Quiz 1.3 – Heat, Temperature, and Dimensional Analysis

Name: Key

Question 1

Complete the following table:

Decimal Quantity	Scientific Notation	Prefix Notation
0.0045 m	$4.5 \cdot 10^{-3}$ m	4.5 mm
36,000,000 m	$3.6 \cdot 10^{7}$ m	36 Mm
0.000000560	$5.60 \times 10^{-7}\ m$	560 nm or 0.560 μm

Question 2

A cup of water is about 237 g. How much energy is required to bring one cup of water from 25.0 °C to 100.0 °C?

$q = m\,C\,\Delta T = 237\,g \cdot 4.186\ \frac{J}{g\,°C} \cdot 75.0\,°C = 74{,}400\ J = 74.4\ kJ$

Question 3

An adult male should consume about 2500 Cal each day. If 2500 Cal are added to 200.0 lb of water, how much would the water temperature change?

$2500\,Cal \left|\frac{1000\,cal}{1\,Cal}\right|\frac{4.184\,J}{1\,cal} = 1.046 \cdot 10^{7}\,J$

$200.0\,lb \left|\frac{1\,kg}{2.205\,lb}\right|\frac{1000\,g}{1\,kg} = 90{,}700\,g$

$q = mc\Delta T \rightarrow \Delta T = \frac{q}{mc} = \frac{1.046 \cdot 10^{7}\,J}{90{,}700\,g \cdot 4.184\ J/g\,°C} = 27.6\,°C$

Question 4

Convert the following temperatures from K to °C or from °C to K

25.0 °C	376.5 K	−12.3 °C	184.7 K
298 K	103.4 °C	260.9 K	−88.5 °C

Question 5

Pure gold has a density of 19.3 $\frac{g}{cm^3}$. A small sample of pure gold measures 3.5 mm by 7.6 mm by 5.5 mm. How much should you expect this sample to weigh?

$V = 0.35\,cm \cdot 0.76\,cm \cdot 0.55\,cm = 0.15\,cm^3\ (0.146\,cm^3)$

$m = d \cdot V = 19.3\ g/cm^3 \cdot 0.146\,cm^3 = 2.8\,g$