**Fall 2021 Chemistry Final B**

*Choose the best answer to each of the following questions. (2 pt. each)*

1. Which is the largest particle inside an atom?
   1. Nucleus
   2. Proton
   3. Neutron
   4. Electron
2. Which particle has no charge?
   1. Nucleus
   2. Proton
   3. Neutron
   4. Electron
3. Given the following atom, 11950 Sn, what does the number 50 represent?
   1. Atomic number
   2. Mass number
   3. Oxidation number
   4. Average atomic mass
4. How many protons are in 71Ga?
   1. 31
   2. 32
   3. 70
   4. 71
5. How many neutrons are in 110Ag?
   1. 47
   2. 61
   3. 63
   4. 110
6. How many electrons are in S2-?
   1. 6
   2. 14
   3. 16
   4. 18
7. Compared to an atom, ions have a different:
   1. Number of protons
   2. Number of electrons
   3. Number of neutrons
   4. Mass number
8. Based on the Bohr model of Hydrogen, what type of energy is released if electrons move from n=4 to n=2?
   1. Infrared light
   2. Ultraviolet light
   3. Visible light—blue
   4. Visible light—red
9. Which form of electromagnetic radiation has the lowest frequency?
   1. Radio waves
   2. Gamma rays
   3. Infrared radiation
   4. Visible light
10. Which element has the electron configuration: *1s22s22p63s23p4*?
    1. Silicon
    2. Sulfur
    3. Oxygen
    4. Selenium
11. Which element has the electron configuration: *[Rn] 7s25f 14 6d5*?
    1. Tantalum
    2. Bohrium
    3. Hassium
    4. Dubnium
12. What isotope is needed to make this nuclear equation true?

90Sr 🡪 β + \_\_\_\_\_

* 1. Yttrium-89
  2. Yttrium-90
  3. Krypton-88
  4. Rubidium-88

1. Cesium-137 has a half-life of 30 years. If your 400-gram sample sits in the laboratory for the next 120 years, how much will be left for those chemists to use?
   1. 0 grams
   2. 25 grams
   3. 50 grams
   4. 200 grams
2. Which type of nuclear reaction can be seen in the equation below?

235U + 1n 🡪 144Ba + 89Kr + 3 1n

* 1. Alpha decay
  2. Beta decay
  3. Nuclear fusion
  4. Nuclear fission

1. Which element would most likely become a cation?
   1. Xenon
   2. Oxygen
   3. Lithium
   4. Carbon
2. Based on its electron configuration, which element is most likely stable?
   1. Argon
   2. Calcium
   3. Chlorine
   4. Silicon
3. Based on this electron configuration, *[Xe] 6s24f145d106p3*, how many valence electrons does this element have?
   1. 2
   2. 3
   3. 5
   4. 10
4. What is the oxidation number of Phosphorus when it becomes an ion?
   1. 1-
   2. 3-
   3. 3+
   4. 1+
5. Which diatomic molecule is held together by a double bond?
   1. N2
   2. I2
   3. F2
   4. O2
6. Which intermolecular force is the weakest?
   1. Single covalent bond
   2. London dispersion force
   3. Van der waals force
   4. Ionic bond
7. Which compound is a covalent compound?
   1. NaCl
   2. H2O
   3. Li2SO4
   4. KOH
8. Which is the name of Fe(NO3)3?
   1. Iron nitrate
   2. Iron (III) nitrate
   3. Iron trinitrate
   4. Iron (III) trinitrate
9. What is the formula for sodium carbonate?
   1. Na4C
   2. NaCO3
   3. Na2CO3
   4. SCO3
10. Which is the VSEPR shape of the molecule BF3?
    1. Trigonal planar
    2. Trigonal pyramid
    3. Tetrahedral
    4. bent
11. Which molecule is nonpolar?
    1. H2O
    2. NH2Cl
    3. CCl4
    4. SF2
12. Which elements in each set are in the same period?
    1. H, Li, Na, K
    2. Ag, Au, Tc, W
    3. C, N, O, F
    4. U, Ce, Pm, Ta
13. Which element is a halogen?
    1. Lithium
    2. Calcium
    3. Chlorine
    4. Xenon
14. Based on periodic trends, which element in this set is the most electronegative?
    1. Fluorine
    2. Oxygen
    3. Magnesium
    4. Francium
15. During a few chemical reactions, these salts were formed. Which of them would be considered a precipitate and would NOT make an aqueous solution?
    1. NaOH
    2. BaCl2
    3. AgNO3
    4. MgCO3
16. A student suggested that oxygen gas was produced during a chemical reaction. Which observation could be made to provide evidence that oxygen gas was released by the reaction?
    1. A nearby flame increased in size.
    2. A nearby flame was extinguished.
    3. A smell was produced.
    4. A bright light was produced.
17. What type of reaction is represented by the equation below?

