

## Unit 2- The Atom Study Guide

- 1) The atomic number corresponds to an atom's number of
  - a) **protons**
  - b) quarks
  - c) leptons
  - d) neutrons
  
- 2) Isotopes of an element have different
  - a) Atomic numbers
  - b) Number of electrons
  - c) Number of protons
  - d) **Atomic masses**
  
- 3) Which of the following comparisons correctly describes subatomic particles?
  - a) An electron has a negative charge and a mass larger than the mass of a proton
  - b) **A neutron has a neutral charge and a mass larger than the mass of an electron**
  - c) A neutron has a negative charge and a mass smaller than a proton
  - d) A proton has a positive charge and a mass smaller than the mass of an electron
  
- 4) Which of the following describes a particle that contains 36 electrons, 49 neutrons, and 38 protons?
  - a) an anion with a charge of 2-
  - b) **a cation with a charge of 2+**
  - c) an atom with a mass of 38
  - d) an atom with a mass of 49
  
- 5) Which best describes the current atomic theory?
  - a) Atoms consist of electrons circling in definite orbitals around a positive nucleus
  - b) **Atoms are composed of electrons in a cloud around a positive nucleus**
  - c) Atoms can easily be split, at which time they become radioactive
  - d) An atom's mass is determined by the mass of its neutrons
  
- 6) Atoms of the same element must
  - a) contain the same number of neutrons
  - b) have the same mass number
  - c) **contain the same number of protons**
  - d) have equal numbers of protons and neutrons

7) Which best describes the relationship between subatomic particles in any neutral atom?

- a) **The number of protons equals the number of electrons**
- b) The number of protons equals the number of neutrons
- c) The number of neutrons equals the number of electrons
- d) The number of neutrons is greater than the number of protons

8) Which represents a neutral atom of calcium?

- a) **20 protons, 20 neutrons, 20 electrons**
- b) 20 protons, 10 neutrons, 10 electrons
- c) 40 protons, 40 neutrons, 40 electrons
- d) 20 protons, 20 neutrons, 40 electrons

9) Hydrogen-1 and Hydrogen-3 are

- a) ions
- b) anions
- c) cations
- d) **isotopes**

10) How many electrons does chlorine ion with a negative 1 charge have?

- a) 16
- b) 17
- c) 1
- d) **18**

11) How many neutrons are present in an isotope of oxygen-19?

- a) 8
- b) **11**
- c) 19
- d) 27

12) The net charge on aluminum ion is +3 because there are

- a) 10 protons and 13 electrons in the atom
- b) 10 neutrons and 13 electrons in the atom
- c) 13 protons and 10 neutrons in the nucleus
- d) **13 protons and 10 electrons in the atom**

- 13) Cations are formed when neutral atoms
- a) lose protons
  - b) gain electrons
  - c) lose electrons**
  - d) gain protons
- 14) How many protons, neutrons and electrons are found in an atom of sodium?
- a) 11p+, 12n0, 11e-**
  - b) 11p+, 11n0, 12e-
  - c) 12p+, 11n0, 11e-
  - d) 12p+, 11n0, 12e-
- 15) How does the radioactive isotope carbon-14 differ from its stable counterpart carbon-12?
- a) It has a different number of protons and two less neutrons than C-12
  - b) It has the same number of protons and two more neutrons than C-12**
  - c) It has the same number of protons and two less electrons than C-12
  - d) It has a different number of protons and two more neutrons than C-12
- 16) Anions are formed when neutral atoms
- a) lose electrons
  - b) gain electrons**
  - c) gain or lose neutrons
  - d) lose positrons
- 17) Which of the configurations below would be a positive ion with a charge of one?
- a) 11 protons, 12 neutrons, 10 electrons**
  - b) 1 protons, 0 neutrons, 2 electrons
  - c) 15 protons, 16 neutrons, 15 electrons
  - d) 20 protons, 20 neutrons, 18 electrons
- 18) Atoms are composed mostly of
- a) particulate matter
  - b) radioactive materials
  - c) empty space**
  - d) ions

- 19) According to the electron cloud (wave) model of the atom, an orbital is a
- a) circular path traveled by electrons around the nucleus
  - b) spiral path traveled by an electron toward the nucleus
  - c) region of most probable proton location
  - d) region of most probable electron location**

For questions 20-22, place the correct letter in the box beside the matching number/term.

- |     |          |                             |  |
|-----|----------|-----------------------------|--|
| 20) | <u>a</u> | Law of Conservation of Mass | a) mass is neither created nor destroyed during ordinary chemical reactions or physical changes in a closed system   |
| 21) | <u>b</u> | Law of Definite Proportions | b) a chemical compound contains the same number of elements in exactly the same proportions by mass regardless of the size of the sample or source of the compound   |
| 22) | <u>c</u> | Law of Multiple Proportions | c) if two or more different compounds are composed of the same two elements, then the ratio of the masses of the second element combined with a certain mass of the first element is always a ratio of small whole numbers |

23) Write the nuclear symbol for Sodium-25 isotope.

**Correct answer not provided.**

24) What is one real-world application of isotopes? You may use one we discussed in class or one of your own.

**Carbon-14 dating**

25) John Dalton, the father of atomic theory, described all matter consisting of indestructible spheres. He thought the atom was the smallest part of matter. The many scientists that followed Dalton found that the atom was not a solid indestructible sphere, but was made up of smaller sub-atomic particles.

A. Differentiate between the sub-atomic particles that are located in an atom. Draw a model of the atom and show the relative size of the subatomic particles.

B. Pick an element from the periodic table and identify and explain the meaning of the two numbers associated with it.

**A. You can draw the football field analogy. Make sure to label nucleus (protons+neutrons) and electrons. BE SURE TO DRAW THE ELECTRONS MUCH SMALLER THAN THE NUCLEUS.**

**B. Pick any element. Top number is atomic number and tells number of protons. Bottom number is mass and tells number of protons plus neutrons.**