

1. Match the following words with the correct definition. (8 pts)

Proton A Atomic number B Isotopes C calorie D

- The positively charged particle in an atoms nucleus.
- The number of protons in an atoms nucleus.
- Elements with the same number of protons but a different number of neutrons.
- The amount of energy required to raise one gram of a substance, one degree Celsius.

2. Conversion Factors (20 pts)

Length	Volume	Energy
100 cm = 1 m	1 gal = 4 qt	1000 cal = 1 kcal = 1 Cal
1000 mm = 1 m	1 qt = 2 pints	1 cal = 4.18 J
1 km = 1000 m	1 qt = 32 ounces	1000 J = 1 kJ
1 ft = 12 in	1 gal = 3.78 L	
1 mi = 5280 ft	1000 mL = 1 L	
2.54 cm = 1 in	1 mL = 1 cm ³ = 1 cc	

a. How many cm are in 30 inches?

$$30 \text{ in} \times \frac{2.54 \text{ cm}}{1 \text{ in}} = 76.2 \text{ cm}$$

b. The distance from Salt Lake City to San Francisco is 750 miles. What is this distance in kilometers?

$$750 \text{ mi} \times \frac{5280 \text{ ft}}{1 \text{ mi}} \times \frac{12 \text{ in}}{1 \text{ ft}} \times \frac{2.54 \text{ cm}}{1 \text{ in}} \times \frac{1 \text{ m}}{100 \text{ cm}} \times \frac{1 \text{ km}}{1000 \text{ m}} = 1207 \text{ km}$$

c. The dietary energy requirement for an adult is 2.00×10^3 kcal per day. How many Joules is this equal to?

$$2.00 \times 10^3 \text{ kcal} \times \frac{1000 \text{ cal}}{1 \text{ kcal}} \times \frac{4.18 \text{ J}}{1 \text{ cal}} = 8.36 \times 10^6 \text{ J}$$

d. A car averages 21.3 miles per gallon of gasoline. How many liters of gasoline will be needed for a trip of 750 km?

$$750 \text{ km} \times \frac{1000 \text{ m}}{1 \text{ km}} \times \frac{100 \text{ cm}}{1 \text{ m}} \times \frac{1 \text{ in}}{2.54 \text{ cm}} \times \frac{1 \text{ ft}}{12 \text{ in}} \times \frac{1 \text{ mi}}{5280 \text{ ft}} \times \frac{1 \text{ gal}}{21.3 \text{ mi}} \times \frac{3.78 \text{ L}}{1 \text{ gal}} = 82.7 \text{ L}$$

3. Convert the following to 2 significant figures in scientific notation: (12 pts)

a. 12300

$$1.2 \times 10^4$$

b. 0.0003785

$$3.8 \times 10^{-4}$$

c. -672.41

$$-6.7 \times 10^2$$

d. -0.0318

$$-3.2 \times 10^{-2}$$

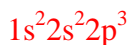
4. A wooden block has a mass of 62.38 g and a height of 1.92 cm, a length of 7.85 cm, and a width of 4.59 cm. What is the density of this block? (10 pts)

$$Volume = l \times w \times h = (1.92 \text{ cm}) \times (7.85 \text{ cm}) \times (4.59 \text{ cm}) = 69.2 \text{ cm}^3$$

$$density = \frac{mass}{volume} = \frac{62.38 \text{ g}}{69.2 \text{ cm}^3} = 0.901 \frac{\text{g}}{\text{cm}^3} = 0.901 \frac{\text{g}}{\text{mL}}$$

5. Write the electron configurations for the following: (5 pts)

a. N 7 electrons



b. Mg 12 electrons



5. Using the Bohr model of an atom, draw the electron dot structure for the following: (12 pts)

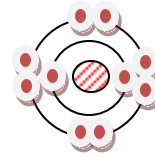
a. Be



b. C



c. Ne



6. Fill in the following Table. (20 pts)

Element	Protons	Neutrons	Electrons	Charge
^{32}S	16	16	16	0
$^{39}\text{K}^+$	19	20	18	+1
^{79}Br	35	44	35	0
^{40}Ca	20	20	20	0
$^{64}\text{Cu}^{+3}$	29	35	26	+3

7. How many nutritional calories (Cal) are in a glass of Guinness if the combustion of 1 glass of Guinness in 2000 g of water gave a temperature change of 63 °C. (Specific Heat of water = 1 cal/g °C) Report the answer in Cal per glass. (10 pts)

$$Q = m \times s \times \Delta T$$

$$Q = (2000 \text{ g}) \times \left(1.00 \frac{\text{cal}}{\text{g}^\circ\text{C}}\right) (63^\circ\text{C}) = 126000 \text{ cal}$$

$$1000 \text{ cal} = 1 \text{ Cal}$$

$$126 \text{ Cal per glass}$$

8. Convert the following temperatures: (3 pts) °F = 1.8(°C) + 32

a. 37 °C to K

$$\text{K} = 37 + 273 = 310 \text{ K}$$

b. 485 K to °F

1st convert K to °C

$$485 \text{ K} - 273 = 212 \text{ }^\circ\text{C}$$

Then convert °C to °F

$$^\circ\text{F} = 1.8(212 \text{ }^\circ\text{C}) + 32 = 414 \text{ }^\circ\text{F}$$

9. (Extra Credit) Is photosynthesis an exothermic or endothermic process? (5 pts)

In photosynthesis, plants absorb light energy thus this process is endothermic.