ionization energy (potential)

II. Atomic radius

III. Atomic mass

A. I only

B. III only

C. I and II only

D. II and III only

E. I, II, and III

22. A student conducting a titration by adding 12.0 mL of  $\text{NaOH}(\text{aq})$ , of unknown concentration to 16.0 mL of 0.15 M  $\text{HCl}(\text{aq})$ . What is the molar concentration of the  $\text{NaOH}(\text{aq})$ ?

A. 2.0 M

B. 2.4 M

C. 0.2 M

D. 0.15 M

23. The reaction of nitrogen dioxide with water yields

- A.  $\text{HNO}_3$  only
- B.  $\text{HNO}_2$  only
- C.  $\text{HNO}_3$  and NO
- D.  $\text{NH}_3$  and  $\text{H}_2\text{O}_2$
- E.  $\text{NH}_3$  and  $\text{O}_2$

24. Which of these is an example of a homogenous mixture?

- A. a bowl of noodle soup
- B. a container of water and sand.
- C. a glass of salt water.
- D. a bottle of oil and vinegar.

25. The half-life of cobalt-60 is 5.27 years. Approximately how much of a 199 g sample will remain after 20 years?

- A. 10.0 g
- B. 12.5 g
- C. 40.0 g
- D. 50.0 g