Key

Measurement and Matter Review

1) Classify each material as a Heterogeneous Mixture, Solution, Compound, or Element.

Material	Classification	Material	Classification
a. air	Solution	**e.** alcohol	Solution or compound
b. paper	Heterogeneous Mixture or solution	**f.** milk	Heterogeneous Mixture
c. table salt	Compound	**g.** plutonium	element
d. apple	Heterogeneous Mixture	**h.** water	compound

2) Classify the following properties as chemical or physical. If a physical property, classify it as E for extensive or I for intensive.

Property	Chemical or Physical	Property	Chemical or Physical
a. color	physical (I)	**h.** expansion	physical (I)
b. reactivity	chemical	**i.** melting point	physical (I)
c. flammability	chemical	**j.** rusting	chemical
d. odor	physical (I)	**k.** reacts with air	chemical
e. mass	physical (E)	**l.** density	physical (I)
f. stability	chemical	**m.** length	physical (E)
g. solubility	physical (I)	**n.** specific heat capacity	physical (I)

3) Mark the following statements as true or false. (The correct answer is struck-thru)

a. All homogeneous mixtures appear to have a uniform appearance. ~~True~~ False

b. All mixtures that appear uniform are homogeneous. True ~~False~~

c. In a solution no grains or particles are visible. ~~True~~ False

d. Solutions are single-phase systems. ~~True~~ False

4) Classify the following changes as chemical or physical.

Change	Chemical or Physical
a. digestion of food	chemical
b. fading of dye in cloth	chemical
c. growth of a plant	chemical
d. melting of ice	physical
e. explosion of gasoline in an engine	chemical
f. making rock candy by evaporating water from a sugar solution	physical
g. burning of coal	chemical
h. tearing of a piece of paper	physical
i. exploding dynamite	chemical

5) Classify the following mixtures as homogeneous or heterogeneous

Mixture	Heterogeneous or Homogeneous
a. gasoline	homogeneous
b. foamy shaving cream	heterogeneous
c. oil and vinegar	heterogeneous
d. stainless steel	homogeneous
e. white copier paper (before printing)	homogeneous
f. pepperoni pizza	heterogeneous
g. diet soda	homogeneous or heterogeneous (depends on T and how long open)
h. coarse sand paper	heterogeneous
i. a sheet of plywood	heterogeneous
j. duct tape	heterogeneous
k. liquid hand soap (clear not opaque)	homogeneous

6) Express the following numbers in meters.

a. 742 cm	_____	meters	7.42
b. 1,055 mm	_____	meters	1.055
c. 6000 km	_____	meters	6×10^{6}
d. 0.0075 cm	_____	meters	7.5×10^{-5}
e. 0.251 mm	_____	meters	2.51×10^{-4}
f. 0.00625 km	_____	meters	6.25

7) Express the following numbers in grams.

a. 152 kg	_____	grams	1.52×10^{5}
b. 0.074 kg	_____	grams	74
c. 0.500 kg	_____	grams	500
d. 20,160 mg	_____	grams	20.16
e. 765 mg	_____	grams	0.765
f. 5.4 mg	_____	grams	0.0054 or 5.4×10^{-3}

8) Express the following numbers in liters.

a. 1500 mL	_____	liters	1.5
b. 340 mL	_____	liters	0.34
c. 0.30 mL	_____	liters	3.0×10^{-4}
d. 17,354 μL	_____	liters	1.7354×10^{-2}

9) Express the following numbers in milliliters.

a. 92 L	_____	mL	92000
b. 0.015 L	_____	mL	15
c. 1,924 µL	_____	mL	1.924
d. 754 L	_____	mL	7.54×10^{5}
e. 2 L	_____	mL	2000

10) Write the number of significant figures for each number.

a. 27316	5	**f.** 9.040×10^{5}	4
b. 186,000	3	**g.** 0.00623	3
c. 717	3	**h.** 40.070	5
d. 1000	1	**i.** 5280	3
e. 6.52×10^{-2}	3	**j.** 0.070830	5

