

## Chapter 3 Review

## Multiple Choice

Identify the choice that best completes the statement or answers the question.

- D 1. Dalton incorporated the law of conservation of mass into his atomic theory by asserting that
- atoms are indivisible.
  - atoms of different elements have different properties.
  - matter is composed of atoms.
  - atoms can not be destroyed in chemical reactions.
- B 2. If each atom of element D has 3 mass units and each atom of element E has 5 mass units, a molecule composed of one atom each of D and E has
- 2 mass units.
  - 8 mass units.
  - 15 mass units.
  - 35 mass units.
- $3+5=8$
- B 3. In oxides of nitrogen, such as  $N_2O$ ,  $NO$ ,  $NO_2$ , and  $N_2O_3$ , atoms combine in small whole-number ratios. This evidence supports the law of
- conservation of mass.
  - multiple proportions.
  - definite composition.
  - mass action.
- A 4. If 63.5 g of copper (Cu) combine with 16 g of oxygen (O) to form the compound  $CuO$ , how many grams of oxygen will be needed to combine with the same amount of copper to form the compound  $CuO_2$ ?
- 16 g
  - 32 g
  - 64 g
  - 127 g
- $63.5 + 16$   
 $63.5 + 16 + 16$
- D 5. According to the law of definite proportions, any two samples of  $KCl$  have
- the same mass.
  - slightly different molecular structures.
  - the same melting point.
  - the same ratio of elements.
- A 6. According to the law of conservation of mass, when sodium, hydrogen, and oxygen react to form a compound, the mass of the compound is \_\_\_\_\_ the sum of the masses of the individual elements.
- equal to
  - greater than
  - less than
  - either greater than or less than
- B 7. Which of the following is *not* part of Dalton's atomic theory?
- Atoms cannot be divided, created, or destroyed.
  - The number of protons in an atom is its atomic number.
  - In chemical reactions, atoms are combined, separated, or rearranged.
  - All matter is composed of extremely small particles called atoms.
- D 8. Experiments with cathode rays led to the discovery of the
- proton.
  - nucleus.
  - neutron.
  - electron.
- with Thompson*
- D 9. In Rutherford's experiments, alpha particles
- passed through a tube containing gas.
  - were used to bombard a cathode plate.
  - collided with electrons.
  - were used to bombard thin metal foil.

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

ID: A

- B 10. In Rutherford's experiments, most of the particles
- a. bounced back.
  - b. passed through the foil.
  - c. were absorbed by the foil.
  - d. combined with the foil.
- A 11. Because most particles fired at metal foil passed straight through, Rutherford concluded that
- a. atoms were mostly empty space.
  - b. atoms contained no charged particles.
  - c. electrons formed the nucleus.
  - d. atoms were indivisible.
- C 12. Because a few alpha particles bounced back from the foil, Rutherford concluded that they were
- a. striking electrons.
  - b. indivisible.
  - c. repelled by densely packed regions of positive charge.
  - d. magnetic.
- B 13. A nuclear particle that has about the same mass as a proton, but with no electrical charge, is called a(n)
- a. nuclide.
  - b. neutron.
  - c. electron.
  - d. isotope.
- D 14. The nucleus of an atom has all of the following characteristics *except* that it
- a. is positively charged.
  - b. is very dense.
  - c. contains nearly all of the atom's mass.
  - d. contains nearly all of the atom's volume.
- B 15. Which part of an atom has a mass approximately equal to 1/2000 of the mass of a common hydrogen atom?
- a. nucleus
  - b. electron
  - c. proton
  - d. neutron
- A 16. Protons within a nucleus are held together by
- a. the nuclear force.
  - b. opposite charges.
  - c. their energy levels.
  - d. electron repulsion.
- C 17. An atom is electrically neutral because
- a. neutrons balance the protons and electrons.
  - b. nuclear forces stabilize the charges.
  - c. the numbers of protons and electrons are equal.
  - d. the numbers of protons and neutrons are equal.
- C 18. Most of the volume of an atom is occupied by the
- a. nucleus.
  - b. nuclides.
  - c. electrons. *in the electron cloud*
  - d. protons.
- B 19. The charge of the electrons form a neutral atom by
- a. preventing compounds from forming.
  - b. balances the charge on the nucleus.
  - c. attracting electrons in other atoms.
  - d. do not exist.
- C 20. The radius of an atom extends to the outer edge of the
- a. nucleus.
  - b. region occupied by the electrons.
  - c. region occupied by the neutrons.
  - d. positive charges.

