Ch. 1-4 Review

1. Explain the difference between the terms "macroscopic" and "microscopic".
Big small

2. Chemistry is a study of matter and its changes. List at least three chemical changes that are a part of your everyday life.
color, heat, bubble, odor, Precipitate

3. In Section 1.3 the statement is made that it is worthwhile for scientists, auto mechanics, doctors, politicians, and poets to take a scientific approach to their professions. Discuss how each of these people could use a scientific approach in his/her profession.
Testing, Experiment

4. Give three examples of when you have used the scientific method (outside of school) in the past month. Discuss how a hypothesis can become a theory.

* 5. True or false: If a theory proves correct over a long period of time, it becomes a law. Explain your answer. F: Laws independent of Testing (Naturally observed)

6. Make 5 qualitative and 5 quantitative observations about the room you are in.
color, texture, shape → Length, #studs, Temp.

7. Differentiate between a "personal theory" and a "scientific theory". Using microscopic drawings (molecular level), show the difference between a gaseous element and a gaseous compound. Explain your drawings.

8. Heat is applied to an ice cube. Eventually, only steam is present. Draw a molecular level representation of this process. What happens to the size of the molecules? What happens to the total mass of the sample? s l g

Diffusion

9. When you are in the room next to your kitchen, you can smell soup cooking. Why is this? Which of the following is true about the state of an individual atom?
   a) An individual atom can be a solid.
   b) An individual atom can be a liquid.
   c) An individual atom can be a gas.
   d) The state of the atom depends on which element it is (for example, an iron atom is solid, but a helium atom is gaseous).
   e) An individual atom cannot be a solid, liquid, or gas.

10. Using microscopic drawings (molecular level), show the difference between an atomic element and a molecular element. Explain your drawings. The boiling of water is a (explain)
   a. physical change because the water disappears.
   b. physical change because the gaseous water is chemically the same as the liquid.
   c. chemical change because heat is needed for the process.
   d. chemical change because hydrogen and oxygen gases are formed.
   e. chemical and physical change.

O_2 C

O_2 N_2 O_2 N_2 vs. NO_2 NO_2

11. Air is a mixture consisting mainly of nitrogen and oxygen gases. Make microscopic drawings showing the differences between a mixture of nitrogen and oxygen gases, and a compound consisting of nitrogen and oxygen. Discuss your drawings.

12. Use molecular level drawings for each of the following to show the difference between a heterogeneous mixture and a homogeneous mixture. Label your drawings.

Hetero

Homo

13. We use terms such as "heterogeneous mixture" and "homogeneous mixture" but not "heterogeneous compound" or "homogeneous compound". Why not?

Compound = pure substance

14. Why would a chemist find fault with the phrase "pure orange juice"?

OJ = mixture

* 15. Make molecular level drawings to accompany Figure 2.18. The text uses words and letters as analogies to compounds and elements. Explain this analogy. Also, in the English language the letter "E" is the most common. Which element is analogous to the letter "E"? Explain.

Letters = elements ; words = compounds ; H, O, C, N

16. Explain what the formula of water, H_2O, tells us in your own words.

2 - Hydrogen 1 - Oxygen

17. What is the difference between 2N and N_2?

$2N = N + N$ $N_2 = N-N$

18. Is there a difference between a homogeneous mixture of hydrogen gas and oxygen gas in a 2:1 ratio and a sample of water vapor? Explain. Use microscopic sketches. Explain how Dalton's theory explains the law of constant composition.

2:1

H_2 H_2 O_2 vs H_2O = 2:1

19. You make water by reacting hydrogen and oxygen gases. Is this water safe to drink? Explain.

Yes + NO H_2O is ok for you. But we also need electrolytes.

20. Suppose you could see atoms. How would a carbon atom appear to be different from a nitrogen atom? How would they be alike? In Section 3.3 of your text, the five main ideas of Dalton's atomic theory are listed. Explain each of these five ideas. Which of these are still generally accepted? Which are no longer accepted? Why not?

Look up in Book

NOT ACCEPTED: (1) All atoms of an element are the same b/c of Isotopes, (2) We have split the atom.

21. An ion is formed (explain):
    1. by either adding or subtracting protons from the atom
    2. by either adding or subtracting neutrons from the atom
    3. by either adding or subtracting electrons from the atom
    4. all of the above
    5. two of the above

22. A certain ion with 27 electrons has a charge of 2+. Which ion is it?

a. Mn^{2+} b. Co^{2+} c. Cu^{2+} should be at 29 e^-

23. An element forms an ionic compound with chlorine having the formula XCl_2. The ion of element X has a mass number of 89 and 36 electrons. Identify the element X and tell how many neutrons it has.