11) Change °C to K

a. 0°C ____273____ K

b. 100°C ____373____ K

c. 312°C ____585____ K

d. 74°C ____347____ K

12) Change K to °C

a. 420 K ____147____ °C

b. 712 K ____439____ °C

c. 900 K ____627____ °C

d. 113 K ____-160____ °C

13) Given the formula °C = $\frac{5}{9}$(°F – 32), change °F to °C:

a. 32°F ____0____ °C

b. 50°F ____10____ °C

c. -40°F ____-40____ °C

d. 16°F ____-8.9____ °C

14) Change °C to °F:

a. 0°C ____32____ °F

b. -40°C ____-40____ °F

c. 60°C ____140____ °F

d. 13°C ____55____ °F

15) Write the following numbers in scientific notation (write the most likely form).

a. 0.0063 _____ 6.3×10^{-3}

b. 72,800 _____ 7.28×10^{4}

c. 5,264,812 _____ 5.264812×10^{6}

d. 0.000000024 _____ 2.4×10^{-8}

e. 0.326 _____ 3.26×10^{-1}

f. 1 _____ 1×10^{0}

g. 145,000,000 _____ 1.45×10^{8}

h. 1/5 _____ 2×10^{-1}

16) Write the following numbers in scientific notation as regular numbers.

a. 2.5×10^{3} ____2500____

b. 1.6×10^{-4} ____0.00016____

c. 8.33×10^{2} ____833____

d. 6.04×10^{0} ____6.04____

e. 9.99×10^{-3} ____0.00999____

f. 4.32×10^{1} ____43.2____

g. 8.78×10^{-1} ____0.878____

h. 1.05×10^{5} ____105000____

17) Solve the following problems. Use the correct number of significant figures in your answers.

a. 30.7 mm + 44.5 cm + 7.01 m (answer in meters) ____7.49 m____

b. If 32.5 L were taken from 85 L, how much is left? ____53 L____

c. What is the area of the bottom of a tank 30.0 cm long and 15.0 cm wide? _____450. cm^2_____

d. 98.4 divided by 10.375 _____9.48_____

18) Name a SI unit used to express the following parameters.

a. length _____ meter

b. temperature _____ Kelvin

c. density _____ kg/m^3

d. pressure _____ pascal or $m^{-1}kg\text{-}s^{-2}$

e. volume _____ m^3

19) Name a metric unit used to express the following parameters (most have many choices).

a. length _____

b. temperature _____

c. density _____

d. pressure _____

e. volume _____

Use dimensional analysis to solve the following problems:

20) An automobile engine has a volume of 5.02 L. What is this volume in ml?

Answer: 5020 mL

$$5.02\,L \times \frac{1000\,mL}{1\,L} = 5020\,mL$$

21) In Saudi Arabia, gasoline costs 30.0 Hillala per liter. If there are exactly 100 Hillalas in one Ryal and one Ryal exchanges for 25.0 cents, what is the cost in cents/liter?

Answer: 7.50 cents/Liter

$$\frac{30.0\ Hillala}{L} \times \frac{1\ Ryal}{100\ Hillala} \times \frac{25.0\ cents}{1\ Ryal} = \frac{7.50\ cents}{L}$$

22) Convert 55 miles/hour to meters/second.
Answer: ~~24.6 m/s~~

$25\ \frac{m}{s}$

$$\frac{55\,mi}{1\,hr} \times \frac{1.61\,km}{1\,mi} \times \frac{1\,hr}{3600\,s} = 24.6\ m/s$$

$25\ m/s$

23) You are riding home from a party and the driver has been drinking. The car is traveling at 60 mph. Suddenly a child steps into the road ahead. Because the driver has been drinking his reaction time has been slowed by 1 second. How far toward the impending accident will the car travel before the driver begins to stop? Give your answer in feet. (Note: this is equal to the extra distance it will take to stop the car because the driver has been drinking.)
Answer: 88 ft

$$1\,s \times \frac{1\,hr}{3600\,s} \times \frac{60\,mi}{1\,hr} \times \frac{5280\,ft}{1\,mi} = 88\,ft$$

