

AP CHEM II WORKSHEET ON SCIENTIFIC CALCULATIONS

Name: _____ Date: _____ Period: _____

(1) Give the derived SI units for each of the following quantities in terms of the base SI units:

- a. acceleration = distance/time²
- b. force = mass x acceleration
- c. work = force x distance
- d. pressure = force/area
- e. power = work/time

(2) Carry out each of the following calculations. Round your answers correctly (pay attention to significant digits) and express all units in the most simplified form:

- a.
$$\frac{(6.626 \times 10^{-34} \text{ J} \cdot \text{s})(2.9979 \times 10^8 \text{ m/s})}{4.73 \times 10^{-9} \text{ m}}$$
- b.
$$\frac{(6.022 \times 10^{23} \text{ molecules/mol})(1.04 \times 10^2 \text{ g})}{44.01 \text{ g/mol}}$$
- c.
$$\frac{4.336 \times 10^7 \text{ g}}{(4/3)(3.1416)(1.05 \times 10^2 \text{ cm})^3}$$
- d.
$$\frac{(1.0 \times 10^{-4} \text{ mol/L})^2(2.65 \times 10^{-3} \text{ mol/L})}{(8.35 \times 10^{-5} \text{ mol/L})(1.48 \times 10^{-2} \text{ mol/L})^3}$$
- e.
$$\frac{2.023 \text{ g} - (1.8 \times 10^{-3} \text{ g})}{1.05 \times 10^4 \text{ mL}}$$
- f.
$$\frac{(4.6 \times 10^3 \text{ mg}) - (2.2 \times 10^2 \text{ mg})}{(3.11 \times 10^4 \text{ cm})(7.12 \times 10^2 \text{ cm})}$$

(3) Perform the following conversions:

- a. 16.2 feet to meters
- b. 5.44 quarts to milliliters
- c. 45.7 in/s to km/hr

- d. 23.5 yd^3 to m^3
- e. 7.85 g/mL to kg/m^3
- (4) Which of the following has a larger volume and by how many fluid ounces. . . a 2.00 Liter bottle or a six-pack of 12 fluid ounce cans? There are 8 fluid ounces in one cup. Show your work to prove your answer.
- (5) The annual global atmospheric increases in carbon dioxide, the major greenhouse gas, are 6.8 gigaton from fossil-fuel burning, 7.1 gigaton from industrial activity, and 1.6 gigaton from deforestation. All tons are metric (1 metric ton = 1000 kg). What is the total annual increase in carbon dioxide expressed in pounds?
- (6) In the United States, water used for irrigation (desalinated water) is measured in acre-feet. An acre-foot of water covers an acre to a depth of exactly one foot. An acre is 4840 yd^2 . An acre-foot is enough water to supply two typical households for 1.00 years. Desalinated water costs \$2500 per acre-foot.
- a. How much does desalinated water cost per liter?
- b. How much would it cost one household per day if one acre-foot was the only source of water?
- (7) Anton van Leeuwenhoek, a 17th century pioneer in the use of microscopes, described the microorganisms he saw as “animalcules” whose length were “25 thousandths of an inch.” How long were these “animalcules” in meters?
- (8) A certain chemical process requires 215 gallons of pure water each day. The available water contains 11 parts per million (ppm) of salt (in other words, for every 1 000 000 grams of water there are 11 grams of salt). What mass of salt must be removed each day? (one gallon of water has a mass of 3.67 kilograms)

KEY: WORKSHEET ON SCIENTIFIC CALCULATIONS

- (1) a. m/s^2
b. $\text{kg} \cdot \text{m/s}^2$
c. $\text{kg} \cdot \text{m}^2/\text{s}^2$
d. $\text{kg/m} \cdot \text{s}^2$
e. $\text{kg} \cdot \text{m}^2/\text{s}^3$
- (2) a. $4.20 \times 10^{-17} \text{ J/s}^2$
b. 1.42×10^{24} molecules
c. 8.94 g/cm^3
d. $9.8 \times 10^{-2} \text{ L/mol}$
e. $1.9 \times 10^{-4} \text{ g/mL}$
f. $2.0 \times 10^{-4} \text{ mg/cm}^2$
- (3) a. 4.94 m
b. $5.13 \times 10^3 \text{ mL}$
c. 4.18 km/hr
d. 18.0 m^3
e. 7850 mL
- (4) The six pack has a larger volume. Larger by 4.16 fluid ounces.
- (5) 3.4×10^{13} pounds
- (6) a. 2.03×10^{-3} dollars (or 0.203 cents)
b. \$3.43 per day
- (7) $6.35 \times 10^{-4} \text{ m}$
- (8) 8.68 g salt