Practice Exam Solutions

1. Is the following statement True or False? “Carbon dioxide molecules consist of two atoms – one carbon and one oxygen atom – held together in a straight line by a chemical bond.
	1. True
	2. False (CO2 molecules consist of three atoms – one carbon and two oxygen atoms)
2. Is the following statement True or False? “Scientific method is a way of learning that emphasizes reasoning as the way to understand the world.”
	1. True
	2. False (It emphasizes observation and experimentation)
3. What does the following definition represent? “a tentative interpretation or explanation of the observation”
	1. Model
	2. Scientific theory
	3. Hypothesis
	4. All of the above
4. Fill in the blank with the correct word: “Theories are tested and validated by \_\_\_\_\_\_\_\_.”
	1. Experiments
	2. Hypothesis
	3. Reasoning
	4. Models
5. Is the following statement True or False? “The characteristics of water molecule make water vapor at room temperature.”
	1. True
	2. False (Makes it liquid)
6. What is the scientific notation of 5983?
	1. 5.983 × 103 (large numbers have positive exponent, small numbers have negative exponenets)
	2. 5.983 × 10-3
	3. 6.0 × 103
	4. 6.0 × 10-3
7. What does the following definition represent? “the non-place-holding digits in a measurement”
	1. Scientific notation
	2. Trailing zeros
	3. Interior zeros
	4. Significant figures
8. Is the following statement True or False? “Leading zeros are significant”
	1. True
	2. False (Leading zeros are NOT significant)
9. Fill in the blank with the correct word: “ The most convenient system for science measurements is based on the \_\_\_\_\_\_\_ system”
	1. English
	2. US
	3. Metric
	4. None of the above
10. Which of the following prefixes is NOT correct?
	1. Tera = 10-12 (Tera is 1012)
	2. Giga = 109
	3. Kilo = 103
	4. Centi = 10-2
11. Fill in the blank with the correct word: “We define \_\_\_\_\_\_\_\_\_ as anything that occupies space and has mass”
	1. Energy
	2. Sound
	3. Matter
	4. Light
12. Fill in the blank with correct words: “Pure substances can themselves be divided into two types: \_\_\_\_\_\_ and \_\_\_\_\_\_\_.”
	1. Molecules, metals
	2. Elements, compounds
	3. Molecular compounds, acids
	4. Molecules, ions
13. Which of the following is NOT a chemical property?
	1. Corrosiveness
	2. Flammability
	3. Odor
	4. Toxicity
14. Is the following statement True or False? “Chemical systems contain chemical energy, a form of work associated with the positions of the particles that compose the chemical system”
	1. True
	2. False (a form of potential energy not work)
15. Which of the following has the highest specific heat among others?
	1. Water
	2. Lead
	3. Gold
	4. Silver
16. Which of the following represents Thomson model of atoms?
	1. He theorized hat atoms are indestructible particles.
	2. He theorized that negatively charged electrons were small particles held within a positively charged sphere.
	3. He theorized there are many negatively charged electrons outside the nucleus as there are positively charged particles (protons) inside the nucleus.
	4. He theorized that electrons travel around the nucleus in circular orbits that are similar to planetary orbits around the sun.
17. Is the following statement True or False? “Most matter is charged because the number of protons and neutrons in atoms are not necessarily the same.”
	1. True
	2. False (Most matter is charge-neutral because protons and electrons occur together, and their charges cancel)
18. Fill in the blanks with correct words: “\_\_\_\_\_\_\_\_\_\_ elements are in columns labeled with an number and a letter A. \_\_\_\_\_\_\_\_\_\_ elements are in columns labeled with a number and the letter B.”
	1. Transition, Lanthanide
	2. Lanthanide, Transition
	3. Transition, Main group
	4. Main group, Transition
19. What is the mass number?
	1. The sum of number of protons and neutrons in an atom
	2. The sum of number of electrons and neutrons in an atom
	3. The sum of all the charges in an atom
	4. The sum of charges and masses in an element
20. What does the following formula represent?

