# CHEMISTRY : DIMENSIONAL ANALYSIS PRACTICE V

1. The distance from the thumb to the little finger on Erbie Terbium's hand is 9 inches. Convert this to centimeters.

2. According to the Guinness Book of Records the heaviest baby ever born weighed 29 lbs 4 oz. (29.25 lbs). What was the baby's mass in kg? (Historical Note: The birth occurred in Effingham IL in 1939 and due to respiratory problems the baby died two hours later. The heaviest babies to survive weighed 22.5 lbs and were born in 1955 and 1982.)

3. Your cross country skis are 210 cm long. What is their length in inches?

4. A condor has a wing span of 3.05 m. What is the wing span in feet?

5. In Europe gasoline is sold by the liter. Assume that it takes 14 gallons of gasoline to fill the tank of a compact car. How many liters of gasoline will it take?

6. You have just received a French cookbook from the exchange student. You want to make 3 quarts of punch for a party. Will a recipe of 2.5 L be enough?

7. Some owls maintain territories of up to 3 acres. How many owls could live in a large wooded area of 20 hectares? (1 hectare=1 sq. dekameter=100 $m^2$= 2.47 acres)

8. Ruth Palladium (RuPd) bought 10 acres of land and built a house on 2 acres. RuPd wanted to raise sheep on the remaining 8 acres. If it takes 1/8 (0.125) hectare to raise one sheep, how many sheep can be raised on the 8 acres.

9. One 1.6 oz. of package of cinnamon and spice instant oatmeal contains 34 g of carbohydrates. If you had instant oatmeal 6 days a week, how many ounces of carbohydrate would you consume in a week?
(16 oz =1 lb = 454 g = 256 Drams = 7000 Grains)

10. Many candybars have 9 g of fat per bar. If during a "chocolate attack" you ate one pack of candy (0.6 dekabars), how many ounces of fat would you have eaten? There are approximately 9 Calories per gram of fat, how many Calories is this?

11.If the RDA for vitamin C is 60 mg per day and there are 70 mg of vitamin C per 100 g of orange, how many 3 oz. oranges would you have to eat each week to meet this requirement?

12. If Gasp cigarettes have 5 mg tar and 0.4 mg nicotine per cigarette and there are 20 cigarettes per pack, how many packs of cigarettes would have to be smoked to coat your lungs with 4 oz (1/4 lb.) of tar? How many packs would you have to smoke to introduce your lungs to one gram of the drug nicotine?

13. You are riding home from a party and the driver has been drinking. The car is traveling at 60 mi per hour. Suddenly a child steps into the road ahead. Because the driver has been drinking his reaction time has been slowed by 1 second. How many feet toward the impending accident will the car travel before the driver begins to stop? (Note: This is equal to the extra distance it will take to stop the car because the driver has been drinking.)

14. Because you never learned dimensional analysis, you have been working at a fast food restaurant for the past 35 years wrapping hamburgers. Each hour you wrap 184 hamburgers. You work 8 hours per day. You work 5 days a week. You get paid every 2 weeks with a salary of $840.34. How many hamburgers will you have to wrap to make your first one million dollars?

15. Recently, Dr. Louis Frank has suggested that Earth may be pelted by thousands of house-sized comets. Satellite imagery has been inconclusive, and the idea remains controversial. When Frank first considered the idea of mini-comets falling to Earth, he no doubt scrambled to make a quick Dimensional Analysis calculation. Comets can be thought of as dirty snowballs - maybe Earth's oceans have accumulated from these comets over the ages! Use the following information to estimate what percent of Earth's oceans could be accounted for given a constant bombardment by comets over the last 4 billion years (your known). You will need the following information:

Each mini-comet contains about 30 tons of water

* 1 year = 365.25 days
* 1 ton = 2000 pounds
* 1 pound = 454 grams
* density of water is 1 $g/cm^3$
* 15,000 mini-comets hit the Earth each day
* Earth's oceans occupy 1.36 billion $km^3$

Note: Many people don't accept Dr. Frank's mini-comet theory, but, if he's right, it would radically change our understanding of Earth science. You don't need to worry about getting hit by these comets, they are vaporized long before they reach the surface.

16. Mark McGuire hit 70 home runs in the 1998 season. Given that there are 4 bases with 90 feet between each base, how many miles did he run last season just from home runs?

17. Your chemistry teacher empties his dehumidifier tank once a day. If the capacity of the tank is 2 gallons, determine how many molecules of water the dehumidifier collects from the air per millisecond.

* 1 day = 24 hours
* 1 quart = 0.94633 liter
* 4 quarts = 1 gallon
* density of water is 1g/mL
* 18 g water = $6.02 \times 10^{23}$ molecules of water

18. In one of the episodes of the TV program McGyver, a plane load of gold was being transported form the Soviet Union to the United States during World War II. The plane crashed in the Artic region and to prevent the "bad guys" from getting the gold the pilot and co-pilot transferred it to a cave by stacking the gold on a door of the crashed plane and pulling the gold on this "sled" to the cave. You were led to believe in the episode that they accomplished the move in one trip because the gold was neatly stacked on the "sled" in the cave. The neatly stacked gold measured about 1 meter on a side. Calculate the weight, in tons, of one cubic meter of gold and determine if it would be possible for the two pilots to accomplish this feat. Would a plane of WWII vintage be able to carry this amount of gold? ($D_{Au}$=19.4 g/cc)

19. A high School senior was applying to college and wondered how many applications she needed to send. Her counselor explained that with the excellent grade she received in chemistry she would probably be accepted to one school out of every three to which she applied. [*3 applications = 1 acceptance*] She immediately realized that for each application she would have to write 3 essays, [*1 application = 3 essays*] and each essay would require 2 hours work *[1 essay = 2 hours*]. Of course writing essays is no simple matter. For each hour of serious essay writing, she would need to expend 500 calories [*1 hour = 500 calories*] which she could derive from her mother's apple pies [1 pie = 1000 calories]. How many times would she have to clean her room in order to gain acceptance to 10 colleges? Hopefully you didn't skip problem No 1.

20. At one time Rigel IV, a class M planet. had a system of weights and measures called the Bozo system. This system was created and used by the Bozonians, who lived on a continent in the Northern hemisphere, and had all of the deficiencies of the current English system on earth. The relationships between the various units used for length in the Bozo system are given below:

* 325 cubebs = 1 furbish
* 6 furbishes = 1 nautical smile
* 20 nautical smile = 1 minor league
* 3 minor leagues = 1 major league

Using the above conversion factors determine the number of cubebs a Bozonian would have to walk if his doctor recommended that he walk 2 major leagues each day to maintain cardiovascular health.