C3H8 + 5O2 🡪 3CO2 + 4H2O

* 1. Synthesis
  2. Decomposition
  3. Single Replacement
  4. Combustion

1. Which single replacement reaction can occur?
   1. CaI2 + Cl2 🡪 CaCl2 + I2
   2. 2Mn(CN)5 + 5Zn 🡪 5Zn(CN)2 + 2Mn
   3. 2KOH + Co 🡪 Co(OH)2 + 2K
   4. Al2O3 + 3Cd🡪 3CdO + 2Al
2. Which equation shows a neutralization reaction?
   1. 2NaClO3 + PbI2 🡪 2NaI + Pb(ClO3)2
   2. KCl + LiC2H3O2 🡪 KC2H3O2 + LiCl
   3. 3HNO3 + Al(OH)3 🡪 Al(NO3)3 + 3H2O
   4. SnF2 + CuBr2 🡪 SnBr2 + CuF2
3. Which can be the (unbalanced) products of the following reaction?

MgHCO3 🡪 ???

* 1. MgO + H2O + CO2
  2. MgCO3 + O2
  3. MgCO3 + H2O
  4. Mg + HCO3

1. Which is a balanced equation?
   1. Li2O + CaCl2 🡪 LiCl + 2CaO
   2. 2FeCl3 🡪 Fe + 3Cl2
   3. C3H8 + 5O2 🡪 3CO2 + 8H2O
   4. K2SO4 + 2NaBrO3 🡪 2KBrO3 + Na2SO4
2. Look at the equation: Ag3PO4 + 3KI 🡪 3AgI + K3PO4. If you have 2.0 moles of KI, how many moles of K3PO4 could be produced?
   1. 0.33 moles
   2. 0.67 moles
   3. 1.0 mole
   4. 1.3 moles
3. Using the same equation from #36, if you have 104.5 grams of KI, how many formula units (fus) of K3PO4 can be produced by the reaction?
   1. 1.263 x 1023 fus
   2. 1.477 x 1023 fus
   3. 2.318 x 1023 fus
   4. 3.552 x 1023 fus
4. Given the equation, C7H16 + 11O2 🡪 7CO2 + 8H2O, if you use 6.0 moles of O2 in the reaction, how many liters of H2O would be produced at STP?
   1. 54 L
   2. 69 L
   3. 98 L
   4. 120 L
5. What is the empirical formula of a compound that contains 43.6% P and 56.4% O?
   1. PO3
   2. P2O3
   3. P2O5
   4. P3O6
6. The empirical formula of a chemical is CH2O. The molecular mass of the chemical is 120.1 grams/mole. What is the molecular formula of the chemical?
   1. CH2O
   2. C4H8O4
   3. C6H12O6
   4. C8H16O8
7. What is the percent composition of water in the following hydrate: Na2CO3\*10H2O?
   1. 47.1%
   2. 50.9%
   3. 53.4%
   4. 63.0%
8. Which has to be true for any system of reversible reactions at equilibrium?
   1. Keq > 1
   2. Keq < 1
   3. Keq = 1
   4. Keq = 0
9. What is the equilibrium constant in the following reaction AND which side of the reaction is favored?

CO2(g) + H2O (l) 🡨🡪 H2CO3 (aq)

[CO2] = 0.0375 M

[H2CO3] = 0.0500 M

* 1. 0.750; Reactants are favored.
  2. 0.750; Products are favored.
  3. 1.33; Reactants are favored.
  4. 1.33; Products are favored.

1. Using the same equation from #43, if we assume that we are at equilibrium, and more H2O is added to the system, what happens?
   1. Reactants are favored and more CO2 is made.
   2. Reactants are favored and more H2CO3 is made.
   3. Products are favored and more CO2 is made.
   4. Products are favored and more H2CO3 is made.
2. Which of the chemicals below is a base?
   1. HCl
   2. NaOH
   3. H2O
   4. H3PO4
3. What is a characteristic of a chemical known as an acid?
   1. reacts with metals
   2. pH greater than 7
   3. bitter to taste
   4. releases OH- ions in a solution
4. What is the pH of a chemical that has a [OH-] = 1 x 10-3 M?
   1. pH = 3; The chemical is an acid.
   2. pH = 3; The chemical is a base.
   3. pH = 11; The chemical is an acid.
   4. pH = 11; The chemical is a base.
5. You mix 47.65 grams of CaCl2 in 1.8 liters of water. What is the molarity of your solution?
   1. 0.24 M
   2. Chart, line chart

      Description automatically generated0.33 M
   3. 0.45 M
   4. 0.67 M
6. Look at the solubility curves on the right. If you wanted to make an unsaturated solution in 100 grams of water using KClO3 at 70 degrees C, how much of the salt would you need to add?
   1. 20 grams
   2. 32 grams
   3. 40 grams
   4. 55 grams
7. In your Chemistry class, you were asked to perform a titration to determine the molarity of an unknown acid. You were given 25.0 mL of acid as well as a 0.20 M NaOH solution. When you ran the titration, you used 86 mL of the base. What was the molarity of your mystery acid?
   1. 0.45 M
   2. 0.51 M
   3. 0.69 M
   4. 0.78 M