

Name: \_\_\_\_\_

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

- 1) The number with the most significant zeros is \_\_\_\_\_. 1) \_\_\_\_\_
- A)  $2.501 \times 10^{-7}$
  - B) 0.00002510
  - C) 250000001
  - D) 2.5100000
  - E) 0.02500001

Answer: C

- 2) Of the following, only \_\_\_\_\_ is a chemical reaction. 2) \_\_\_\_\_
- A) dropping a penny into a glass of water
  - B) crushing of stone
  - C) melting of lead
  - D) tarnishing of silver
  - E) dissolving sugar in water

Answer: D

- 3) Which of the following are a physical properties? 3) \_\_\_\_\_
- 1) The density of a liquid
  - 2) The temperature of the air
  - 3) The color of a solution
  - 4) The weight of a crystal
- A) 1, 2                      B) 1, 2, 3, 4                      C) 2, 3                      D) 1, 4

Answer: B

- 4) The number 0.000816 has \_\_\_\_\_ significant figures. 4) \_\_\_\_\_
- A) 2                      B) 3                      C) 6                      D) 7                      E) 5

Answer: B

- 5) A combination of sand, salt, and water is an example of a \_\_\_\_\_. 5) \_\_\_\_\_
- A) compound
  - B) heterogeneous mixture
  - C) homogeneous mixture
  - D) beach
  - E) pure substance

Answer: B

- 6) There should be \_\_\_\_\_ significant figures in the answer to the following computation. 6) \_\_\_\_\_

$$\frac{(10.07 + 7.395)}{2.5}$$

- A) 1                      B) 2                      C) 3                      D) 4                      E) 5

Answer: B

- 7) For which of the following can the composition vary? 7) \_\_\_\_\_
- A) homogeneous mixture
  - B) element
  - C) heterogeneous mixture
  - D) pure substance
  - E) both homogeneous and heterogeneous mixtures

Answer: E

- 8) In the following list, only \_\_\_\_\_ is not an example of matter. 8) \_\_\_\_\_
- A) table salt
  - B) elemental phosphorus
  - C) planets
  - D) light
  - E) dust

Answer: D

- 9) Of the following, \_\_\_\_\_ is the largest mass. 9) \_\_\_\_\_
- A)  $2.5 \times 10^{10}$   $\mu\text{g}$
  - B)  $2.5 \times 10^{12}$  ng
  - C)  $5 \times 10^{-2}$  mg
  - D)  $2.5 \times 10^{15}$  g
  - E)  $7 \times 10^3$  kg

Answer: D

- 10) Which of the following about atoms is NOT a true statement 10) \_\_\_\_\_
- A) Atoms are the building blocks of matter
  - B) Each element is made up of various types of atoms
  - C) Molecules are the smallest units of a substance
  - D) A compound is made of two or more different kinds of elements

Answer: B

- 11) The STM was used in class to demonstrate that while atoms are very small, they can be visualized with modern instrumentation. What does STM stand for? 11) \_\_\_\_\_
- A) Scanning Tunneling Microscope
  - B) Small Technology Microscope
  - C) Scanning Electron Microscope
  - D) Electron Microscope

Answer: A

- 12) The formula for the compound formed between aluminum ions and sulfate ions is \_\_\_\_\_. 12) \_\_\_\_\_
- A)  $\text{AlSO}_4$
  - B)  $\text{AlS}$
  - C)  $\text{Al}_3(\text{SO}_4)_3$
  - D)  $\text{Al}(\text{SO}_4)_3$
  - E)  $\text{Al}_2(\text{SO}_4)_3$

Answer: E

- 13) Predict the charge of the most stable ion of magnesium. 13) \_\_\_\_\_
- A) -1
  - B) +2
  - C) +1
  - D) +3
  - E) -2

Answer: B

- 14) Elements in Group 1A are known as the \_\_\_\_\_. 14) \_\_\_\_\_
- A) chalcogens
  - B) alkaline earth metals
  - C) halogens
  - D) alkali metals
  - E) noble gases

