

Atoms/Ions/Isotopes

1. How does an atom change if the number of:

- a) protons changes?
- b) neutrons changes?
- c) electrons changes?

2. Given: $^{121}_{51}\text{Sb}^{-3}$ Determine the:

- a) number of protons:
- b) number of electrons:
- c) number of electrons in a neutral atom:
- d) number of valence electrons:
- e) atomic number:
- f) hyphen notation:
- g) mass number:
- h) average atomic mass:

3. What information about a particular atom can you learn from either an isotope notation or hyphen notation?

4. Write hyphen notation and isotope notation for an isotope of nitrogen with 8 neutrons. Label the different parts of each notation with what they are.

5. Fill in the chart as it pertains to subatomic particles.

Particle name	Symbol	Charge	Relative mass (amu)	Location in atom	Discovered by
		+1			
		-1			
		0			

6. What was Chadwick's contribution to modern atomic theory?

7. Write the name of the scientist associated with each model:

Plum Pudding model: _____ Solar System model: _____

8. What is the difference between leading zeros, trailing zeros, and sandwich zeros?

9. Complete the table for the following neutral isotopes

Isotope Notation	Number of Protons	Number of Neutrons	Number of Electrons	Average Atomic Mass	Mass Number	Heavy, Light, or Average?
Bromine-80						
	9				19	
Barium-137						
		29		51.996		
Cesium-133						

10. Complete the table.

Element	Symbol	Atomic Number	Mass Number	Number of Protons	Number of Neutrons	Number of Electrons	Charge
Nitrogen		7			8	7	
	H	1			1	1	0
Cobalt			65				+2
	Ca		41	20		18	
		83	209	83		83	
Potassium				19	21		+1
Sulfur					32		-2
	Br		83			36	

11. List the contributions of the following scientists and describe their models of the atom:

- Dalton:
- J.J. Thomson:
- Ernest Rutherford:
- Bohr:

12. If an atom has 4 protons, 6 neutrons and, 2 electrons, what is its mass number?

13. How many neutrons are in an atom of Argon-40?

14. What is the mass number of ${}_{29}^{64}\text{Cu}$?

15. Calculate the average atomic mass of chromium. Report your answer to 4 sig figs.

Isotope	Abundance
${}^{50}\text{Cr}$	4.35%
${}^{52}\text{Cr}$	83.78%
${}^{53}\text{Cr}$	9.51%
${}^{54}\text{Cr}$	2.36%

16. Calculate the average atomic mass of the unknown element. Report your answer to 4 sig figs.

Isotope	Abundance
${}^{28}\text{X}$	92.21%
${}^{29}\text{X}$	4.68%
${}^{30}\text{X}$	3.07%

What element is this most likely to be? _____

17. Using gold foil, positively charged radiation and a radiation sensing film, how did Rutherford develop his model of the atom? What happened in Rutherford's Gold Foil Experiment? How did this allow him to conclude atoms were mostly empty space with a positive charge?

18. Describe wavelength.
 What are the units of wavelength?
19. Describe frequency:
 What are the units of frequency?
20. What are the units of energy?
21. What is the relationship between energy, frequency and wavelength?
22. Which color of light has more energy, red or violet? _____
23. What type of radiation has a longer wavelength, ultraviolet or UV? _____
24. Describe the electron movement in the flame test lab.

25. High energy on EM Spectrum: (high or low) frequency and (long or short) wavelength
26. Low energy on EM Spectrum: (high or low) frequency and (long or short) wavelength

27. How many valence electrons do the following elements have?
 nitrogen: lithium: neon: magnesium: sulfur: bromine:

28. What is the symbol for the following elements:
 a) tin b) zinc c) antimony d) silver e) sodium
 f) gold g) manganese h) arsenic i) cesium j) bismuth

29. a) What charge will the following atoms have when they form ions?

a. K	b. S	c. Al	d. Br	e. Be	f. Se
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30. a) A wave has the wavelength of 5.44×10^8 meters. What is the frequency of this wave?
- b) Convert the frequency that you got in part a) to Megahertz.

31. a) A ray has the energy of 5.0×10^{-16} Joules. What is the frequency?