X = Sr^{2+} X^{2+} Cl^-

24. Which of the following did Dalton **not** discuss in his atomic theory? Explain.
    - Isotopes, ions, protons, electrons, neutrons } all of these

25. Why is the term "sodium chloride molecule" incorrect but the term "carbon dioxide molecule" correct?

M ∴ NaCl is Type I NOT Type III

26. Knowing the number of protons of a neutral atom enables you to determine which of the following (there may be more than one answer)?
    - the number of neutrons
    - the number of electrons
    - the name of the atom

What other information would you need to find the remaining items?

Mass #

Type I Type II

27. The formulas $CaCl_2$ and $CoCl_2$ look very similar. What is the name for each compound? Why do we name them differently?
Calcium Chloride Cobalt (II) chloride

28. The formulas MgO and CO look very similar. What is the name for each compound? Why do we name them differently?
Magnesium Oxide Carbon Monoxide

29. Explain how you use the periodic table to tell you that there are two chloride ions for every magnesium ion in magnesium chloride and one chloride ion for every sodium ion in sodium chloride. Then write the formulas for calcium oxide and potassium oxide and explain how you got them. CaO K_2O • Elements want Be Like Noble Gases • Balance the CHARGES

30. What is the general formula for an ionic compound formed by elements in the following groups? Explain your reasoning and provide an example for each (name and formula).
    a. Group 1 with group 7 1:1
    b. Group 2 with group 7 1:2
    c. Group 1 with group 6 2:1
    d. Group 2 with group 6 1:1

31. Explain any problems with each of the given names. Then, identify the formula for each compound with the given name (there may be more than one possible answer) and provide the systematic name for this compound (name each of the possible formulas from an incorrect name)

name	problem	formula	systematic name
barium dichloride	Type I	$BaCl_2$	BARIUM CHLORIDE
carbon oxide	wrong use of Prefixes	CO	CARBON MONOXIDE
copper(II) sulfate	N/a	$CuSO_4$	correct
iron oxide	Type II use R.N.	Fe_2O_3 → IRON (III) OXIDE FeO → IRON (II) OXIDE	
diphosphorus pentoxide	n/a	P_2O_5	correct
potassium sulfide	n/a	K_2S	correct
perchloric acid	n/a	$HClO_4$	correct
sulfur hexafluoride	n/a	SF_6	correct
magnesium phosphide	n/a	Mg_3P_2	correct
calcium(II) nitrate	Type I No R.N.	$Ca(NO_3)_2$	Calcium NITRATE

Fe^{3+} Cl^- Cl^- Cl^-

32. If you dissolve 10 "units" of iron(III) chloride, there will be 40 particle(s) in solution. The formula for iron(III) chloride is $FeCl_3$.

Pb^{2+} NO_3^- NO_3^-

33. If you dissolve 5 "units" of $Pb(NO_3)_2$, there will be 15 particle(s) in solution. The name of $Pb(NO_3)_2$ is Lead (II) Nitrate.

34. If you dissolve 8 molecules of HCl, there will be 16 particle(s) in solution. The name of HCl is hydro Chloric Acid.

K^+ K^+ $Cr_2O_7^{2-}$

35. If you dissolve 7 "units" of $K_2Cr_2O_7$, there will be 21 particle(s) in solution. The name of $K_2Cr_2O_7$ is Potassium diChroma.

Ca^{2+} OH^- OH^-

36. If you dissolve 6 "units" of calcium hydroxide, there will be 18 particle(s) in solution. The formula for calcium hydroxide is $Ca(OH)_2$.

Cs^+ Cs^+ SO_3^{2-}

37. If you dissolve 3 "units" of Cs_2SO_3, there will be 9 particle(s) in solution. The name of Cs_2SO_3 is Cesium Sulfite.

38. If you dissolve 2 "units" of barium phosphate, there will be 10 particle(s) in solution. The formula for barium phosphate is $Ba_3(PO_4)_2$.

39. If you dissolve 1 "unit" of NH_4SCN, there will be 2 particle(s) in solution. The name of NH_4SCN is Ammonium Thiocyuate.

40. If you dissolve 4 "units" of copper(I) chloride, there will be 8 particle(s) in solution. The formula for copper(I) chloride is CuCl.

41. If you dissolve 4 "units" of copper(II) chloride, there will be 12 particle(s) in solution. The formula for copper(II) chloride is $CuCl_2$.