Answer: D

- 15) Of the three types of radioactivity characterized by Rutherford, which is/are not electrically charged? 15) \_\_\_\_\_
- A)  $\gamma$ -rays
  - B)  $\alpha$ -rays,  $\beta$ -rays, and  $\gamma$ -rays
  - C)  $\alpha$ -rays and  $\gamma$ -rays
  - D)  $\alpha$ -rays and  $\beta$ -rays
  - E)  $\alpha$ -rays

Answer: A

- 16) The atom contains \_\_\_\_\_. 16) \_\_\_\_\_
- A) protons
  - B) protons and neutrons
  - C) protons, neutrons, and electrons
  - D) electrons
  - E) protons and electrons

Answer: C

- 17) Which pair of elements would you expect to exhibit the greatest similarity in their physical and chemical properties? 17) \_\_\_\_\_
- A) Si, P                      B) C, N                      C) K, Ca                      D) O, S                      E) F, He

Answer: D

- 18) Which formula/name pair is incorrect? 18) \_\_\_\_\_
- A) FeS                      iron(II) sulfide
  - B) FeSO<sub>4</sub>                      iron(II) sulfate
  - C) Fe<sub>2</sub>(SO<sub>3</sub>)<sub>3</sub>                      iron(III) sulfite
  - D) Fe<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>                      iron(III) sulfide
  - E) FeSO<sub>3</sub>                      iron(II) sulfite

Answer: D

- 19) Of the following, the smallest and lightest subatomic particle is the \_\_\_\_\_. 19) \_\_\_\_\_
- A) proton
  - B) electron
  - C) nucleus
  - D) neutron
  - E) alpha particle

Answer: B

- 20) Which species below is the nitrate ion? 20) \_\_\_\_\_
- A) NO<sub>3</sub><sup>-</sup>                      B) N<sup>3-</sup>                      C) NH<sub>4</sub><sup>+</sup>                      D) N<sub>3</sub><sup>-</sup>                      E) NO<sub>2</sub><sup>-</sup>

Answer: A

- 21) Which species below is the sulfite ion? 21) \_\_\_\_\_  
A)  $\text{H}_2\text{S}$       B)  $\text{H}_2\text{SO}_4$       C)  $\text{SO}_2^{-2}$       D)  $\text{SO}_3^{-2}$       E)  $\text{S}^{2-}$   
Answer: D
- 22) Which one of the following is a nonmetal? 22) \_\_\_\_\_  
A) Ca      B) Au      C) I      D) Zn      E) Pb  
Answer: C
- 23) Cathode rays are \_\_\_\_\_. 23) \_\_\_\_\_  
A) protons      B) atoms      C) electrons      D) x-rays      E) neutrons  
Answer: C
- 24) The gold foil experiment performed in Rutherford's lab \_\_\_\_\_. 24) \_\_\_\_\_  
A) confirmed the plum-pudding model of the atom  
B) utilized the deflection of beta particles by gold foil  
C) proved the law of multiple proportions  
D) was the basis for Thompson's model of the atom  
E) led to the discovery of the atomic nucleus  
Answer: E
- 25) A molecular formula always indicates \_\_\_\_\_. 25) \_\_\_\_\_  
A) which atoms are attached to which in a molecule  
B) the isotope of each element in a compound  
C) the geometry of a molecule  
D) how many of each atom are in a molecule  
E) the simplest whole-number ratio of different atoms in a compound  
Answer: D
- 26) In the periodic table, the elements are arranged in \_\_\_\_\_. 26) \_\_\_\_\_  
A) order of increasing metallic properties  
B) reverse alphabetical order  
C) order of increasing neutron content  
D) alphabetical order  
E) order of increasing atomic number  
Answer: E
- 27) The correct name for  $\text{HClO}_2$  is \_\_\_\_\_. 27) \_\_\_\_\_  
A) hydrochlorous acid  
B) chlorous acid  
C) chloric acid  
D) hydrochloric acid  
E) perchloric acid  
Answer: B