32. Determine if each of the following are Physical or Chemical Changes. List the word that clued you in in the box.

32. Example	Physical Change	Chemical Change
Burning Magnesium metal with a Bunsen burner		
Water condensing on a glass		
Mixing vinegar and baking soda and creating a gas		
A penny corroding in acid		
Mixing food coloring with water		
Burning a candle		

Properties and Changes in Matter

33. Define the following terms and GIVE AN EXAMPLE of each:

- a) Matter _____ Example:
- b) Mass _____ Example:
- c) Compound _____ Example:
- d) Mixture _____ Example:
- e) Homogeneous mixture _____ Example:
- f) Heterogeneous mixture _____ Example:
- g) Pure substance _____ Example:

34. What is the difference between a compound and a mixture?

35. Differentiate between malleability and ductility of metals.

36. How are chemical properties different from physical properties? List one example of each.

37. How are chemical changes different from physical changes? List one example of each.

38. How do pure substances (elements and compounds) differ from mixtures? List several examples of each.

39. Categorize the following as substances/mixtures, then homogeneous/heterogeneous, then solution/suspension

Material	Pure Substance or Mixture	Homogeneous or Heterogeneous	Solution or Suspension
brass			
tea			
gasoline			
steel			
Air			
soil			
seawater			
sandy water			
raisin bread			
beef stew			
pudding			

40 Which of the following CANNOT be classified as a substance?

- a) Table salt b) Air c) Nitrogen d) Gold e) Sodium nitrate

41. Circle the physical properties from the following list:

- a) Color and odor b) Density and hardness c) Melting and boiling points d) All of the above

Matter Cont'd**Section 3 Due:** _____

42. Identify each of the following changes as physical or chemical changes:

- a) Bending b) Melting c) Rusting d) Cutting

43. Classify the following properties as physical or chemical property:

- a) Color b) Density c) Reactivity d) Flammability
e) Hardness f) Melting point g) Boiling point

44. Why is NaOH considered a pure substance AND a compound? Does it matter that it is made up of 3 different types of atoms?

45. Compare and contrast solids, liquids and gas as to their volume, shape and compressibility. Draws pictures to represent each.

46. Draw a mini periodic table and label:
the alkali metals, alkaline earth metals, halogens,
and noble gases:**Significant Figures and Scientific Notation**

47. How many sig figs are in the following numbers?

- a) 0.000456 b) 0.0004500 c) 4.00 _____
d) 456 e) 4 f) 40 _____
g) 4.50×10^2 h) 450.000 _____

48. Round the following to 3 sig figs:

- a) 8.778 b) 46.92 c) 374,990 _____
d) 8.775 e) 3.14159 _____

49. In scientific notation, a negative exponent (ex. 10^{-8}) indicates a number (greater than 1 / less than 1)50. a) Is 4.5×10^5 a very small number or a very big number? _____b) Is 7.5×10^{-9} a very small number or a very big number? _____

51. Convert 954 nanometers to Gigameters.

52. Write the following numbers correctly in scientific notation:

- a) 0.000456 b) 0.000450 c) 4.00 _____
d) 456 e) 4 f) 40 _____
g) 450. h) 450.000 _____

50. Write the following numbers correctly in standard notation:

a) 2.30×10^{-3} _____

b) 8.9904×10^3 _____

c) 5.6×10^5 _____

d) 7.70×10^0 _____

51. Calculate: $5.37 \times 10^8 / 2.69 \times 10^4$ _____

52. Convert 4.3×10^5 picometers to kilometers.

53. Calculate the following and answer with the correct number of significant figures and units.

a) $1,031 \text{ m}^2 \div 42 \text{ m} =$ _____ b) $150 \text{ m} \div 4 \text{ s} =$ _____ c) $1.252 \text{ mm} \times 0.115 \text{ mm} \times 0.012 \text{ mm} =$ _____

d) $505 \text{ kg} - 450.25 \text{ kg} =$ _____ e) $7.4 \times 10^5 \text{ m} / 9.43 \times 10^9 \text{ s} =$ _____ f) $12.01 \text{ mL} + 35.2 \text{ mL} + 6 \text{ mL} =$ _____

g) $0.15 \text{ cm} + 1.15 \text{ cm} + 2.051 \text{ cm} =$ _____ h) $0.021 \text{ cm} \times 3.2 \text{ cm} \times 100.0 \text{ cm} =$ _____

54. Put 693,260,305,005.33 in scientific notation and round to 3 sig figs.

Electron Configuration:

55. Describe Aufbau's Rule:

56. Describe Hund's Rule:

57. Describe the Pauli Exclusion Principle:

58. Draw the orbital diagram for neutral calcium. Be sure to label your boxes.

59. Draw the orbital diagram for neutral copper. Be sure to label your boxes.

60. Draw a mini periodic table:

Label the "s", "p", "f" and "d" blocks.

