Chemistry Exam Review

Name Key

Date _____

Standard 1.1 Analyze the structure of atoms and ions.

E 1. As a consequence of the discovery of the nucleus by Rutherford, which model of the atom is believed to be true?
- A) A model in which the protons, electrons and neutrons are evenly distributed throughout the volume of the atom.
- B) A model in which the nucleus is made of protons, electrons, and neutrons
- C) A model in which the nucleus is made of neutrons only
- D) A model in which the nucleus is made of electrons and protons
- (E) A model in which the region outside the nucleus is largely empty space in which the electrons are situated

B 2. The atomic number of an element is the total number of which particles in the nucleus?
- A) neutrons
- (B) protons
- C) electrons
- D) protons and electrons
- E) protons, electrons and neutrons

D 3. Most of the volume of an atom consists of
- A) protons
- B) protons and neutrons
- C) electrons
- (D) empty space
- E) neutrons

B 4. The mass number of an element is equal to
- A) the total number of electrons in the nucleus
- (B) the total number of protons and neutrons in the nucleus
- C) less than twice the atomic number
- D) a constant number for the lighter elements

B 5. All atoms of the same element have the same
- A) number of neutrons
- (B) number of protons
- C) mass numbers
- D) mass

A 6. Isotopes of the same element have different
- (A) numbers of neutrons
- B) numbers of protons
- C) numbers of electrons
- D) atomic numbers
- E) symbols

*Define Isotope: Atoms of the same element w/ a diff. # of neutrons (diff. mass)

E 7. In which of the following is the number of neutrons correctly represented?
- A) F-19 has 0 neutrons
- B) As-75 has 108 neutrons
- C) Mg-24 has 24 neutrons
- D) Au-197 has 79 neutrons
- (E) U-238 has 146 neutrons

238 − 92 = 146

A 8. How does the energy of an electron change when the electron moves closer to the nucleus?
- (A) it decreases
- B) it increases
- C) it stays the same

C 9. What particle is emitted in alpha radiation?
- A) electron
- B) photon
- (C) helium nucleus
- D) hydrogen nucleus

$^{4}_{2}He$

A 10. The splitting of a nucleus into two similar-sized pieces is called
- (A) fission
- B) fusion
- C) neutron absorption
- D) transmutation

B 11. What particle decomposes to produce the electron of beta radiation?
- A) proton
- (B) neutron
- C) electron
- D) muon

$^{0}_{-1}e$

*The resulting element now has an extra proton.

C 11. The most penetrating form of radiation is
- A) alpha radiation
- B) beta radiation
- (C) gamma radiation
- D) visible radiation

A 12. In a neon light, when is the light given off?
- (A) when electrons return to their normal atomic orbital
- B) when electrons absorb electrical energy
- C) when protons move
- D) when atoms collide

13. What color light is given off from a hydrogen atom when its electron drops from the n= 4 to n=2 energy level? And how much energy is this?

Blue, $E = h\left(\frac{c}{\lambda}\right) = 4.1 \times 10^{-19}$ J

A 14. What is the approximate energy of a photon having a frequency of 4×10^{7} hz? (h= 6.6×10^{-34} J·s)

(A) 3×10^{-26} J
B) 3×10^{-27} J
C) 2×10^{-41} J
D) 3×10^{42} J
E) 1×10^{-18} J

*Formula used: $E=h\nu$

B 15. Silicon occurs in nature in three isotopes, Si-28 at 92.21% abundancy, Si-29 at 4.70% abundancy and Si-30 at 3.09% abundancy. According to this data, what is the average atomic mass of silicon?

A) 29 amu (B) 28.11 amu
C) 29.11 amu D) 40.38 amu

*Formula used: Σ(isotope mass x % abund in decimal)

16. Determine the following for electromagnetic radiation with a wavelength of 6.0×10^{-3} m. ($c = 3.0 \times 10^{8}$ m/s $h = 6.626 \times 10^{-34}$ Js)

a) What type of wave is this? microwaves
b) What is the frequency of the wave? 5×10^{10} hz
c) What energy does the wave possess? 3.313×10^{-23} J

*What formula can you use to calculate energy directly from wavelength: $E=h(\frac{c}{\lambda})$

B 17. When Carbon-14 undergoes beta decay, what new element is formed?

A) Carbon-12
(B) Nitrogen-14
C) Oxygen-14
D) No new element can be formed from another element.

*What is Beta decay? emission of electron ie

C 18. A certain radioactive isotope has a half life of three days. If 40 g of substance is present at the beginning, how much is left nine days later?

