

Take-Home Quiz  
Topic 06: Measurements, Prefixes, and Dimensional Analysis

**Objective:**

This is to assess your comprehension of the material we have covered so far and to help prepare you for the exam.

**Instructions and Notes:**

- Most of the quiz problems are from or adapted from “Exercises” at the end of the chapters in the Chemistry: Atoms First 2e Online Textbook (OpenStax)
- You must *CLEARLY LABEL* all problems and *SHOW ALL WORK* neatly and legibly to receive credit. If the problems do not require calculations/work then you must explain how you got the answer. (can be a few words up to a few sentences or even a few arrows)
- If the problem requires calculations, the answers should be highlighted or boxed.
- Book sections covered: 1.4, 1.5, 1.6, Appendix B, Appendix C, 2.4

**Submission:**

The quiz is usually due ~1 week after we start this section (see our due date schedule). Summer session is due sooner. This should be scanned as a single PDF and submitted online through Canvas. The file cannot be larger than 20 Mb (20,000 kB).

**Helpful Tips:**

- Start as soon as we’re done with the lecture.
- Refer to the lecture and/or videos (if available).
- Use the corresponding chapter in the book to help you through difficult problems/concepts.
- There are answers and solutions available to the odd numbered problems (book number not quiz number) on the OpenStax website under “Student Resources”. It is not advised to rely on the solutions because you will not have access to the solutions during the exam. Only use the solutions as a last resort. Struggling is good and that is when you are learning the most!
- Work together with your classmates.
- Go to tutoring in the ASTC or MESA, ask your classmates in our Discord room, watch YouTube Videos, come to office hours, etc.
- To ensure your mastery of the material, do the quiz multiple times.

## Take-Home Quiz

### Topic 06: Measurements, Prefixes, and Dimensional Analysis

#### **1.4 Measurements**

1) (From Chapter 1.4 #34) Is one liter about an ounce, a pint, a quart, or a gallon?

2) (From Chapter 1.4 #35) Is a meter about an inch, a foot, a yard, or a mile?

(From Chapter 1.4 #37) Indicate the SI base units or derived units that are appropriate for the following measurements:

3) the mass of the moon

4) the distance from Dallas to Oklahoma City

5) the speed of sound

6) the density of air

7) the temperature at which alcohol boils

8) the area of the state of Delaware

9) the volume of a flu shot or a measles vaccination

(From Chapter 1.4 #38) Give the name and symbol of the prefixes used with SI units to indicate multiplication by the following exact quantities.

10)  $10^3$

11)  $10^{-2}$

12) 0.1

13)  $10^{-3}$

14) 1,000,000

15) 0.000001

(From Chapter 1.4 #39) Give the name of the prefix and the quantity indicated by the following symbols that are used with SI base units.

16) c

17) d

18) G

19) k

20) m

21) n

22) p

23) T

#### **1.6 Mathematical Treatment of Measurement Results**

(From Chapter 1.6 #57) Write conversion factors (with equals signs) for the number of:

24) yards in 1 meter

25) liters in 1 liquid quart

26) pounds in 1 kilogram

26) (From Chapter 1.6 #61) Soccer is played with a round ball having a circumference between 27 and 28 in. and a weight between 14 and 16 oz. What are these specifications in units of centimeters and grams?

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27) (From Chapter 1.6 #63) How many milliliters of a soft drink are contained in a 12.0-oz can?

28) (From Chapter 1.6 #65) The diameter of a red blood cell is about  $3 \times 10^{-4}$  in. What is its diameter in centimeters?

29) (From Chapter 1.6 #67) Is a 197-lb weight lifter light enough to compete in a class limited to those weighing 90 kg or less?

30) (From Chapter 1.6 #69) Many medical laboratory tests are run using  $5.0 \mu\text{L}$  blood serum. What is this volume in milliliters?

31) (From Chapter 1.6 #70) If an aspirin tablet contains 325 mg aspirin, how many grams of aspirin does it contain?

(From Chapter 1.6 #71) Use scientific (exponential) notation to express the following quantities in terms of the SI base units in [Table 1.2](#):

32) 0.13 g    33) 232 Gg    34) 5.23 pm    35) 86.3 mg    36) 37.6 cm

37) 54  $\mu\text{m}$     38) 1 Ts    39) 27 ps    40) 0.15 mK

(From Chapter 1.6 #72) Complete the following conversions between SI units.

