

Name Mr. Perfect Date Su 10

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

Joule b Potential Energy a Thermodynamics d Kinetic Energy c

- a. Energy due to position or composition.
- b. Energy unit.
- c. Energy due to motion.
- d. The study of energy and its interconversions.

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 <sup>3</sup> = 1 cc	

a. How many ft are in 3 cm?

$$3 \text{ cm} \times \frac{1 \text{ in}}{2.54 \text{ cm}} \times \frac{1 \text{ ft}}{12 \text{ in}} = \mathbf{0.098 \text{ ft}}$$

b. How many pints are in a gallon of olive oil?

$$1 \text{ gal} \times \frac{4 \text{ qt}}{1 \text{ gal}} \times \frac{2 \text{ pts}}{1 \text{ qt}} = \mathbf{8 \text{ pts}}$$

c. A car averages 32 miles per gallon of gasoline. If gas is \$3.34 per gallon, how many gallons will it take to drive 22 km?

$$22 \text{ km} \times \frac{1000 \text{ m}}{1 \text{ km}} \times \frac{100 \text{ cm}}{1 \text{ m}} \times \frac{1 \text{ in}}{2.54 \text{ cm}} \times \frac{1 \text{ ft}}{12 \text{ in}} \times \frac{1 \text{ mi}}{5280 \text{ ft}} \times \frac{1 \text{ gal}}{32 \text{ mi}} = \mathbf{0.43 \text{ gal}}$$

d. If a 100 watt (Joules per second) light bulb is left on for 10 minutes, how many calories are burned?

$$100 \frac{\text{J}}{\text{s}} \times \frac{60 \text{ s}}{\text{min}} \times 10 \text{ min} \times \frac{1 \text{ cal}}{4.18 \text{ J}} = \mathbf{14354 \text{ cal}}$$

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

a. 32.286

$$3.2 \times 10^1$$

b. 0.32476

$$3.2 \times 10^{-1}$$

c. -100.00

$$-1.0 \times 10^2$$

d. -0.0482

$$-4.8 \times 10^{-2}$$

4. A solid block has a mass of 73.13 g and a density of 1.23 g/mL. If the solid block has a length of 5.21 cm and a width of 2.79 cm, what is the height of the block? (10 pts)

$$h = \frac{73.13 \text{ g}}{1.23 \frac{\text{g}}{\text{cm}^3} \times 5.21 \text{ cm} \times 2.79 \text{ cm}} = 4.09 \text{ cm}$$

5. Write the Lewis dot structures for the following elements. (5 pts)

a) He



b) N



6. How many grams of fat are in a serving of Quaker Oats oatmeal if a serving of oatmeal contains 274 kcal and the following nutritional values? (10 pts)

Carbohydrate	42 g	x 4 kcal/g	=168 kcal
Fat	?	x 9 kcal/g	= X
Protein	13 g	x 4 kcal/g	= 52 kcal

$$X = 274 \text{ kcal} - [168 \text{ kcal} + 52 \text{ kcal}] = 54 \text{ kcal for fat}$$

$$\text{grams of fat} = \frac{54 \text{ kcal}}{9 \text{ kcal/g}} = 6 \text{ g}$$

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

Element	Protons	Neutrons	Electrons	Charge
$^{40}\text{Ca}^{2+}$	20	20	18	+2
$^7\text{Li}$	3	4	3	0
$^{32}\text{S}^{2-}$	16	16	18	-2
$^{79}\text{Br}^-$	35	44	36	-1
$^{106}\text{Pd}^{+2}$	46	60	44	+2

7. How many calories (cal) are in a serving of diet Skippy peanut butter if the combustion of 1 serving of peanut butter in 2000 g of water gave a temperature change of 74°C. (Specific Heat of water = 1.00 cal/g °C) Report the answer in cal per serving. (10 pts)

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

$$2000 \text{ g} \times 1.00 \frac{\text{cal}}{\text{g}^\circ\text{C}} \times 74^\circ\text{C} = \mathbf{148000 \text{ cal}}$$

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

a. Ca



b. Cl



9. (Extra Credit) Convert 311 K to °F. [Hint: °F = 1.8 (°C) + 32] (5 pts)

$$^\circ\text{F} = 1.8(311 - 273) + 32 = \mathbf{100.4 \text{ }^\circ\text{F}}$$