Student:_____

How Things Work

Homework 7 – Due Sunday, July 29, in class

1)   Read the **<u>Introduction to Chapter 5</u>** (pp. 138-139), **<u>Section 5.1</u>** (pp.140-150), and **<u>Section 7.2</u>** (pp. 215-223) in the Textbook. Write a summary of what you have learned, including discussions on the concepts of *density, buoyancy,* and *three phases of matter (solid, liquid, gas).*

2) Answer the following "Check your understanding" questions from the textbook.

(IMPORTANT LEARNING OPPORTUNITY: For your benefit, **FIRST** answer the question, and **THEN** check answers in book. If your answer does not agree with the book's answer, re-think your answer and repeat the process until you understand the concept. This is a great way to really learn. If you simply copy the answer from the book, there will be no learning benefit.)

    a. <u>Check Your Understanding #3: Mountain Travel Is a Pain in the Ears</u>
       (**Textbook p. 144**)

    b. <u>Check Your Understanding #4: Why People Don't Float in Air</u>
       (**Textbook p. 146**)

c. <u>Check Your Understanding #5: Ballooning Weather</u>
    (**Textbook p. 147**)

d. <u>Check Your Understanding #3: Ice Water</u>
    (**Textbook p. 218**)

e. <u>Check Your Understanding #5: Seeing Your Breath</u>
    (**Textbook p. 220**)

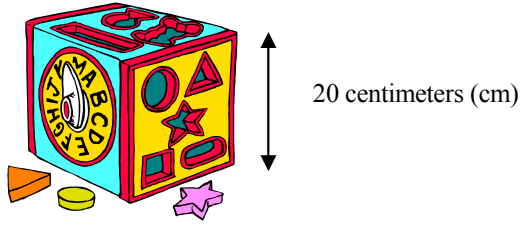Work the following "Exercises" from the textbook p. 163.

3)   Exercise #1

4)   Exercise #2

5)   Exercise #3

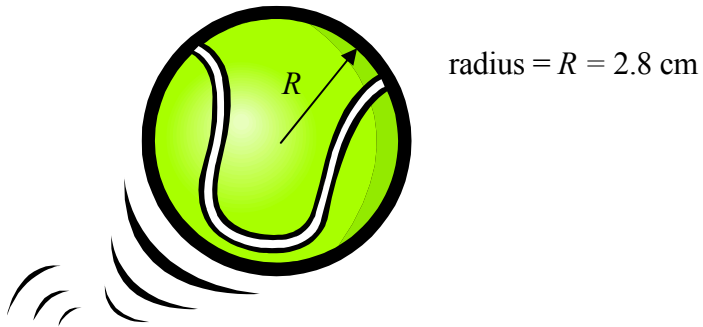6)   <u>Exercise #4</u>

7)   <u>Exercise #7</u>

8)   Find the *volume* of the cube below in cubic centimeters (cm³):

20 centimeters (cm)

9)   Find the *volume* of the sphere below in cubic centimeters (cm³):

radius = R = 2.8 cm

R

10)   A sphere made of iron (Fe) has a mass of 264 g and a radius of 2.0 cm (centimeters).

a. Find the volume of the iron sphere in cm^3 (cubic centimeters)

b. Find the density of iron in g/cm^3 (grams/cubic centimeter)

11) In the previous problem you obtained numerical values for the *mass*, the *volume*, and the *density* of the iron sphere. Explain the physical meaning of each of these concepts and discuss the relationship exists between them.

12)   A sphere made of an unknown metallic material has a mass of 105 g and a radius of 1.0914 cm (centimeters).

   a. Find the volume of this sphere in cm^3 (cubic centimeters)

   b. Find the density of this sphere in g/cm^3 (grams/cubic centimeter)

   c. Use the attached periodic table and <u>identify</u> this unknown metallic material.

Table 4 Density and atomic concentration

The data are given at atmospheric pressure and room temperature, or at the stated temperature in deg K. (Crystal modifications as for Table 3.)

