
1. Which of the following statements best describes the characteristics of a **gas**?

- A. Gas particles are packed closely together, but have some ability to move.
- B. Gas particles are arranged in regular, repeating patterns.
- C. Gas particles are packed closely together in fixed positions.
- D. Gas particles have freedom of motion and are not held together.

2. Which example below describes a physical process?

- A. oxidation of methanol to formaldehyde upon ingestion
- B. sublimation of solid carbon dioxide (dry ice) to carbon dioxide gas
- C. tarnishing of silver metal to silver sulfide over time
- D. combustion of hydrogen gas to form water

3. A photon of violet light has a wavelength of 401 nanometers. Which of the following values is the wavelength of the violet light photon in proper scientific notation?

- A. $401 \times 10^8 \text{ m}$
- B. $4.01 \times 10^{-7} \text{ m}$
- C. $4.01 \times 10^{-9} \text{ m}$
- D. $4.01 \times 10^{10} \text{ m}$

4. The density of iron is 7.86 g/cm^3 . What volume does 2.5 kilograms of iron occupy?

- A. $2.9 \times 10^{-2} \text{ cm}^3$
 - B. $3.2 \times 10^2 \text{ cm}^3$
 - C. $4.8 \times 10^{-2} \text{ cm}^3$
 - D. $3.6 \times 10^2 \text{ cm}^3$
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5. What is the answer to the calculation below using the correct number of significant figures?

$$2.81 + 3456.1 =$$

- A. 3458.9
B. 3.46×10^3
C. 9.71×10^3
D. 3458.91

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6. What is the answer to the calculation below using the correct number of significant figures?

$$(5.2 + 2.7182818 + 3.145)^3 \div 4.54 \times 28.90 =$$

- A. 35.10
B. 70.42
C. 10.3
D. 8.62×10^3

-
7. How many meters are in 3.1 miles?

- A. 5.0×10^3 m
B. 5.3×10^2 m
C. 1.8×10^3 m
D. 3.1×10^3 m

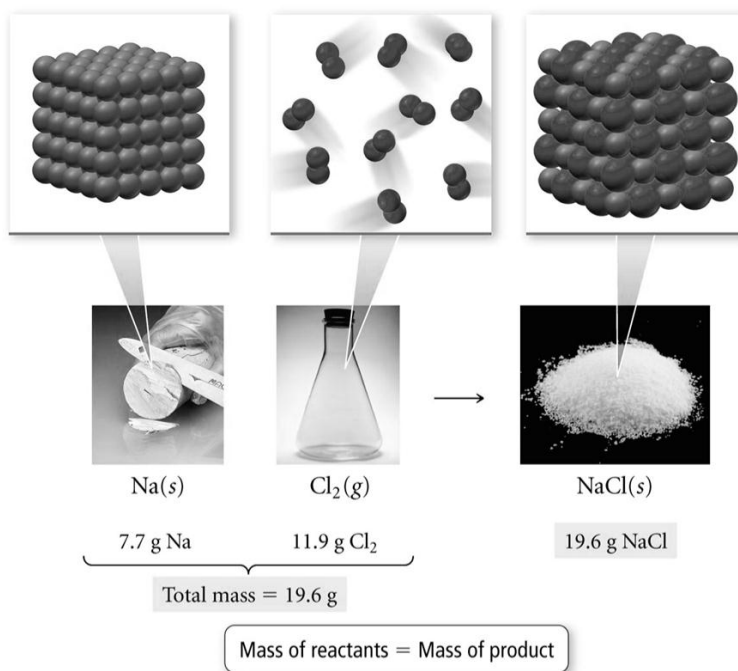
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8. How long would it take the Mississippi River to fill a 3.53×10^{20} gallon container if the flow rate of the river is 593,000 ft³/s? (1 ft = 12 in)

- A. 1254 years
B. 2.53×10^6 years
C. 1.48×10^6 years
D. 4.54×10^6 years
-

9. Dalton's atomic theory postulates that atoms are indivisible and indestructible, and that all atoms of a given element are identical in mass and properties. Which of the following discoveries led to modifications of Dalton's atomic theory?

- I. isotopes
 - II. radioactive decay
 - III. gravity
 - IV. DNA
- A. I C. I and II
- B. I, II, and III D. III and IV

10. During chemical reactions, matter is neither created nor destroyed, as shown in the figure below.



Which law accounts for the observation depicted in the figure?