Atomic mass = (Fraction of isotope 1 × Mass of isotope 1) + (Fraction of isotope 2 × Mass of isotope 2) + (Fraction of isotope 3 × Mass of isotope 3) + …

* 1. Atomic number
	2. Formula mass
	3. Atomic mass
	4. Atomic charge
1. Write the ionic compound forming from Iron (III) and acetate:
	1. Ir3C2H3O2
	2. Fe(C2H3O2)3
	3. Fe3(C2H3O2)
	4. Ir(C2H3O2)3
2. Name the following compound. Is it ionic, molecular, or acid? “BCl3”
	1. Bromide tetrachloride, ionic
	2. Boron tetrachloride, ionic
	3. Bromide trichloride, molecular
	4. Boron trichloride, molecular
3. What does the following definition represent? “elements combine in fixed proportions to form compounds”
	1. Law of conservation of mass
	2. Law of conservation of energy
	3. Law of constant composition
	4. Atomic theory
4. Which acid name is not correct?
	1. Nitric acid (oxyanion formula = NO3-)
	2. Acetic acid (oxyanion formula = C2H3O2-)
	3. Carbonic acid (oxyanion formula = CO32-)
	4. Chloric acid (oxyanion formula = ClO2-) Chlorite ion leads to Chlorous acid
5. Which of the following metals form more than one type of ion?
	1. Zn
	2. Sn
	3. Ag
	4. Al
6. What is the formula mass of H4C2O2?
	1. 8.00
	2. 19.02
	3. 40.06
	4. 60.06 Formula mass = (4×H) + (2×C) + (2×O) = (4×1.01) + (2×12.01) + (2×16.00) = 60.06 amu
7. How many grams of carbon are in 27 grams of CO2?
	1. 0.1 g
	2. 9 g
	3. 27 g
	4. 7.4 g

$$? C=27 g CO\_{2}×\frac{1 mol CO\_{2}}{ \left(12.01\right)+(16.00×2) g CO\_{2}}×\frac{1 mol C}{ 1 mol CO\_{2}}×\frac{12.01 g C}{ 1 mol C}=7.37 g=7.4 g$$

1. How many oxygen molecules are in 25 g O2?
	1. 4.7 × 1023
	2. 9.4 × 1023
	3. 6.022 × 1023
	4. 1.5 × 1025

$$?O\_{2}molecules=25 g O\_{2}×\frac{1 mol O\_{2}}{\left(16.00 ×2\right) g O\_{2}}×\frac{\left(6.022×10^{23}\right)O\_{2} molecules}{1 mol O\_{2}}=4.7 ×10^{23}$$

$$ $$

1. What is the mass percent composition of N in N2O5?
	1. 0.26
	2. 0.29
	3. 0.28
	4. 0.27

$$Mass percent composition of N in N\_{2}O\_{5}=\frac{N×2}{\left(N×2\right)+(O×5)}×100\%=\frac{14.01×2}{\left(14.01×2\right)+(16.00×5)}×100\%=26\%=0.26$$

1. Calculate the empirical formula for Tylenol: C, 63.56 %, H, 6.00 %, N, 9.27 %, O, 21.17 %
	1. CHNO
	2. C20H10N10O
	3. C8H9NO2
	4. C6H6NO

$$?g C=63.56 g C×\frac{1 mol C}{12.01 g C}=5.2923 g C$$

$$?g H=6.00 g H×\frac{1 mol H}{1.01 g H}=5.9406 g H$$

$$?g N=9.27 g N×\frac{1 mol N}{14.01 g N}=0.6617 g N$$

$$?g O=21.17 g O×\frac{1 mol O}{16.00 g O}=1.3231 g O$$

$$C\_{5.2923}H\_{5.9406}N\_{0.6617}O\_{1.3231}$$

$$Now we divide all by the smallest number, We get:$$

$$C\_{7.99}H\_{8.98}N\_{1}O\_{1.99}$$

$$So the answer is c$$

1. Which of the following is NOT a chemical reaction?
	1. Ice melting
	2. Iron rusting
	3. Decomposition of water
	4. Redox
2. Fill in the blank with the correct word: “By balancing chemical equations we make sure the \_\_\_\_\_\_\_\_\_ is preserved.”
	1. Law of conservation of energy
	2. Empirical formula
	3. Theoretical yield
	4. Law of conservation of mass
3. Which of the following compounds are NOT soluble in water?
	1. NaCl
	2. AgCl
	3. KOH
	4. (NH4)2S
4. What does the following definition represent? “equations showing only species that actually participate in the reaction.”
	1. Complete ionic equation
	2. Molecular equation
	3. Net ionic equation
	4. All of the above
5. What is oxidation?
	1. Ionic charges
	2. Gain of electrons
	3. Loss of electrons
	4. All of the above
6. What is stoichiometry?
	1. The qualitative relationship between reactants and products in a chemical reaction
	2. The quantitative relationship between reactants and products in a chemical reaction
	3. The qualitative relationship between elements in a chemical formula
	4. The quantitative relationship between elements in a chemical formula
7. Which step IS NOT being taken when converting Mass A to Mass B in the chemical equation A🡪B?
	1. Convert Mass A to Moles A
	2. Convert Mass A to Mass B
	3. Convert Moles A to Moles B
	4. Convert Moles B to Mass B
8. 10.4 g of As reacts with 11.8 g of S to produce 14.2 g of As2S3. What cannot be inferred from this statement?
	1. As is the limiting reactant
	2. 14.2 g of As2S3 is theoretical yield (this is actual yield)
	3. 17.1 g As2S3 is theoretical yield
	4. There are 2 moles of As in 1 mol As2S3