Legend (three values per element):
- Density in g cm^{-3} (10^3 kg m^{-3})
- Concentration in 10^{22} cm^{-3} (10^{28} m^{-3})
- Nearest-neighbor distance, in Å (10^{-10} m)

Element	Temp (K)	Density	Concentration	Nearest-neighbor
H	4K	0.088		
He	2K	0.205 (at 37 atm)		
Li	78K	0.542	4.700	3.023
Be		1.82	12.1	2.22
B		2.47	13.0	1.54
C		3.516	17.6	1.54
N	20K	1.03		
O				
F				1.44
Ne	4K	1.51	4.36	3.16
Na	5K	1.013	2.652	3.659
Mg		1.74	4.30	3.20
Al		2.70	6.02	2.86
Si		2.33	5.00	2.35
P				
S		2.03		2.02
Cl	93K	2.03		2.02
Ar	4K	1.77	2.66	3.76
K	5K	0.910	1.402	4.525
Ca		1.53	2.30	3.95
Sc		2.99	4.27	3.25
Ti		4.51	5.66	2.89
V		6.09	7.22	2.62
Cr		7.19	8.33	2.50
Mn		7.47	8.18	2.24
Fe		7.87	8.50	2.48
Co		8.9	8.97	2.50
Ni		8.91	9.14	2.49
Cu		8.93	8.45	2.56
Zn		7.13	6.55	2.66
Ga		5.91	5.10	2.44
Ge		5.32	4.42	2.45
As		5.77	4.65	3.16
Se		4.81	3.67	2.32
Br	123K	4.05	2.36	
Kr	4K	3.09	2.17	4.00
Rb	5K	1.629	1.148	4.837
Sr		2.58	1.78	4.30
Y		4.48	3.02	3.55
Zr		6.51	4.29	3.17
Nb		8.58	5.56	2.86
Mo		10.22	6.42	2.72
Tc		11.50	7.04	2.71
Ru		12.36	7.36	2.65
Rh		12.42	7.26	2.69
Pd		12.00	6.80	2.75
Ag		10.50	5.85	2.89
Cd		8.65	4.64	2.98
In		7.29	3.83	3.25
Sn		5.76	2.91	2.81
Sb		6.69	3.31	2.91
Te		6.25	2.94	2.86
I		4.95	2.36	3.54
Xe	4K	3.78	1.64	4.34
Cs	5K	1.997	0.905	5.235
Ba		3.59	1.60	4.35
La		6.17	2.70	3.73
Hf		13.20	4.52	3.13
Ta		16.66	5.55	2.86
W		19.25	6.30	2.74
Re		21.03	6.80	2.74
Os		22.58	7.14	2.68
Ir		22.55	7.06	2.71
Pt		21.47	6.62	2.77
Au		19.28	5.90	2.88
Hg	227K	14.26	4.26	3.01
Tl		11.87	3.50	3.46
Pb		11.34	3.30	3.50
Bi		9.80	2.82	3.07
Po		9.31	2.67	3.34
At		—		
Rn		—		
Fr		—		
Ra		—		
Ac		10.07	2.66	3.76
Ce		6.77	2.91	3.65
Pr		6.78	2.92	3.63
Nd		7.00	2.93	3.66
Pm		—		
Sm		7.54	3.03	3.59
Eu		5.25	2.04	3.96
Gd		7.89	3.02	3.58
Tb		8.27	3.22	3.52
Dy		8.53	3.17	3.51
Ho		8.80	3.22	3.49
Er		9.04	3.26	3.47
Tm		9.32	3.32	3.54
Yb		6.97	3.02	3.88
Lu		9.84	3.39	3.43
Th		11.72	3.04	3.60
Pa		15.37	4.01	3.21
U		19.05	4.80	2.75
Np		20.45	5.20	2.62
Pu		19.81	4.26	3.1
Am		11.87	2.96	3.61
Cm		—		
Bk		—		
Cf		—		
Es		—		
Fm		—		
Md		—		
No		—		
Lr		—		