24) You are shadowing a nurse at Hershey Medical Center who receives an order to adjust the infusion rate of a pump so that 1.6 mg of lidocaine are being delivered per minute. Hanging is a 100cc piggyback containing 0.4 grams lidocaine, a 0.4% solution. Without writing anything down, the nurse tries to solve the problem on a calculator. After the fifth different and incorrect answer you find a piece of scratch paper and offer to show her how to set up the problem. She assures you she can always do problems like this on tests, but admits that at the moment her brain doesn't seem to be working. How would you set up and explain the problem to her?

$$X\ \frac{mL}{min} \times \frac{0.4\,g}{100\,mL} \times \frac{1000\,mg}{1\,g} = 1.6\ \frac{mg}{min}$$

Solve for X: 0.004 mL/min

(you could do it this way, the way on pg 14 is easier.)

pg 14

25) One 1.6 oz package of cinnamon and spice instant oatmeal contains 34 grams of carbohydrates. If you had 1 package of instant oatmeal per day 6 days a week, how many ounces of carbohydrate would you consume in a week? (16 oz = 1 lb = 453.6 g)
Answer: 7.2 oz

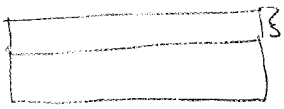
$$6\,days \times \frac{1\,package}{1\,day} \times \frac{34\,g}{1\,package} \times \frac{16\,oz}{453.6\,g} = 7.2\ ounces$$

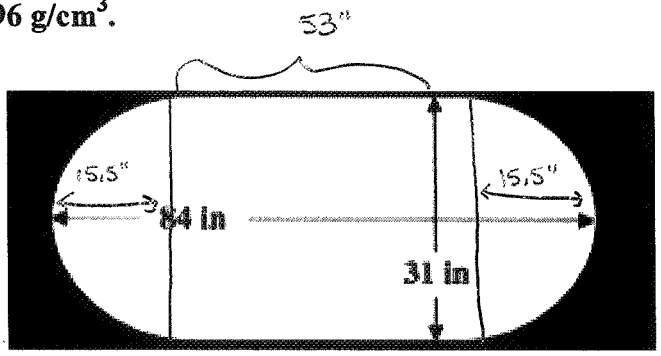
26) A man weighing 198 lbs climbs into a very large bathtub of 30°C water and submerges himself. The bathtub is 84.0 inches long, and 31.0 inches wide. The ends of the bathtub are perfect semicircles that are 31.0 inches in diameter. The water level of the tub increases by 2.36 inches; assume that the sides of the bathtub are perpendicular to the floor. The density of water at 30°C is 0.996 g/cm^3.

a) What is the man's volume (in cm^3)?

Answer: 92800 cm^3

$1 in^3 = 16.387 cm^3$

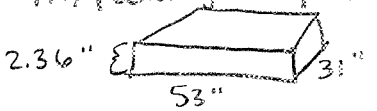




$h = 2.36 in$

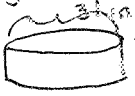
2 parts

A.) rectangular prism (main tub)



$V = l \times w \times h = 3877 in^3 \times \frac{16.387 cm^3}{1 in^3} = 63532.6 cm^3$

B.) cylinder (combined ends)



$r = 15.5 in$

$h = 2.36 in$

$V = \pi (15.5 in)^2 (2.36 in) = 1781 in^3 \times \frac{16.387 cm^3}{1 in^3} = 29185.2 cm^3$

b) What is the man's density (g/cm^3)?

Answer: 0.968 g/cm^3

TOTAL = 92718 cm^3 or 92700 cm^3

$198 lbs \times \frac{454 g}{1 lb} \times \frac{1}{92700 cm^3} = 0.9697 g/cm^3$

$0.970 g/cm^3$

c) Would the man sink or float if the bathtub was big enough?

~~Answer: Sink~~ Float

Useful Information

1 inch = 2.54 cm
1 lb = 453.6 grams
1 mile = 5280 feet
Volume of a cylinder = $\pi r^2 h$

Infusion rate = $\frac{mL}{min}$ (the problem assumes you know this)

#24

$\frac{1.6 mg}{1 min} \times \frac{g}{1000 mg} \times \frac{100 mL}{0.4 g} = 0.4 \frac{mL}{min}$