4

Density   (SHOW ALL WORK)

Substance:	Density:
osmium	22.6 g/mL
gold	19.3 g/mL
mercury	13.6 g/mL
lead	11.4 g/mL
copper	8.96 g/mL
aluminum	2.70 g/mL
water	1.00 g/mL
alcohol	0.781 g/mL
styrofoam	0.145 g/mL
air	1.28 g/L
helium	0.179 g/L

Volume Equations
block:	$V = lwh$
cylinder:	$V = \pi r^2 h$
sphere:	$V = \dfrac{4\pi r^3}{3}$

1. A 13.2 mL rock weighs 47.6 g. Determine its density.

Ans: ____

2. 138.42 g of salt water has a volume of 117.0 mL.
Determine its density.

Ans: ____

3. 0.446 g of hydrogen gas fills a 5.0 L bag.
Determine hydrogen's density.

Ans: ____

4. 25.2 mL of water are placed in a graduated cylinder.
A 22.6 g stone is dropped in, and the water level rises to 32.4 mL.
Find the stone's density.

Ans: ____

5. A graduated cylinder is placed on an electronic balance, and the scale reads 78.32 g.
10.0 mL of glycerine are added, and the scale reads 91.78 g.
What is the density of glycerine?

Ans: ____

6. A 3.0 cm x 4.5 cm x 6.7 cm brick as a mass of 985 g.   a>   What is its density, and...
b>   from what material is it most likely made?

Ans: a> ____   b> ____

7. A cylinder has a mass of 528.6 g, a length of 14.2 cm, and a diameter of 2.30 cm.
Of what is the cylinder most likely made of?

Ans: ____

8. A ball has a mass of 753 g and a radius of 5.62 cm.   a>   Will the ball float or sink in water?
b>   Will it float or sink in salt water? (see #2)

Ans: a> ____   b> ____

9. a> How much would a 15.2 mL chunk of styrofoam weigh?
b> How much would the same size chunk of osmium weigh?

Ans: a> ____
Ans: b> ____

10. How much would a 15.9 cm x 11.6 cm x 7.3 cm block of aluminum weigh?

Ans: ____

11. A piece of gold wire has a diameter of 0.175 cm.
How much will precisely 1.00 x 10⁵ cm (about 2/3 mile) of the wire weigh? (hint- think of the wire as a tiny cylinder)

Ans: ____

12. What volume would 62.4 g of mercury have?

Ans: ____

13. How large would a balloon be when filled with: a> 17.8 g of air?
(find the volume)   b> With 17.8 g of helium?

Ans: a> ____   b> ____

14. What volume of alcohol would have a mass of 10.0 g?

Ans: ____

15. A 187.3 g lead block has dimensions 3.20 cm x 2.95 cm x Z cm.
Find Z (the thickness of the block)   (remember V = l•w•h)

Ans: ____

16. A rectangular piece of aluminum foil measures 13.72 cm x 8.63 cm and has a mass of 3.1 g.
Find how thick it is.   (remember V = l•w•h)

Ans: ____

* (challenge) At a cost of $1800/oz, how much would you have to pay for a solid cubic foot of gold?
(1 oz = 28.4 g; 1 in = 2.54 cm) hint- your starting point should be: 1 ft³ x ...   * (answer not in ans. bank..)

Ans: ____

#5 - Atoms, Isotopes, + Ions!

Model A: Nuclear Symbol Notation

Mass number $\rightarrow$ $^A_Z X$ $\leftarrow$ Chemical symbol

Atomic number

Mass Number (A)- sum of protons and neutrons
Atomic Number (Z)- number of protons
Example: $^{13}_{6}C$
Carbon atom with 6 protons and 7 neutrons.