A) 40 g
B) 20 g
(C) 5 g
D) 4.4 g

*Define half-life: Time it takes for 1/2 of material to decompose

B 19. The heat of the sun is produced by

A) a redox reaction
(B) a nuclear fusion reaction
C) a combustion reaction
D) thousands of tiny ants holding up lit matches

*Define Fusion: combining nuclei

Standard 1.2 Understand the bonding that occurs in simple compounds in terms of bond type, strength and properties.

C 20. Which of the following crystals is the most malleable?

A) sodium chloride
B) ammonium nitrate
(C) iron
D) sugar

*What type of substances are malleable: metals

C 21. Which of the following has the highest melting point?

A) CO_2
B) $C_6H_{12}O_6$
(C) KBr
D) SO_3

*What type of substances have high melting and boiling points? ionic

D 22. Which of the following bonds would be MOST polar?

A) B-O
B) B-Br
C) B-N
(D) B-F

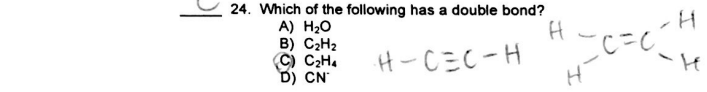
*Define Polar: uneven electronegativity δ^+ on one side δ^- on the other

B 23. Which of the following bonds would be the LEAST polar?

A) C-O
(B) B) C-C
C) C-F
D) C-N

C 24. Which of the following has a double bond?

A) H_2O
B) C_2H_2
(C) C_2H_4
D) CN^-



*Draw lewis structure:

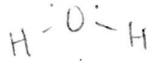
B 25. The VSEPR theory gives information about why ___ Valence shell Electron Pair Repulsion

A) atoms share electrons
(B) molecules are shaped the way they are
C) electron configurations are the way they are
D) dipole-dipole forces may be attractive or repulsive

B 26. What is the shape of the water (H_2O) molecule?

A) tetrahedral
B) bent
C) linear
D) trigonal pyramidal

*Draw lewis structure:



D 27. Which of the following compounds exhibits hydrogen bonding?
A) HF
B) NH_3
C) H_2O
(D) All of the above

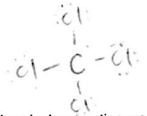
*What is hydrogen bonding? IM force when H is bound to O, N, F

D 28. How many electrons are shared in a double covalent bond?
A) 1
B) 2
C) 3
(D) 4
E) 8

C 29. Which of the forces of molecular attraction is the strongest?
A) dipole interaction
B) dispersion forces
(C) hydrogen bonds

C 30. The shape of the carbon tetrachloride (CCl_4) molecule is ___.
A) linear
B) bent
(C) tetrahedral
D) square

*Draw lewis structure:



D 31. If two elements have similar chemical properties, you would expect them to have
A) similar atomic masses
B) similar atomic radii
C) the same number of energy levels
(D) the same number of outer electrons

*What do we call the other electron? Valence electrons

A 32. Which of the following pairs of elements is most likely to form an ionic compound?
(A) magnesium and fluorine
B) nitrogen and sulfur
C) oxygen and chlorine
sodium and aluminum

*Define ionic compound: Metal and Nonmetal

B 33. How many unshared pairs of electrons are in a water molecule?
A) 1
(B) 2
C) 3
D) 4

C 34. What type of compound is always an electrolyte?
A) polar covalent
B) nonpolar covalent
(C) ionic

C 35. Which of the following is the correct formula for nickel (I) chloride?
A) $NiCl_2$
B) Ni_2Cl
(C) NiCl
D) $NiCl_3$

Name the compounds. Write the correct name for each of the following compounds.

Sodium Acetate 36. $NaC_2H_3O_2$

Barium Hydroxide 37. $Ba(OH)_2$

Calcium Oxide 38. CaO

Sodium Nitride 39. Na_3N

Carbon Tetrachloride 40. CCl_4

Write the correct chemical formula for each of the following compounds.

NiCl 41. Nickel (I) chloride

$KMnO_4$ 42. Potassium permanganate

$NaHCO_3$ 43. Sodium bicarbonate

N_2O_5 44. Dinitrogen pentoxide

HCl 45. Hydrochloric acid

BF_3 46. Boron trifluoride

*What do roman numerals represent? The metal's charge

*When do you use prefixes such as mono- di- tri-? Molecular compounds

C 47. In the chemical formula Na_2SO_4, the subscript 2 indicates
A) that sodium is a diatomic element
B) that sodium is a polyatomic ion
(C) that there are two atoms of sodium in one formula unit of sodium sulfate
D) that sodium has a positive 2 charge