$$2 As+3 S\rightarrow As\_{2}S\_{3}$$

$$?g As\_{2}S\_{3}=10.4 g As ×\frac{1 mol As}{74.92 g As}×\frac{1 mol As\_{2}S\_{3}}{2 mol As}×\frac{(2×74.92+32.06×3)g As\_{2}S\_{3}}{1 mol As\_{2}S\_{3}}=17.08 g As\_{2}S\_{3}≅17.1 g As\_{2}S\_{3}$$

$$?g As\_{2}S\_{3}=11.8 g S ×\frac{1 mol S}{32.06 g S}×\frac{1 mol As\_{2}S\_{3}}{2 mol S}×\frac{(2×74.92+32.06×3)g As\_{2}S\_{3}}{1 mol As\_{2}S\_{3}}=45.28 g As\_{2}S\_{3}$$

$$The smallest number \left(17.1 g As\_{2}S\_{3}\right)is theoretical yeild and the$$

$$ reactant leading to theoretical yield \left(As\right), is limiting reactant. $$

1. What is the definition of percent yield?
	1. $\frac{theoretical yield}{actual yield}×100\%$
	2. $\frac{actual yield}{theoretical yield}×100\%$
	3. $\frac{limiting reactant}{actual yield}×100\%$
	4. $\frac{limiting reactant}{theoretical yield}×100\%$
2. What cannot be inferred from the following reaction?

C3H8 (g) + 5 O2(g) 🡪 3 CO2 (g) + 4 H2O (g) ∆Hrxn = -2044 kJ

* 1. This reaction is endothermic (the enthalpy of reaction is negative, so the reaction is exothermic)
	2. 1 mol C3H8 reacts with 5 mol O2 and generates 3 mol CO2 and 4 mol H2O
	3. 2044 kJ is released as a result of combustion of 1 mol C3H8
	4. This reaction can be considered a redox reaction
1. What is the periodic law?
	1. When elements are arranged in order of increasing atomic number, certain sets of properties recur periodically.
	2. When elements are arranged in order of increasing atomic charges, certain sets of properties recur periodically.
	3. Elements in each row (or period) in periodic table of elements have the same properties.
	4. Periodic table consists of metals, nonmetals, and metalloids.
2. Which of the following is NOT correct about light?
	1. Light has no mass
	2. Light is a form of electromagnetic radiation
	3. Light is a type of energy
	4. All of the above are correct about light
3. What is responsible for the colors we see in our everyday vision?
	1. The presence of prism that passes through a light bulb
	2. The presence of red in Infrared light
	3. The presence of color in white light
	4. The presence of blue in UV light
4. Which of the following has the highest frequency?
	1. Radio waves
	2. IR
	3. UV
	4. X-rays
5. What is the Bohr energy ladder?
	1. It is possible to stand on all steps at the same time
	2. It is possible to stand between steps if we have enough acrobatic abilities
	3. It is impossible to stand between steps in a ladder
	4. It is impossible to stand in any step in a ladder
6. What is electron configuration of oxygen?
	1. 1s22s22p6
	2. 1s22s22p4 (oxygen is in row or period 2, it means n = 2, it is in group 6A, so it should have 6 valence electrons)
	3. 1s22s22d6
	4. 1s22s22d4
7. Fill in the blanks (in order) with the correct words: “If the electrons are transferred, the bond is \_\_\_\_\_ and if the electrons are shared, the bond is \_\_\_\_\_\_.
	1. Ionic, covalent
	2. Covalent, ionic
	3. Chemical, ionic
	4. Chemical, covalent
8. What is the total number of electrons in the Lewis structure of OH-?
	1. 6
	2. 7
	3. 8 (oxygen has 6 valence electrons, H has one valence electrons, and we have the charge of -1 “one extra electron”, so 6+1+1=8)
	4. 9
9. Which of the following is NOT an exception to the octet rule?
	1. NO
	2. BF3
	3. NH3 ( see the study guide)
	4. SF6
10. What is the definition of octet rule?
	1. In chemical bonding, atoms transfer electrons to obtain outer shells with eight electrons
	2. In chemical bonding, atoms share electrons to obtain outer shells with eight electrons
	3. In chemical bonding, atoms transfer or share electrons to obtain outer shells with eight electrons
	4. In chemical bonding, hydrogen and lithium atoms transfer or share electrons to obtain outer shells with two electrons