- 28) Fluorine is a \_\_\_\_\_ and calcium is a \_\_\_\_\_. 28) \_\_\_\_\_  
A) metalloid, nonmetal  
B) nonmetal, metal  
C) metal, nonmetal  
D) metal, metal  
E) metal, metalloid

Answer: B

- 29) \_\_\_\_\_ typically form ions with a -1 charge. 29) \_\_\_\_\_  
A) Chalcogens  
B) Halogens  
C) Alkaline earth metals  
D) Transition metals  
E) Alkali metals

Answer: B

- 30) Consider the following selected postulates of Dalton's atomic theory: 30) \_\_\_\_\_  
(i) Each element is composed of extremely small particles called atoms.  
(ii) Atoms are indivisible.  
(iii) Atoms of a given element are identical.  
(iv) Atoms of different elements are different and have different properties.

Which of the postulates is(are) no longer valid?

- A) (ii) only  
B) (ii) and (iii)  
C) (iii) and (iv)  
D) (iii) only  
E) (i) and (ii)

Answer: B

- 31) The formula of a salt is XF. The X-ion in this salt has 36 electrons. The metal X is \_\_\_\_\_. 31) \_\_\_\_\_  
A) Zn                      B) V                      C) Pd                      D) Rb                      E) Fe

Answer: D

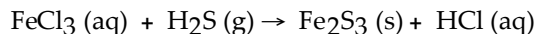
- 32) A molecule of ammonia contains hydrogen and nitrogen in a 1:3 ratio by mass. This is a statement 32) \_\_\_\_\_  
of \_\_\_\_\_.  
A) the law of conservation of energy  
B) the law of multiple proportions  
C) the law of constant composition  
D) the law of conservation of mass  
E) none of the above

Answer: C

- 33) The element \_\_\_\_\_ is the most similar to magnesium in chemical and physical properties. 33) \_\_\_\_\_  
A) Li                      B) Rb                      C) Cs                      D) At                      E) Ba

Answer: E

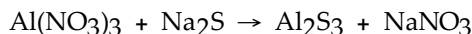
34) When the following equation is balanced, the coefficient of H<sub>2</sub>S is \_\_\_\_\_. 34) \_\_\_\_\_



- A) 4                      B) 1                      C) 2                      D) 5                      E) 3

Answer: E

35) When the following equation is balanced, the coefficients are \_\_\_\_\_. 35) \_\_\_\_\_



- A) 4, 6, 3, 2              B) 2, 1, 3, 2              C) 2, 3, 2, 3              D) 2, 3, 1, 6              E) 1, 1, 1, 1

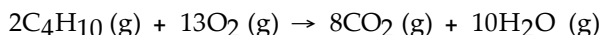
Answer: D

36) 6,020,000 neon atoms is \_\_\_\_\_ mol of neon atoms. 36) \_\_\_\_\_

- A)  $6.0 \times 10^{23}$   
B)  $1.0 \times 10^{+6}$   
C)  $1.7 \times 10^{-18}$   
D)  $1.0 \times 10^{-17}$   
E) 3

Answer: D

37) The combustion of propane (C<sub>4</sub>H<sub>10</sub>) produces CO<sub>2</sub> and H<sub>2</sub>O: 37) \_\_\_\_\_



The reaction of 0.75 mol of C<sub>4</sub>H<sub>10</sub> will produce \_\_\_\_\_ mol of H<sub>2</sub>O.

- A) 0.75                      B) 5.0                      C) 1.5                      D) 2.5                      E) 3.75

Answer: E

38) The formula of nitrobenzene is C<sub>6</sub>H<sub>5</sub>NO<sub>2</sub>. The molecular weight of this compound is \_\_\_\_\_ amu. 38) \_\_\_\_\_

- A) 109.10                      B) 107.11                      C) 3.06                      D) 43.03                      E) 123.11

Answer: E

39) The formula weight of ammonium sulfate ((NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>) is \_\_\_\_\_ amu. 39) \_\_\_\_\_

- A) 132                      B) 100                      C) 118                      D) 264                      E) 116

Answer: A

40) Of the reactions below, which one is a decomposition reaction? 40) \_\_\_\_\_