41) 612 g = \_\_\_\_\_ mg    42) 8.160 m = \_\_\_\_\_ cm    43) 3779  $\mu\text{g}$  = \_\_\_\_\_ g

44) 781 mL = \_\_\_\_\_ L    45) 4.18 kg = \_\_\_\_\_ g    46) 27.8 m = \_\_\_\_\_ km

47) 0.13 mL = \_\_\_\_\_ L    48) 1738 km = \_\_\_\_\_ m    49) 1.9 Gg = \_\_\_\_\_ g

50) (From Chapter 1.6 #73) Gasoline is sold by the liter in many countries. How many liters are required to fill a 12.0-gal gas tank?

51) (From Chapter 1.6 #75) A long ton is defined as exactly 2240 lb. What is this mass in kilograms?

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(From Chapter 1.6 #77) Make the conversion indicated in each of the following:

- 52) the length of a soccer field, 120 m (three significant figures), to feet
- 53) the height of Mt. Kilimanjaro, at 19,565 ft, the highest mountain in Africa, to kilometers
- 54) the area of an 8.5- × 11-inch sheet of paper in  $\text{cm}^2$
- 55) the displacement volume of an automobile engine, 161  $\text{in.}^3$ , to liters
- 56) the estimated mass of the atmosphere,  $5.6 \times 10^{15}$  tons, to kilograms
- 57) the mass of a bushel of rye, 32.0 lb, to kilograms

58) (From Chapter 1.6 #81) As an instructor is preparing for an experiment, he requires 225 g phosphoric acid. The only container readily available is a 150-mL Erlenmeyer flask. Is it large enough to contain the acid, whose density is 1.83 g/mL?

59) (From Chapter 1.6 #87) Calculate the density of aluminum if 27.6  $\text{cm}^3$  has a mass of 74.6 g.

(From Chapter 1.6 # 89) Calculate these masses.

- 60) What is the mass of 6.00  $\text{cm}^3$  of mercury, density = 13.5939  $\text{g}/\text{cm}^3$ ?
- 61) What is the mass of 25.0 mL octane, density = 0.702  $\text{g}/\text{cm}^3$ ?

(From Chapter 1.6 #91) Calculate these volumes.

- 62) What is the volume of 25 g iodine, density = 4.93  $\text{g}/\text{cm}^3$ ?
- 63) What is the volume of 3.28 g gaseous hydrogen, density = 0.089  $\text{g}/\text{L}$ ?

64) (From Chapter 1.6 #93) Convert the boiling temperature of gold, 2966  $^{\circ}\text{C}$ , into degrees Fahrenheit and kelvin.

65) (From Chapter 1.6 #95) Convert the temperature of the coldest area in a freezer,  $-10^{\circ}\text{F}$ , to degrees Celsius and kelvin.

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## 2.4 Chemical Formulas

(From Chapter 2.4 #47) Determine the mass of each of the following:

66) 0.0146 mol KOH

67) 10.2 mol ethane, C<sub>2</sub>H<sub>6</sub>

68)  $1.6 \times 10^{-3}$  mol Na<sub>2</sub>SO<sub>4</sub>

69)  $6.854 \times 10^3$  mol glucose, C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>

70) 2.86 mol Co(NH<sub>3</sub>)<sub>6</sub>Cl<sub>3</sub>

(From Chapter 2.4 #48) Determine the number of moles of the compound and determine the number of moles of each type of atom in each of the following: (convert grams to moles to molecules and then use the mole ratio of the atoms in the molecule to calculate how many atoms there are in each compound)

71) 2.12 g of potassium bromide, KBr

72) 0.1488 g of phosphoric acid, H<sub>3</sub>PO<sub>4</sub>

73) (From Chapter 2.4 #53)

(a) Determine the number of atoms of zirconium, silicon, and oxygen found in 0.3384 mol of zircon, ZrSiO<sub>4</sub>, a semiprecious stone. (convert mol of ZrSiO<sub>4</sub> to molecules of ZrSiO<sub>4</sub> using  $6.022 \times 10^{23}$  molecules = 1 mol) and then use the mole ratio to figure out how many atoms there are of Zr, Si, and O (remember there are 4 oxygen atoms in 1 molecule of ZrSiO<sub>4</sub>)

(b) Determine the mass of zirconium, silicon, and oxygen found in 0.3384 mol of zircon, ZrSiO<sub>4</sub>, a semiprecious stone. (use the number of molecules you found in part (a) for each element [Zr, Si, and O] then convert to moles (using  $6.022 \times 10^{23}$  atoms = 1 mole) then to grams (using the grams per mole on the periodic table).