Chemistry
Tigard High
2018 - 2019

Name_____ Date_____

Due ☞ Test Day!

# Unit 1: Atomic Theory

# Pretest Practice

1.) Complete the following table:

Work space (if needed)

| Composition of Various Isotopes | | | | | |
|---|---|---|---|---|---|
| Isotope | Atomic number | Mass number | Number of protons | Number of neutrons | Number of electrons |
| | | 32 | 16 | | |
| | | | | 24 | 20 |
| Zn-64 | | | | | |
| | 9 | | | 10 | |
| | 11 | 23 | | | |

2.) What do the superscripts and subscript represent in the symbol below?

$$^{39}_{19}K^{+}$$

3.) Show how the number of neutrons an atom contains is determined from its mass and atomic numbers.

4.) How many protons and electrons are contained in an atom of element with the atomic number=44?
(Recall, always assume an atom or isotope is neutrally charged unless there is information to the contrary.)

5.) For each of the chemical symbols given below, write the element's name and its atomic number:

V _____ # _____ Mn_____ # _____ S_____ # _____

6.) An isotope of mercury has 80 protons and 120 neutrons. What is the mass number of this isotope?

7.) Data for chromium's four naturally occurring isotopes is provided in the table below.
Use this data to calculate chromium's atomic mass. Show your work!

| Chromium Isotope Data | | |
|---|---|---|
| Isotope | Percent abundance | Mass (amu) |
| Cr-50 | 4.35% | 49.946 |
| Cr-52 | 83.79% | 51.941 |
| Cr-53 | 9.50% | 52.941 |
| Cr-54 | 2.36% | 53.939 |

8.) How many electrons, protons, and neutrons are contained in each of the following?

| | | | |
|---|---|---|---|
| $^{132}_{55}Cs$ #p=____ #n= ____ #e⁻=____ | $^{70}_{30}Zn^{2+}$ #p=____ #n= ____ #e⁻=____ | $^{80}_{34}Se^{2-}$ #p=____ #n= ____ #e⁻=____ | gallium-69 #p=____ #n= ____ #e⁻=____ |

9.) Who proposed 2500 years ago that matter was composed of tiny, indivisible particles (that matter could not be infinitely divided)?

10.) Who is often called the father of our modern atomic theory?

11.) Which subatomic particle was discovered by using a cathode ray tube (Crooke's tube)?

12.) Rutherford's gold foil experiment show that atoms are made up of almost entirely _____ _____ and that almost all the mass of an atom can be found within a very small region within its center called the _____.

13.) What keeps the electrons confined in the space surrounding the nucleus? (Why don't they just fly away?)

14.) Draw a wave and indicate its wavelength (λ).

15.) Using the correct symbols, write the equation that relates wavelength, frequency, and the speed of light.

16.) Describe the relationship among the energy of a wave, its frequency (υ), and its wavelength (λ)? (Hint: As energy increases, what happens to the other two?)

17.) Draw two waves with the wavelengths representing the relative energies of red light and of blue light. Label one "more energetic," the other "less energetic."

18.) In the box below, place the following sections of the electromagnetic spectrum in order of increasing energy (lowest energy to highest): [See page 92.]

| | | | |
|---|---|---|---|
| Infrared | Microwaves | X Rays | Visible light |
| Gamma Rays | Ultraviolet | Radio | |

| | | | | | |
|---|---|---|---|---|---|
| → | → | → | → | → | → |

19.) How does the Bohr model explain the atomic emission spectrum of hydrogen (the colored lines)?

20.) What two shortcomings caused scientists to finally reject Bohr's model of the atom?

21.) What is the probability that an electron will be found within the given shape of an atomic orbital?

22.) What does n represent in the quantum mechanical model of the atom?

23.) Complete the following table:

| Principal Energy Level | Total number of sublevels | Total number of orbitals | Total number of electrons |
|---|---|---|---|
| 2 | | | |
| | 4 | | |
| | | 25 | |

24.) Circle any of the following that are examples of <u>incorrect</u> orbital designations:

a. 7f b. 3f c. 2d d. 6p e. 1p f. 5d

25.) Write labeled orbital diagrams for each of the following elements:

a. silicon

b. vanadium

26.) Use noble gas notation to give the electron configurations for the following elements:

a. Mn

b. P

c. $Si^{4-}$

d. Zn

e. Ti

f. $Au^{3+}$

27.) Write the symbol for the element that is represented by each of the following electron configurations.

a. $1s^2 2s^2 2p^5$ ____

b. $[Xe]6s^2 4f^4$ _____

c. $[Ar]4s^2$ _____

d. $[Kr]5s^2 4d^{10} 5p^4$ _____

28.) An atom of arsenic has how many electron-containing orbitals?

How many half-filled orbitals does arsenic have?

29.) Use noble gas notation to write the electron configuration for the two elements that are exceptions to the aufbau principle. (Recall, you only need to know these two!)

a. Symbol: _____ Notation: _____

b. Symbol: _____ Notation: _____

30.) Make a drawing of the three p orbitals given on page 103 of your text (also in your notes):

31.) For Iridium-178 (atomic number 77)

a. Determine the number of protons, neutrons, and electrons

#p= #n= #$e^-$=

b. Write its electron configuration using noble gas notation

c. How many unpaired electrons does it contain? _____

32.) Name the element represented by each of the following electron configurations and determine the number of unpaired electrons each contains:

| | | # unpaired $e^-$ |
|---|---|---|
| a. $1s^2 2s^2 2p^6 3s^2 3p^4$ | _____ | _____ |
| b. $[Kr]5s^2 4d^8$ | _____ | _____ |
| c. $[Xe]6s^2 4f^{14} 5d^{10} 6p^2$ | _____ | _____ |

33.) Determine which of the following electron configurations represent an atom in the excited state and identify that element. (Circle choice and name the element)

a. $1s^2 2s^3 2p^6 3s^2 3p^6$ b. $1s^2 2s^1 2p^6 3s^2 3p^5$ c. $1s^2 3s^2 2s^2 2p^6 3p^6$

34.) Three isotopes of argon occur in nature, Ar-36, Ar-38, and Ar-40. Calculate the atomic mass of argon to two decimal places, given the following relative atomic masses and abundances of each of the isotopes: argon-36 (35.97 u; 0.337%), argon-38 (37.96 u; 0.063%), and argon-40 (39.96 u; 99.600%).

35.) a. Write a nuclear equation for the alpha decay of $^{185}_{79}Au$ .

b. Write a nuclear equation for the beta decay of $^{24}_{11}Na$ .

c. Write a nuclear equation for the alpha decay of Uranium-238.

d. Write a nuclear equation for the beta decay of Iodine-131.

36.) State the Heisenberg uncertainty principle:

_____

_____

_____

37.) Take the Standard-Based Assessment tests on the following pages of the textbook (links to pg. 89 and pg. 123 are on the lesson calendar):

Page 89

1._____
2._____
3._____
4._____
5._____
6._____
7._____
8. N/A
9. N/A
10._____
11. N/A

Page 123

1._____
2._____
3._____ (will NOT be on the test)
4._____ (hint: use n instead of E)
5. N/A
6. N/A
7._____
8._____
9._____
10. N/A
11. Orbital diagram for sulfur: