

Semester 1 Final Exam Review Sheet

Your final exam for CP Chemistry will be on _____ January ____, ____ (two weeks!)

About your final exam:

- There are 100 questions, and your final exam is worth 15% of your overall grade.
- You will be given a calculator, scratch paper, a periodic table, and reference material for the test.
- There will be a curve on this test – you will only receive the curve if you turn in this completed review sheet by its due date. (late review sheets = no curve)
- Tuesday, January ____ is the **last** day to ask questions about the final or receive extra help.

About this review sheet:

- Questions must be completed on loose leaf paper and you need to show all work for the FLM and mole problems.
- Due the start of your scheduled final exam.
- Extra Help: Please arrive at the beginning of any lunch to ask for help on this review sheet.
- You will not be given class time to work on this review sheet. At the end of each period, you usually have time to work on homework – you could use that time to work on this review.
- In class on Tuesday, January ____ I will go over any questions you have on this review sheet.

What you need to bring to class on the day of the final

- A number 2 pencil
- Something quiet to do when you finish your test (sorry, no electronics).
- NOT your cell phone (having your cell phone on during the final can be interpreted as academic dishonesty, using your cell phone during the final (even if you are finished) is considered academic dishonestly and will be written up as cheating).

What you need to study

- Chapters 1-12
- This review sheet. Please remember that it is easy to change numbers/formulas from the test to the review sheet, so do not memorize these answers – it will not help you (at all).
- Online: frohnclass.com → [test review](#) → click [pretests](#) or [final exam](#) from the left side menu to find a copy of this review sheet, released standard exam questions, a review game, and previous year's review guides and answer key.

Investigation and Experimentation

1. Elizabeth prepared three samples of a substance containing potassium and oxygen in different ways as shown in the table. Which samples are the same compound? or are they all different?

Sample	Total Mass	Mass of K	Mass of O
1	1.85 g	1.258 g	0.592 g
2	1.65 g	1.122 g	0.528 g
3	1.35 g	0.918 g	0.432 g

2. The mass of a block is 9.66 g and its density is 3.26 g/mL. What is the volume of the block?
3. Solve the following problem and round your answer to the appropriate number of significant figures:
 $15.5 \times 0.095 \div 2.01 = \underline{\hspace{2cm}}$
4. How many millimeters are there in 43 meters?
5. Solve the following problem and round your answer to the appropriate number of significant figures:
the sum of 321.20 km and 48.0 km
6. Which combination of laboratory tools could you use to determine whether a salt crystal is a hydrate?

7. There are many sources of error in experiments. Which of these is an unavoidable source of error? **a)** The balance can only measure mass within $\pm 1g$ **b)** The experiment is rushed because there is not enough time to do it correctly. **c)** The measuring instruments are not correctly calibrated. **d)** The reaction mixture overheated because the Bunsen burner was too close.
8. A student must measure 10.00 mL of liquid for an experiment. What is the appropriate tool to measure the liquid?

Nuclear Processes

9. What is X in the following nuclear decay reaction?

$${}_{84}^{218}\text{Po} \rightarrow X + {}_2^4\text{He}$$
10. As the ratio of the number of neutrons to protons in an atom's nucleus increases, what happens to the stability of the nucleus?
11. Chemists and physicists have studied the emission of radiation from radioactive isotopes. Which is not an example of how this research has been applied to medicine? **a)** detection of thyroid problems with iodine-131 **b)** production of insulin through recombinant DNA **c)** nuclear magnetic resonance scanners **d)** radiation therapy for cancer
12. Where on the periodic table are naturally occurring radioactive elements most generally found?
13. Carbon-14 is used to date artifacts produced by early humans. An archaeologist measured the percentage of carbon-14 found in samples from four locations. Which location is the oldest?
- | <u>Location</u> | <u>A</u> | <u>B</u> | <u>C</u> | <u>D</u> |
|----------------------------------|----------|----------|----------|----------|
| Percentage of Original Carbon-14 | 13 | 25 | 7 | 50 |
14. Carbon-14 has a half-life of 5,715 years. How much of a 128 mg sample of carbon-14 will remain after 17,145 years?
15. Iodine-131, a radioisotope, has a half-life of 8 days. If the amount of iodine-131 in a sample is 10.0 g, how much iodine-131 will remain after 32 days?
16. Which type of ionizing radiation can be blocked by clothing?
17. Which of the following has a 2+ charge? **a)** alpha particle **b)** beta particle **c)** neutrino **d)** gamma ray
18. The equation $E = mc^2$ is used to calculate what?
19. Give the correct order of nuclear radiation with the most energy to the the least energy.
20. An isotope that undergoes radioactive decay **a)** always has a very short half-life. **b)** has an unstable nucleus. **c)** will not be found in nature. **d)** will not participate in a chemical reaction
21. Which type of radiation has no mass and no charge?
22. Some people have raised concerns about the use of recombinant DNA to alter food crops. Which of the following is most likely to be a reason for their concern? **a)** Altered plants will grow too slowly, producing smaller crops. **b)** Consumers will have too many types of food to choose from, causing confusion. **c)** Genetic changes could cross into other plants with unpredictable results. **d)** Modified plants may be too sensitive to pesticides.
23. Protons and neutrons are bound together in the nucleus by what?

Atomic and Molecular Structure

24. The nucleus of an atom is (positively or negatively) charged and has a (high or low) density
25. Why did theories about the structure of the atom have to be revised after the publication of Rutherford's gold foil experiment results?
26. Suppose scientists discovered a stable new element in Group 17. How many valence electrons would it have?
27. As one moves from the red end of the visible spectrum to the violet end, the energy **a)** decreases **b)** increases **c)** does not change **d)** can't be predicted
28. What were the results obtained in Rutherford's gold foil experiment?
29. What was Bohr's contribution to the development of atomic structure?
30. The characteristic bright-line spectrum of an element is produced when electrons do what?
31. Which elements have an electron configuration that makes it unlikely to react with other atoms?
32. How many valence electrons do each of the following atoms have? **a)** Ba **b)** Ga **c)** F **d)** I
33. Thomson performed an experiment where he discovered that cathode rays are deflected by a magnet and attracted by a positively charged plate. What did this prove about the particles that make up the rays?

34. What is the most likely conclusion you could draw if you read a report that scientists claimed that a new element had an atomic number of 34.5? **a)** The modern atomic theory is incorrect because the data does not support it. **b)** The scientists have discovered a new scientific law that will change our understanding of chemistry. **c)** The scientists most likely made an error because a well-established theory states that a fractional atomic number is impossible. **d)** Subatomic particles exist that have charges that are one-half the normal charge on an electron or proton.
35. Within a group on the periodic table, how does atomic mass generally change?
36. The number of nonmetallic atoms in $\text{Al}_2(\text{SO}_3)_3$ is ____.
37. Which element has the greatest electronegativity value?
38. Which list of elements shows atomic radii in order from largest to smallest? **a)** F, N, B, Be, Li **b)** Cs, Ba, Ca, Mn, S **c)** I, P, Fe, Ca, Li **d)** Ra, Sr, Co, C, Sb
39. Which of the following observations was *not* part of the information on which Dalton based his atomic theory? **a)** In a reaction, the masses of the reactants and the products are the same. **b)** There are many elements, each with unique properties. **c)** When an element is heated, it emits light at certain wavelengths. **d)** When elements form compounds, they combine in fixed proportions.
40. Chlorine has atomic number 17 and mass number 35. It has ____ protons, ____ electrons, and ____ neutrons
41. Among the groups of elements listed below, which have the same number of electrons in their outermost energy levels? **a)** Li, B, C, F **b)** Na, Mg, Al, S **c)** K, Ca, Rb, Sr **d)** N, P, As, Sb
42. The elements on the periodic table are ordered on the basis of _____.
43. Where on the periodic table are the lanthanide and actinide elements found
44. The element represented by $1s^2 2s^2 2p^6 3s^2 3p^3$ has an atomic number of ____.
45. Where are the halogens on the periodic table?
46. Which of the following statements represents a hypothesis that was tested in the development of Dalton's atomic theory? **a)** Atoms cannot be divided into smaller particles **b)** Atoms are made of electrons that move around protons. **c)** Each element has atoms that are different from the atoms of other elements. **d)** There are about 100 elements that make up all matter.

Chemical Bonds

47. Metal and non-metal react to form a ____ compound.
48. A nitrogen molecule, N_2 , has ____ pairs of shared electrons and ____ pairs of unshared electrons
49. When metals with low electronegativity combine with nonmetals of high electronegativity, they tend to form ____ compounds
50. A formula unit of an ionic compound **a)** is not an independent unit that can be isolated and studied **b)** is the simplest ratio of ions that balances total charge **c)** describes the crystal lattice **d)** all of the above
51. Which of the following contains a nonpolar covalent bond? **a)** HCl **b)** Cl_2 **c)** Cl_2O **d)** NH_3
52. What is the Lewis structure for the nitrite ion, NO_2^-
53. What are the seven diatomic elements?
54. What is the Lewis structure for an ammonium ion, NH_4^+
55. Which atom will form an ionic bond with a Br atom? **a)** S **b)** K **c)** O **d)** Br
56. The bond between the atoms in HCl is a(n) **a)** polar covalent bond **b)** nonpolar covalent bond **c)** ionic bond **d)** double bond
57. The chemical bond formed when two atoms share electrons is called a(n) ____ bond.
58. Which of the following has bonding that is ionic? **a)** O_2 **b)** CaF_2 **c)** H_2O **d)** CCl_4
59. The number of lone (unbonded) pairs of electrons in H_2O is ____.
60. An electron dot diagram is one model of atomic structure. In an electron dot diagram, lithium and sodium are each shown with one dot representing a single valence electron. Although the two elements are very similar, they do not react with other elements in exactly the same way. Why does the electron dot diagram not indicate the differences?

Nomenclature and Writing Formulas

61. What is the name of the ionic compound $\text{Sn}(\text{NO}_3)_2$?
62. In the chemical formula CaCl_2 , the 2 is called a(n) _____.
63. Why is there a Roman numeral next to certain metal ions, such as tin(II) and tin(IV)?
64. What is the name of this molecular compound: CS_2

65. All molecular compounds end in _____.
66. The formula for barium hydroxide is _____.
67. A compound contains 54.3% C, 5.6% H, and 40.1% Cl. What is the empirical formula?
68. The formula $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ shows that a) Na_2CO_3 cannot trap water b) there are 10 units of Na_2CO_3 present for every unit of water c) there are 10 units of water present for every unit of Na_2CO_3 d) the compound cannot exist
69. What is the empirical formula for a compound that is 31.9% potassium, 28.9% chlorine, and 39.2% oxygen?
70. What is the empirical formula for C_8H_{20} ?
71. The formula for the compound formed by tin(IV) and the chromate ion, CrO_4^{2-}
72. What is the correct chemical formula for the ionic compound ammonium phosphate?
73. What is the name of SO_3 ?
74. What is the correct formula for the ionic compound aluminum bromide?
75. The formula for copper (II) oxide is _____.
76. The empirical formula for a common drying agent is P_2O_5 . The compound has a molar mass of 284 g/mol. What is the molecular formula for this compound?

Conservation of Matter and Stoichiometry

77. Complete and balance the following reaction: $\text{Ca} + \text{MgCl}_2 \rightarrow$
78. Given the following reaction: $2 \text{KClO}_3 \rightarrow 2 \text{KCl} + 3 \text{O}_2$ solve the following problem:
2.80 mol $\text{O}_2 =$ _____ g KClO_3
79. Given the following reaction: $\text{Cu} + 2 \text{AgNO}_3 \rightarrow 2 \text{Ag} + \text{Cu}(\text{NO}_3)_2$ solve the following problem:
3.40 g $\text{Ag} =$ _____ mol Cu .
80. Which formula shows how to calculate the percent yield of a reaction? Percent error?
81. Given the following reaction: $2 \text{Mg} + \text{O}_2 \rightarrow 2 \text{MgO}$ if 2.3 moles of magnesium react with 1.3 moles of oxygen gas, how many grams of magnesium oxide can be produced?
82. Which reactant controls the amount of product formed in a chemical reaction?
83. 2.00 mol of CO_2 a) Have a mass of _____ g b) Contain _____ molecules c) Contain _____ molar masses of CO_2
84. What type of reaction is represented by the following equation: $2 \text{C}_4\text{H}_{10} + 13\text{O}_2 \rightarrow 4 \text{CO}_2 + 5 \text{H}_2\text{O}$
85. In a double replacement reaction, hydrogen chloride and sodium hydroxide react to produce sodium chloride. Another product is _____
86. Given the following reaction: $4 \text{NH}_3 + 7 \text{O}_2 \rightarrow 4 \text{NO}_2 + 6 \text{H}_2\text{O}$ solve the following problem:
3.50 mol $\text{NH}_3 =$ _____ mol O_2
87. What type of reaction is represented by the following equation: $\text{LiAlH}_4 \rightarrow \text{LiH} + \text{Al} + \text{H}_2$
88. Dioxin, $\text{C}_{12}\text{H}_4\text{Cl}_4\text{O}_2$, is a powerful poison. How many molecules of dioxin are there in a 140. gram sample of dioxin?
89. What is the definition of one mole?
90. In the following chemical equation: $2 \text{Cu} + \text{O}_2 \rightarrow 2 \text{CuO}$ the CuO is the _____ and the Cu and O_2 are the _____.
91. Will the following reaction occur: $2 \text{AgNO}_3 + \text{Cu} \rightarrow \text{Cu}(\text{NO}_3)_2 + 2 \text{Ag}$
92. What is the molar mass of the compound sodium carbonate, Na_2CO_3
93. What type of reaction is represented by the following equation: $2\text{KClO}_{3(s)} \rightarrow 2\text{KCl}_{(s)} + 3\text{O}_{2(g)}$
94. Balance the following reaction: $\text{H}_3\text{PO}_4 + \text{MgCO}_3 \rightarrow \text{Mg}_3(\text{PO}_4)_2 + \text{CO}_2 + \text{H}_2\text{O}$
95. In the following reaction: $\text{Zn} + 2 \text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$ 96.8 grams of ZnCl_2 was actually formed, although the theoretical yield was 103.6 grams. What is the percent yield?
96. Solve the following problem: 265 grams $\text{CaCO}_3 =$ _____ moles
97. How many moles of Li atoms are in 10.22 g of Li?
98. Balance the following reaction: $__ \text{Na} + __ \text{H}_2\text{O} \rightarrow __ \text{NaOH} + __ \text{H}_2$
99. Complete and balance the following: $\text{Na}_2\text{SO}_4(\text{aq}) + \text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2(\text{aq}) \rightarrow$
If no reaction occurs, write NR
100. How many grams of chlorine are in 8.06 moles of CaCl_2 ?