

Name (PRINT) KEY

1. True or False. [6 pts]

- a) A small amount of table salt, NaCl, completely dissolved in water would be classified as a homogeneous mixture.

**TRUE.**

- b) Accuracy is a measure of how closely two or more measurements of the same quantity agree with one another.

**FALSE. This statement is the definition of precision, not accuracy.**

- c) Isotopes of a given element have the same number of protons.

**TRUE.**

- d) The reaction of hydrogen gas with oxygen gas to produce water is an example of a physical change.

**FALSE. This is a chemical change.**

- e) Sulfur, S<sub>8</sub>, would be classified as an element.

**TRUE.**

- f)  $1000 \text{ cm}^3 = 1 \text{ L}$

**TRUE.**

2. What is the number of **significant figures** in each of the following measured quantities? [4 pts]

- a) 250 min                      **2 or 3**

- b)  $4.000 \times 10^{19}$  pg              **4**

- c) 10005 g/cm<sup>3</sup>                      **5**

- d) 0.00200 cm                      **3**

3. Carry out the following operations and express the **answer** with the appropriate number of **significant figures**. [3 pts]

- a)  $(4.2 \times 10^2) \times 768.15 =$   **$3.2 \times 10^5$**

- b)  $97.5 + 11.012 =$  **108.5**

- c)  $(5.20 + 6.8) \times 8.234 =$  **98.8**

4. Fill in the blank with the scientist's name. [3 pts]
- Rutherford** proved that most of the atom was empty space.
  - Millikan** determined the mass of an electron.
  - Thomson** determined that electrons existed in all elements.

5. Complete the following table of metric prefixes. [4 pts]

Prefix	Symbol	Meaning (Number)
kilo-	<b>k</b>	$1 \times 10^3$
centi-	<b>c</b>	$1 \times 10^{-2}$
pico-	<b>p</b>	$1 \times 10^{-12}$
milli-	<b>m</b>	$1 \times 10^{-3}$

6. For each of the following species, determine the number of protons, neutrons, and electrons in the atom. [6 pts]

	protons	neutrons	electrons
a) ${}^3_2\text{He}$	<b>2</b>	<b>1</b>	<b>2</b>
b) ${}^{48}_{22}\text{Ti}^{2+}$	<b>22</b>	<b>26</b>	<b>20</b>
c) ${}^{25}\text{Mg}$	<b>12</b>	<b>13</b>	<b>12</b>
d) ${}^{209}\text{Bi}^{3-}$	<b>83</b>	<b>126</b>	<b>86</b>

7. The average US automobile releases **0.38 kg** of  $\text{CO}_2$  **per mile** that the car is driven. Assuming that the average person drives 37 miles per day, what is the amount  $\text{CO}_2$  released in **pounds** (lbs) by one US automobile **per year**? (1 year = 365 days; 1 lb = 453.6 g) [5 pts]

$$\frac{0.38 \text{ kg}}{1 \text{ mi}} \times \frac{37 \text{ mi}}{1 \text{ day}} \times \frac{365 \text{ days}}{1 \text{ yr}} \times \frac{1000 \text{ g}}{1 \text{ kg}} \times \frac{1 \text{ lb}}{453.6 \text{ g}} = \mathbf{1.1 \times 10^4 \text{ lbs CO}_2}$$

8. The radius of an aluminum atom is 143 picometers (pm). Convert this radius to units of **inches**. (1 in = 2.54 cm). [4 pts]

$$143 \text{ pm} \times \frac{1 \times 10^{-12} \text{ m}}{1 \text{ pm}} \times \frac{1 \text{ cm}}{1 \times 10^{-2} \text{ m}} \times \frac{1 \text{ in}}{2.54 \text{ cm}} = \mathbf{5.6 \times 10^{-9} \text{ in}}$$