- B 21. Isotopes are atoms of the same element that have different  
 a. principal chemical properties. c. numbers of protons.  
 b. masses. d. numbers of electrons.
- A 22. The atomic number of oxygen, 8, indicates that there are eight  
 a. protons in the nucleus of an oxygen atom.  
 b. oxygen nuclides.  
 c. neutrons outside the oxygen atom's nucleus.  
 d. energy levels in the oxygen atom's nucleus.
- C 23. The total number of protons and neutrons in the nucleus of an atom is its  
 a. atomic number.  c. mass number.  
 b. Avogadro number. d. average atomic mass.
- C 24. As the mass number of an element's isotopes of an element increases, the number of protons  
 a. decreases.  
 b. increases.  
 c. remains the same.  
 d. doubles each time the mass number increases.
- Protons can not change without changing the element*
- D 25. All atoms of the same element have the same  
 a. atomic mass. c. mass number.  
 b. number of neutrons.  d. atomic number.
- A 26. In determining the atomic mass of elements, the standard is the  
 a. C-12 atom. c. H-1 atom.  
 b. C-14 atom. d. O-16 atom.
- A 27. The average atomic mass of an element is the average of the atomic masses of its  
 a. naturally occurring isotopes. c. radioactive isotopes.  
 b. two most abundant isotopes. d. artificial isotopes.
- C 28. An aluminum isotope consists of  13 protons, 13 electrons, and  14 neutrons. Its mass number is  
 a. 13.  c. 27.  
 b. 14. d. 40. *13+14*
- A 29. Chlorine has atomic number 17 and mass number 35. It has  
 a. 17 protons, 17 electrons, and 18 neutrons.  
 b. 35 protons, 35 electrons, and 17 neutrons.  
 c. 17 protons, 17 electrons, and 52 neutrons.  
 d. 18 protons, 18 electrons, and 17 neutrons.
- 35 mass# - 17 atomic# = 18 neutrons*
- B 30. Carbon-14 (atomic number 6), the radioactive nuclide used in dating fossils, has  
 a. 6 neutrons. *14* c. 10 neutrons.  
 b. 8 neutrons. *- 6* d. 14 neutrons.  
*8*
- B 31. Phosphorus-33 (atomic number 15) contains  
 a. 33 protons. c. 33 neutrons.  
 b. 18 neutrons. *33* d. 18 protons.  
*- 15*  
*18*

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

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- B 32. The number of atoms in 1 mol of carbon is  
a.  $6.022 \times 10^{22}$ .  
b.  $6.022 \times 10^{23}$ .  
c.  $5.022 \times 10^{22}$ .  
d.  $5.022 \times 10^{23}$ .
- D 33. To determine the molar mass of an element, one must know the element's  
a. Avogadro constant.  
b. atomic number.  
c. number of isotopes.  
d. average atomic mass.
- C 34. Molar mass  
a. is the mass in grams of one mole of a substance.  
b. is numerically equal to the average atomic mass of the element.  
c. Both (a) and (b)  
d. Neither (a) nor (b)
- C 35. The mass of 1 mol of chromium (atomic mass 51.996 amu) is  
a. 12 g.  
b. 198 g.  
c. 51.996 g.  
d.  $6.02 \times 10^{23}$  g.

\* Remember we are expressing only 2 decimals from P.T. in class

### Short Answer

36. Describe the law of definite proportions.  
A chemical compound always retains the same elements in same proportions
37. What is the law of conservation of mass?  
mass cannot be created or destroyed
38. What is the atomic number of an atom?  
the number of protons
39. What is the mass number of an atom?  
protons + neutrons
40. What is the relationship between isotopes, mass number, and neutrons?  
isotopes = atoms w/ different # of neutrons and therefore different mass #

### Problem

41. How many atoms are present in 8.00 mol of chlorine atoms?  $8.00 \text{ mol} \times \frac{6.022 \times 10^{23} \text{ atoms}}{1 \text{ mole}} = 4.82 \times 10^{24}$
42. Determine the number of moles of helium in 10.0 g of helium. The molar mass of helium is 4.00 g/mol.  
 $10.0 \text{ g He} \times \frac{1 \text{ mol}}{4.00 \text{ g}} = 2.50 \text{ mol He}$
43. Determine the number of moles in 100. g of potassium. The molar mass of potassium is 39.10 g/mol.  
 $100. \text{ g K} \times \frac{1 \text{ mol}}{39.10 \text{ g}} = 2.56 \text{ mol K}$
44. The mass of 1 mol of gold atoms is 196.97 g. Find the mass of 1 atom of gold.  
 $1 \text{ atom} \times \frac{196.97 \text{ g}}{6.022 \times 10^{23} \text{ atoms}} = 3.27 \times 10^{-22} \text{ g}$
45. Calculate the mass in grams of 9.00 mol of potassium (molar mass 39.10 g/mol).  
 $9.00 \text{ mol} \times \frac{39.10 \text{ g}}{1 \text{ mol}} = 352 \text{ g K}$

Practice Bohr Models and Ave. Atomic Weight problems!