- A)  $2\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$   
B)  $\text{Cd}(\text{NO}_3)_2 + \text{Na}_2\text{S} \rightarrow \text{CdS} + 2\text{NaNO}_3$   
C)  $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$   
D)  $2\text{CH}_4 + 4\text{O}_2 \rightarrow 2\text{CO}_2 + 4\text{H}_2\text{O}$   
E)  $\text{NH}_4\text{Cl} \rightarrow \text{NH}_3 + \text{HCl}$

Answer: E

**SHORT ANSWER. Write the word or phrase that best completes each statement or calculate the answer the question showing all work (for max. partial credit).**

41) Isotopes can be separated using what type of spectroscopic equipment?

41) \_\_\_\_\_

Answer: Mass spectrometer

42)  $3.435 \times 10^{-4}$  L = \_\_\_\_\_  $\mu$ L

42) \_\_\_\_\_

Answer: 343.5  $\mu$ L

43) How many molecules of  $\text{CO}_2$  are there in 1.64 moles of  $\text{CO}_2$

43) \_\_\_\_\_

Answer:  $9.87 \times 10^{23}$

44)  $5.78 \mu\text{g}/\text{cm}^3 =$  \_\_\_\_\_  $\text{kg}/\text{m}^3$

44) \_\_\_\_\_

Answer:  $5.75 \times 10^{-3}$

45) The density of gold is  $19.3 \text{ g/cm}^3$ . A piece of gold that occupies a volume of  $21.4 \text{ mm}^3$  would have a mass of \_\_\_\_\_g. 45) \_\_\_\_\_  
Answer: 0.413

46) The correct answer (reported to the proper number of significant figures) to the following is \_\_\_\_\_. 46) \_\_\_\_\_  
 $(1815+1806) / (9.11 \times 7.92) = \underline{\hspace{2cm}}$

Answer: 50.2

47) If matter is uniform throughout, cannot be separated into other substances by physical processes, but can be decomposed into other substances by chemical processes, it is called a (an) \_\_\_\_\_. 47) \_\_\_\_\_  
Answer: compound

48) Predict the formula of the ionic compound that forms from sulfite and magnesium. 48) \_\_\_\_\_  
Answer:  $\text{MgSO}_3$

49) There are \_\_\_\_\_ hydrogen atoms in 25 molecules of  $\text{C}_4\text{H}_4\text{S}_2$ . 49) \_\_\_\_\_  
Answer: 100

50) Magnesium burns in air with a dazzling brilliance to produce magnesium oxide: 50) \_\_\_\_\_  
$$2\text{Mg (s)} + \text{O}_2 \text{ (g)} \rightarrow 2\text{MgO (s)}$$

When 1.00 g of magnesium burn in excess  $\text{O}_2$ , the mass of magnesium oxide produced is \_\_\_\_\_ g.  
Answer: 1.66

51) What is the coefficient of  $\text{O}_2$  when the following equation is completed and balanced? If 10 moles of  $\text{O}_2$  were consumed how many moles of  $\text{CO}_2$  were produced? 51) \_\_\_\_\_  
$$\text{C}_4\text{H}_8\text{O}_2 + \text{O}_2 \rightarrow \underline{\hspace{2cm}}$$

Answer: 5, 8 moles  $\text{CO}_2$  produced



52) A sample of  $\text{CH}_2\text{F}_2$  with a mass of 19 g contains \_\_\_\_\_ atoms of F.

52) \_\_\_\_\_

Answer:  $4.4 \times 10^{23}$

53) Name the following:

A)  $\text{Na}_2\text{S}$  \_\_\_\_\_

B)  $\text{NO}_2$  \_\_\_\_\_

C)  $\text{CO}_3^{-2}$  \_\_\_\_\_

D)  $\text{SF}_6$  \_\_\_\_\_

E)  $\text{KI}$  \_\_\_\_\_

Answer: A) sodium sulfide B) nitrogen dioxide C) carbonate ion D) sulfur hexafluoride E) potassium iodide