Label the 2p row, the 3d row, and the 1s row.

61. Circle: What block is Cr found in on the periodic table? s-block p-block d-block f-block

62. What element has the following electron configuration: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^3$. _____

63. Identify the **element** that has the following electron configuration AND tell how many valence electrons each contains: $1s^2 2s^2 2p^6 3s^2 3p^4$ Element: _____ # of valence electrons: _____

64. Write out the electron configuration for

K: _____

S: _____

Al: _____

Ni: _____

Mixed Review:

Section 4 Due: 12/12/11e 5pm

65. How many valence electrons does the following atom have: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$

66. How many neutrons does arsenic-76 have?

76. How many protons does Fe^{+2} have?

67. How many electrons does As^{-3} have?

77. Write barium-140 in isotope notation.

68. How many protons does Cl^{-1} have?

78. How many electrons does B^{+3} have?

69. How many neutrons does copper-65 have?

79. Write ${}_{50}^{120}Sn$ in hyphen notation:

70. Identify the reaction type:

$O_3 \rightarrow O + O_2$ Rxn Type: _____ $P_4 + O_2 \rightarrow P_2O_3$ Rxn Type: _____

$UO_2 + HF \rightarrow UF_4 + H_2O$ Rxn Type: _____ $Cl_2 + KI \rightarrow KCl + I_2$ Rxn Type: _____

$NH_4NO_3 \rightarrow N_2 + O_2 + H_2O$ Rxn Type: _____ $H_2 + Br_2 \rightarrow HBr$ Rxn Type: _____

$CO_2 \rightarrow CO + O_2$ Rxn Type: _____ $Ti + Cl_2 \rightarrow TiCl_4$ Rxn Type: _____

$AlCl_3 + Fe_2O_3 \rightarrow Al_2O_3 + FeCl_3$ Rxn Type: _____

71. DRAW:

a) Draw a Bohr model for aluminum:

b) Draw a Bohr model for sulfur:

c) Draw the Bohr model for chlorine:

d) Draw the Bohr model for sodium:

72. Define ion:

73. Define cation:

74. Define anion:

75. Define isotope:

76. Are the following metals, non-metals, or metalloids:

a) Si

b) K

c) Xe

d) Co

e) Ca

f) P

77. Rank the following in order from slowest to fastest speed & explain your answer: X-rays, Visible light, Infrared rays.

78. Define electronegativity:

79. Define ionization energy:

80. High ionization energy means it is (easy or hard) to remove an electron?

81. Put in order from smallest to largest atom: Pt, He, K

82. Put in order from highest electronegativity to lowest electronegativity: O, Si, Br

83. Put in order from highest ionization energy to lowest ionization energy: N, Na, Zn

84. a) Round to 3 sig figs: 84,791 kg = _____ b) Round to 4 sig figs: 38.5432 g = _____

c) Round to 2 sig figs: 256.745 cm = _____ d) Round to 1 sig fig: 4.9356 m = _____

85. Round the following to 3 sig figs AND put in scientific notation:

a) 0.00000058986 _____ e) 100,000,000,000 _____

b) 893,092,974 _____ f) 807.000006 _____

86. Use your calculator correctly!!!

a) $\frac{8.5 \times 10^{-8}}{2.5 \times 10^{-3}}$ c) $(6.5 \times 10^{14}) \times (9.0 \times 10^3)$

b) $\frac{2.5 \times 10^9}{2.9 \times 10^{17}}$ d) $(7.7 \times 10^6) \times (3.6 \times 10^8)$

87. Pick the right answer: CO₂ (aq) is a) Liquid carbon dioxide b) Dissolved carbon dioxide
c) Liquid carbon monoxide d) Dissolved carbon monoxide

88. What does (aq) mean? Does (aq) indicate a mixture or a pure substance?

89. List all of the diatomic elements on the periodic table.

90: a) Who ordered the periodic table by atomic mass?

b) Who ordered the periodic table by atomic number?

c) Who arranged the f-block of radioactive elements?