



Part 1 – Multiple Choice (30 points)

- Why study chemistry?
  - To help us learn a technique for identifying and solving problems
  - To understand the behavior of materials
  - To help inform us about our world
  - To be better able to make informed decisions
  - All the above
- Which is a scientific observation?
  - Freezing and boiling are called physical changes
  - If a substance has a density of 1.00g/mL it must be water.
  - When a substance freezes its molecules lose potential energy.
  - Water freezes at zero degrees C
  - All of the above are scientific observations
- A well established hypothesis is often called a(n)
  - theory
  - observation
  - fact
  - law
- Which is a pure substance?
  - coffee
  - orange juice
  - sugar
  - mud
- How many significant digits are in the number  $1.30 \times 10^4$ ?
  - 1
  - 2
  - 3
  - 4
- The number, 14.74999, when rounded to three digits is
  - 10.0
  - 15.0
  - 14.8
  - 14.7
- One kilometer is equal to
  - 100m
  - 1000m
  - 0.001m
  - 0.01m
- When expressed in proper scientific notation the number 0.000034 is
  - $34 \times 10^{-4}$
  - $3.4 \times 10^{-4}$
  - $3.4 \times 10^4$
  - $3.4 \times 10^{-5}$
  - $3.4 \times 10^5$
- Which type of element has the following general properties: low melting point and density, lacks luster, poor conductor of heat and electricity, and brittle?
  - Transition element
  - Metal
  - Nonmetal
  - Metalloid
- The smallest particle of an element that can exist is called a(n)
  - Ferrule
  - Neutron
  - Electron
  - Proton
  - Atom



Part 3 – Problems and Questions (60 points)

1. (6 points) Evaluate each of the following expressions. State the answer to the proper number of significant figures.

a.  $68.353 + 3.98 + 255.33 = 327.66$  or  $3.2766 \times 10^3$

b.  $\frac{0.000844}{21.588} = 3.91 \times 10^{-5}$

2. (8 points) Complete the following metric conversions using the correct number of significant figures. Put the answer in correct scientific notation.

- a. 4.81 kg to mg

$$? \text{ mg} = 4.81 \text{ kg} \times \frac{1000 \text{ g}}{1 \text{ kg}} \times \frac{1000 \text{ mg}}{1 \text{ g}} = 4.81 \times 10^6 \text{ mg}$$

- b. 71.9 km to m

$$? \text{ m} = 71.9 \text{ km} \times \frac{1000 \text{ m}}{1 \text{ km}} = 7.19 \times 10^4 \text{ m}$$

3. (8 points) Complete the following American / metric conversions using the correct number of significant figures

- a. 0.472 m to in

$$? \text{ in} = 0.472 \text{ m} \times \frac{100 \text{ cm}}{1 \text{ m}} \times \frac{1 \text{ in}}{2.54 \text{ cm}} = 29.2 \text{ in}$$

- b. 6.31 qt to mL

$$? \text{ mL} = 6.31 \text{ qt} \times \frac{946 \text{ mL}}{1 \text{ qt}} = 5.70 \times 10^3 \text{ mL}$$

4. (6 points) Complete the following temperature conversion  
63 °C to °F

$$^{\circ}\text{F} = \left( 63^{\circ}\text{C} \times \frac{180^{\circ}\text{F}}{100^{\circ}\text{C}} \right) + 32^{\circ}\text{F} = 145^{\circ}\text{F}$$

5. (6 points) After you have worked out at the gym on a stationary bike for 45 minutes, the distance gauge indicates that you have traveled 16.5 miles. What was your rate in km/hr (5280 ft = 1 mile)

$$? \frac{km}{hr} = \frac{16.5 mi}{45 min} \times \frac{60 min}{1 hr} \times \frac{5280 ft}{1 mi} \times \frac{12 in}{1 ft} \times \frac{2.54 cm}{1 in} = \frac{3.54 \times 10^6 km}{hr}$$

6. (6 points) Iron has a density of 7.87 g/mL. If 63.4 g of iron is added to 75.0 mL of water in a graduated cylinder, to what volume reading will the water level in the cylinder rise?

$$volume \text{ in graduated cylinder} = 75.0 \text{ mL} + 8.06 \text{ mL} = 83.1 \text{ mL}$$

What is the volume of the iron? (Hint: Do this part 1<sup>st</sup>)

$$? \text{ volume iron} = 63.4 \text{ g iron} \times \frac{1 \text{ mL iron}}{7.87 \text{ g iron}} = 8.06 \text{ mL iron}$$

7. (6 points) A personal trainer uses calipers on a client to determine his percent body fat. After taking the necessary measurements, the personal trainer determines that the client's body contains 12.5% fat by mass. If the client weighs 105 kg, how many kg of fat does he have?

$$? \text{ kg fat} = 105 \text{ kg} \times \frac{12.5 \text{ kg fat}}{100 \text{ kg}} = 13.1 \text{ kg fat}$$

8. (8 points) Give definitions for the terms pure substance and mixture and give two examples of each type of material.

Pure substance – substance which is homogeneous throughout and can not be separated into simpler substances by physical means. Pure substances always have the same composition, regardless of where they are found or how they are made.

1. sugar
2. carbon

Mixture – substance which can be separated into individual substances by physical means. Different samples of a mixture may differ in composition.

1. gasoline
2. orange juice

9. (6 points) Aqueous solutions of the substance nickel(II) sulfate are bright green in color. If an aqueous solution of barium chloride is added to an aqueous solution of nickel(II) sulfate, a white precipitate of barium sulfate forms. Based on the information in the previous paragraph, identify a physical and chemical property of nickel(II) sulfate.

Physical property

Bright green in color  
Soluble in water

Chemical Property

Reacts with barium chloride to form a white precipitate of barium sulfate