1. Which number goes on the top left in nuclear symbol notation?

2. Which number goes on the bottom left in nuclear symbol notation?

3. How do you determine what letter to put in the nuclear symbol notation?

4. How do you find an atom's atomic number?

5. The total number of particles in the nucleus is the _____.

6. How can the number of neutrons be calculated using nuclear symbol notation?

7. If an atom is neutral, what must the relationship between subatomic particles be?

8. Look up carbon on your periodic table- what is carbon's
   a. Atomic number:
   b. Atomic mass:

9. Is the mass number equal to the atomic mass?

10. Is the mass number on the periodic table?

11. Assuming all of these atoms are neutral (they do not have a charge written next to them, fill in the chart with the missing information:

Nuclear Symbol	#p	#n	#e	A	Z
$^{115}_{76}Os$	23	27			
		76			
		50	38		52
			20	14	

Model B: Hyphen Notation

Chemical symbol $\rightarrow$ X – A $\leftarrow$ Mass number
or name
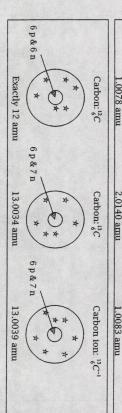
Example: Carbon-13
Carbon atom with 6 protons
and 7 neutrons.

12. What number goes in the hyphen notation?

13. How do you find that number?

14. How do you know the name to put in the hyphen notation?

15. Assuming all of these atoms are neutral (they do not have a charge written next to them, fill in the chart with the missing information:

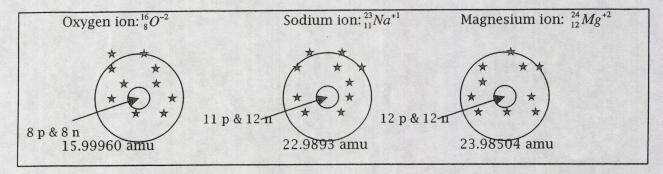| Hyphen Notation	#p	#n	#e	A	Z
	5	6			
Krypton-83					
	21		40		
		64	48	58	27

Model C: Diagrams for Various Atoms

○ : The nucleus of an atom contains the protons and the neutrons.

★ Electron (-)   ⊕ Proton (+)   ▣ Neutron (no charge)

1 amu = 1.6606×10^{-24} g

Hydrogen: ^1_1H Hydrogen: ^2_1H Hydrogen ion: $^1_1H^{-1}$

1 p & 0 n   1 p & 1 n   1 p & 0 n
1.0078 amu   2.0140 amu   1.0083 amu

Carbon: $^{12}_{6}C$ Carbon: $^{13}_{6}C$ Carbon ion: $^{13}_{6}C^{-1}$

6 p & 6 n   6 p & 7 n   6 p & 7 n
Exactly 12 amu   13.0034 amu   13.0039 amu

^1H and ^4H are isotopes of hydrogen and ^{12}C and ^{13}C are isotopes of carbon.

Oxygen ion: $^{16}_{8}O^{-2}$ Sodium ion: $^{23}_{11}Na^{+1}$ Magnesium ion: $^{24}_{12}Mg^{+2}$

8 p & 8 n
15.99960 amu   11 p & 12 n
22.9893 amu   12 p & 12 n
23.98504 amu

16. How many protons are found in
   a. $^{12}_{6}C$?   b. $^{13}_{6}C$?   c. $^{13}_{6}C^{-1}$?

17. How many neutrons are found in
   a. $^{12}_{6}C$?   b. $^{13}_{6}C$?   c. $^{13}_{6}C^{-1}$?

18. How many electrons are found in
   a. $^{12}_{6}C$?   b. $^{13}_{6}C$?   c. $^{13}_{6}C^{-1}$?

19.
   a. What feature distinguishes a neutral atom from an ion?

   b. Write an equation for calculating the charge on an ion.

20. Based on the model,
   a. What do all carbon atoms (and ions) have in common?

   b. What do all hydrogen atoms (and ions) have in common?

21. Draw a diagram of $^{1}H^{+1}$.

22. Based on your answer to #20, what do all nickel (Ni) atoms have in common?

23. What is different between isotopes of a particular element?

24. Where is most of the mass of an atom, within the nucleus or outside of the nucleus? Explain.

25. Look at your answers to #10 and 23. Explain why the mass number is not given on the periodic table.

26. Fill in the chart below:

Nuclear Symbol	Atomic Number	Mass Number	# electrons	# neutrons
$^{58}_{28}Ni^{+2}$				
$^{35}_{17}Cl^{-1}$				
	16		18	16