Name: _____

1) What Greek philosopher was the first person to propose the idea that matter is made of tiny individual particles called atoms?

A) Bohr B) Dalton C) Rutherford D) Democritus

2) In the early 1900's, it was proposed that energy may be absorbed or released from atoms in small, indivisible packets named

A) protons B) nucleons C) quanta D) orbitals

3) The development of the cathode ray tube led to the discovery of what subatomic particle?

A) positron B) neutron C) proton D) electron

4) Experimental evidence indicates that the nucleus of an atom

A) has no charge
B) contains most of the mass of the atom
C) contains a small percentage of the mass of the atom
D) has a negative charge

5) After bombarding a gold foil sheet with alpha particles, scientists concluded that atoms consist mainly of

A) empty space B) electrons C) protons D) neutrons

6) Which symbol represents a proton?

A) $^{1}_{1}H$ B) $^{0}_{0}H$ C) $^{1}_{0}H$ D) $^{0}_{1}H$

7) Which particle has the *least* mass?

A) a proton B) a deuteron C) a neutron D) an electron

8) Which of the following statements *best* describes an electron?

A) It has a greater mass than a proton and a positive charge.
B) It has a greater mass than a proton and a negative charge.
C) It has a smaller mass than a proton and a negative charge.
D) It has a smaller mass than a proton and a positive charge.

9) Which two particles have approximately the same mass?

A) proton and neutron
B) neutron and electron
C) neutron and deuteron
D) proton and electron

10) What are the nucleons in an atom?

A) neutrons and electrons
B) neutrons and positrons
C) protons and neutrons
D) protons and electrons

11) How many protons are in the nucleus of an atom of beryllium?

A) 9 B) 2 C) 5 D) 4

12) All atoms of an element have the same

A) atomic mass
B) atomic number
C) number of neutrons
D) number of nucleons

13) In a sample of pure copper, *all* atoms have

A) the same atomic number and the same number of protons
B) a different atomic number and a different number of protons
C) a different atomic number, but the same number of protons
D) the same atomic number, but a different number of protons

14) A substance that is composed only of atoms having the same atomic number is classified as

A) a compound
B) a heterogeneous mixture
C) an element
D) a homogeneous mixture

15) Which substance is composed of atoms that *all* have the same atomic number?

A) ethene B) methane C) ethane D) magnesium

16) As the number of neutrons in the nucleus of an atom increases, the nuclear charge of the atom

A) increases B) remains the same C) decreases

17) Which atom has the *greatest* nuclear charge?

A) Ar B) Al C) Na D) Si

18) What is the nuclear charge of an atom with a mass of 23 and an atomic number of 11?

A) 12+ B) 23+ C) 11+ D) 34+

19) As an Na atom forms an Na^+ ion, the number of protons in its nucleus

A) increases B) remains the same C) decreases

20) A sodium atom and a sodium ion must have the same number of

A) neutrons
B) outermost electrons
C) protons
D) occupied principal energy levels

21) Which atom contains exactly 15 protons?

A) phosphorus-32 B) nitrogen-15 C) oxygen-15 D) sulfur-32

22) An ion with 5 protons, 6 neutrons, and a charge of 3+ has an atomic number of

A) 11 B) 5 C) 6 D) 8

23) What is the symbol for an atom containing 20 protons and 22 neutrons?

A) $^{42}_{22}Ti$ B) $^{40}_{22}Ti$ C) $^{40}_{20}Ca$ D) $^{42}_{20}Ca$

24) Isotopes of the same element must also have the same

A) mass number
B) atomic number
C) number of neutrons
D) number of nucleons

25) Different isotopes of the same element must have a different

A) mass number
B) atomic number
C) number of protons
D) number of electrons

26) Which pair of nuclei represent isotopes of the same element?

A) $10p\ 10n$ and $11p\ 11n$
B) $1p\ 2n$ and $2p\ 1n$
C) $5p\ 6n$ and $7p\ 6n$
D) $3p\ 3n$ and $3p\ 4n$

27) Which pair of atoms are isotopes of element *X*?

A) ${}^{226}_{90}X$ and ${}^{227}_{91}X$
B) ${}^{226}_{91}X$ and ${}^{227}_{91}X$
C) ${}^{226}_{90}X$ and ${}^{226}_{91}X$
D) ${}^{227}_{91}X$ and ${}^{227}_{90}X$

28) The chemical properties of an atom are related to the number of its

A) neutrons
B) nucleons
C) valence electrons
D) stable isotopes

29) In the ground state, *all* atoms of Group 13 of the Periodic Table have the same number of

A) occupied principal energy levels
B) nuclear particles
C) electrons
D) valence electrons

30) An atom in the ground state contains 8 valence electrons. This atom is classified as a

A) halogen
B) semimetal
C) metal
D) noble gas

31) What is the atomic number of an atom with six valence electrons?

A) 6 B) 10 C) 8 D) 12

32) What is the atomic number of an atom that forms an ion with 18 electrons and a charge of 2+?