- A. law of multiple proportions C. law of variable proportions
- B. law of conservation of mass D. law of gravity

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11. A beam of neutrons passes through an applied electric field. What happens to the path of the neutron beam?
- A. The path of the neutron beam is attracted to the cathode (-) of the electric field.
 - B. The path of the neutron beam is attracted to the anode (+) of the electric field.
 - C. The path of the neutron beam is unaffected by the electric field.
 - D. The path of the neutron beam is repulsed by the anode (+) of the electric field.
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12. Which statement is **correct** concerning the mass differences among subatomic particles?
- A. Protons have much more mass than neutrons, which have much more mass than electrons.
 - B. Protons and neutrons are about equal in mass, but both protons and neutrons have much more mass than electrons.
 - C. Electrons have much more mass than neutrons, which have much more mass than protons.
 - D. Neutrons have much more mass than protons, which have much more mass than electrons.
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13. Complete the following table:

<i>Atomic Number</i>	<i>Mass Number</i>	<i>Neutrons</i>	<i>Atomic Symbol</i>
34	79	W =	X =
Y =	232	142	Z =

- A. $W = 45, X = \text{Se}, Y = 90, Z = \text{Th}$
 - B. $W = 42, X = \text{U}, Y = 47, Z = \text{Ag}$
 - C. $W = 45, X = \text{Se}, Y = 90, Z = \text{Zr}$
 - D. $W = 45, X = \text{Rh}, Y = 187, Z = \text{Re}$
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14. Which of the following must happen for an atom to become a cation?
- A. An atom must gain one or more electrons.
 - B. An atom must gain one or more neutrons.
 - C. An atom must lose one or more electrons.
 - D. An atom must lose one or more protons.
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15. Which of the following elements is/are metal(s)?

- I. copper
- II. selenium
- III. strontium
- IV. chlorine

- A. I only
- B. I and III
- C. I, II, and III
- D. II and IV

16. Naturally occurring gallium has two stable isotopes and an atomic mass of 69.723 amu. If ^{69}Ga (68.926 amu) is 60.11% of natural Ga, what is the mass of the other isotope?

- A. 70.924 amu
- B. 70.964 amu
- C. 70.722 amu
- D. 70.999 amu

17. How many atoms are in 36.5 grams of ammonia (NH_3)?

- A. 6.02×10^{24} atoms
 - B. 1.87×10^{24} atoms
 - C. 5.16×10^{24} atoms
 - D. 8.13×10^{24} atoms
-

18. Which of the following statements is **correct**?

- A. Covalent bonds form when electrons are transferred from one atom to another.
- B. Covalent bonds are attractions between cations and anions.
- C. Ionic bonds form when electrons are shared between atoms.
- D. Ionic bonds form between metals and non-metals.

19. What is the **molecular formula** of a compound with a molar mass of 296.66 g/mol and the empirical formula $C_5H_{10}NS_2$?

- A. $C_5H_{10}NS_2$
- B. $C_{12.5}H_{25}N_{2.5}S_5$
- C. $C_{10}H_{20}N_2S_4$
- D. $C_7H_{13}N_3S_5$

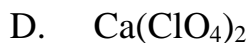
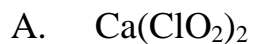
20. Which of the following is an **ionic** compound?

- A. SeO_2
- B. NH_4Br
- C. H_2O
- D. H_2S

21. What is the chemical formula of iron(III) sulfide?

- A. Fe_2S_3
 - B. FeS
 - C. $FeSO_4$
 - D. $Fe_2(SO_3)_2$
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22. What is the chemical formula of calcium chlorite?



23. What is the chemical name of XeF_4 ?

A. tetrafluoroxenide

C. xenon(II) fluoride

B. xenon tetrafluoride

D. monoxenon tetrafluoride

24. What is the **mass percent of sulfur** in Na_2SO_4 ?

A. 30.33%

C. 33.32%

B. 43.04%

D. 22.57%

25. Vanadium forms several different oxide compounds. What is the **molar mass** of the vanadium oxide that is 56% vanadium by mass?

A. 68.94 g/mol

C. 83.51 g/mol

B. 95.94 g/mol

D. 181.88 g/mol

Answer Key:

1. D
2. B
3. B
4. B
5. A
6. D
7. A
8. B
9. C
10. B
11. C
12. B
13. A
14. C
15. B
16. A
17. C
18. D
19. C
20. B
21. A
22. A
23. B
24. D
25. D