A) 48 B) 20 C) 30 D) 18

33) What is the total number of valence electrons in an atom of phosphorus in the ground state?

A) 5 B) 2 C) 3 D) 7

34) What is the total number of valence electrons in an atom with a total of 13 protons?

A) 1 B) 2 C) 3 D) 4

35) What is the total number of valence electrons in an atom with the electron configuration 2-8-5?

A) 8 B) 15 C) 5 D) 2

36) An atom in the ground state has 7 valence electrons. Which electron configuration could represent this atom in the ground state?

A) 1-7 B) 2-8-7 C) 2-7-7 D) 2-5

37) Which of the following is the electron configuration of a neutral atom in the ground state with a total of six valence electrons?

A) 2-4 B) 1-8-6 C) 2-7-6 D) 2-6

38) A strontium atom differs from a strontium ion in that the atom has a *greater*

A) number of electrons
B) atomic number
C) mass number
D) number of protons

39) What principal energy level of an atom contains an electron with the *lowest* energy?

A) $n = 1$ B) $n = 2$ C) $n = 3$ D) $n = 4$

40) What is the total number of principal energy levels that are completely filled in an atom of magnesium in the ground state?

A) 1 B) 2 C) 3 D) 4

41) What is the total number of occupied principal energy levels in a neutral atom of neon in the ground state?

A) 1 B) 2 C) 3 D) 4

42) Which principal energy level can hold a maximum of 18 electrons?

A) 5 B) 2 C) 3 D) 4

43) If n represents the principal energy level, the maximum number of electrons possible in that principal energy level is equal to

A) n^2 B) n C) $2n$ D) $2n^2$

44) What is the maximum number of electrons that can be contained in the $n = 4$ principal energy level?

A) 32 B) 8 C) 18 D) 50

45) What is the total number of electrons in the second principal energy level of a calcium atom in the ground state?

A) 2 B) 18 C) 8 D) 6

46) Which element has a completely filled third principal energy level?

A) Zn B) N C) Fe D) Ar

47) An atom of which element in the ground state has a complete outermost shell?

A) H B) Be C) Hg D) He

48) In an atom that has an electron configuration of 2-5, what is the total number of electrons in its *highest* energy level?

A) 5 B) 7 C) 2 D) 8

49) Given the electron configuration of an atom in the ground state: 2-8-6

This element is found in the Periodic Table in

A) Period 4 and Group 14
B) Period 4 and Group 16
C) Period 3 and Group 16
D) Period 3 and Group 14

50) Which of the following is the electron configuration of an atom in the ground state?

A) 1-8-2 B) 2-8-1 C) 2-7-2 D) 2-7-1-1

51) Which electron configuration represents an atom in an excited state?

A) 2-7-1 B) 2-8-1 C) 2-8-2 D) 2-7

52) Which of the following is the electron configuration of an atom in the ground state?

A) $1s^2 2s^2 3s^1$ B) $1s^2 2s^2 2p^6 3s^1$ C) $1s^2 2s^2 2p^5 3s^2$ D) $1s^2 2s^1 2p^2$

53) An atom of an element has the electron configuration $1s^2 2s^2 2p^2$. What is the total number of valence electrons in this atom?

A) 6 B) 2 C) 5 D) 4

54) Which of the following is the electron configuration of a fluoride ion (F^-) in the ground state?

A) $1s^2 2s^2 2p^5$ B) $1s^2 2s^2 2p^7$ C) $1s^2 2s^2 2p^6$ D) $1s^2 2s^2 2p^4$

55) Which of the following is the electron configuration for Be^{2+} ions?

A) $1s^2 2s^1$ B) $1s^1$ C) $1s^2$ D) $1s^2 2s^2$

56) The total number of orbitals in a *d* sublevel is

A) 1 B) 5 C) 3 D) 7

57) What is the total number of orbitals in the third principal energy level?

A) 1 B) 9 C) 16 D) 4

58) What is the total number of sublevels in the second principal energy level?

A) 1 B) 2 C) 3 D) 4

59) What is the total number of occupied sublevels in an atom of chlorine in the ground state?

A) 1 B) 5 C) 3 D) 9

60) An atom has 8 electrons in a *d* sublevel. How many *d* orbitals in this sublevel are half-filled?

A) 1 B) 2 C) 3 D) 4

61) Which electron configuration contains three half-filled orbitals?

A) $1s^2 2s^2 2p^5$ B) $1s^2 2s^2 2p^4$ C) $1s^2 2s^2 2p^6$ D) $1s^2 2s^2 2p^3$

62) How does the ground state electron configuration of the hydrogen atom differ from that of a ground state helium atom?

A) Hydrogen contains a half-filled orbital.
B) Hydrogen has one electron in a higher energy level.
C) Hydrogen contains a completely filled orbital.
D) Hydrogen has two electrons in a lower energy level.

63) What principal energy level has no *f* sublevel?

A) 5 B) 6 C) 3 D) 4

64) What is the maximum number of electrons that can occupy an orbital?

A) 1 B) 2 C) 3 D) 6