UNIT ONE REVIEW

Name: Answer Key

1. For each value, indicate how many digits are significant:
   a) 120  b) 1.20  c) $2.04 \times 10^3$  d) 10000  e) 4.5000  f) 0.000071  g) 0.009
   3  3  3  5  2  1

2. Express into scientific notation
   a) $0.00456$  
      $4.56 \times 10^{-3}$
   b) $980010000$  
      $9.8001 \times 10^8$

3. Express the value $7.95 \times 10^7$ using the power of ten notation of $10^3$ and $10^{10}$
   $0.0795 \times 10^5$
   $7950 \times 10^{-10}$

4. Express 39589 to two sig figs
   $4.0 \times 10^4$

5. Answer to the correct number of sig figs
   a) $3890 \times 2.0 \times 0.009$  
      $7.76 \times 10^1$
   b) $(24.002 \times 100.0) / (2.90 \times 10^{-8} \times 3.00 \times 10^4)$
      $2.76 \times 10^{14}$

6. Answer to the correct number of sig figs:
   a) $39.0001 + 205.40$  
      $244.401$
   b) $(4.98 \times 10^7) (3.0 \times 10^4)$  
      $1.7 \times 10^{-3}$
   c) $240.0 / 0.00525$  
      $45714.286$

7. Round each of the following to 3 significant figures.
   $77.0653$  
   $2.34 \times 10^{-4}$  
   $2.895 \times 10^{21}$
8. Calculate each of the following showing slanting steps:

a) If there are 3 feet in one yard how many feet are in 1.24 yards.
   \[ UA = 3 \text{ ft} \]
   \[ IA = 1.24 \text{ yd} \]
   \[ CF = 3 \text{ ft} \]
   \[ UA = 1.24 \text{ yd} \times \frac{3 \text{ ft}}{1 \text{ yd}} \]
   \[ UA = 3.72 \text{ ft} \]

b) How many seconds in 2.5 hours
   \[ UA = 2.5 \text{ hrs} \]
   \[ IA = 2.5 \text{ h} \]
   \[ CF = \frac{60 \text{ mins}}{1 \text{ hr}} \]
   \[ UA = 2.5 \text{ hrs} \times \frac{60 \text{ mins}}{1 \text{ hr}} \]
   \[ UA = 9000 \text{ min} \]

(c) If 1 inch = 2.54 cm, how many inches in 27.6 cm
   \[ UA = \frac{2.54 \text{ cm}}{1 \text{ inch}} \]
   \[ IA = 27.6 \text{ cm} \]
   \[ CF = \frac{1 \text{ inch}}{2.54 \text{ cm}} \]
   \[ UA = \frac{2.54 \text{ cm}}{1 \text{ inch}} \times 27.6 \text{ cm} \]
   \[ UA = 10.82 \text{ in} \]

(d) If there are 100 cm in a meter and 1000 m in a km, convert 2.78 x 10^4 cm to km
   \[ UA = 2.78 \times 10^4 \text{ cm} \]
   \[ IA = 2.78 \times 10^4 \text{ cm} \]
   \[ CF = \frac{1 \text{ m}}{100 \text{ cm}} \]
   \[ CF = \frac{1 \text{ km}}{1000 \text{ m}} \]
   \[ UA = 2.78 \times 10^4 \text{ cm} \times \frac{1 \text{ m}}{100 \text{ cm}} \times \frac{1 \text{ km}}{1000 \text{ m}} \]
   \[ UA = 2.78 \times 10^{-1} \text{ km} \]

(e) If 1 kg = 2.2 lb, what is your mass pounds in kg?
   \[ UA = 7 \text{ kg} \]
   \[ IA = \text{whatever your weight is in lb ex. 180 lb} \]
   \[ CF = \frac{1 \text{ kg}}{2.2 \text{ lb}} \]
   \[ UA = 7 \text{ kg} \times \frac{1 \text{ lb}}{2.2 \text{ kg}} \]
   \[ UA = 59.1 \text{ kg} \]

(f) In 1998, Jani Soinnen of Finland won the Bronze Medal for the ski jump at the Nagano Winter Olympics with a jump of 136 m. If 1 feet (ft) = 12 inches (in), 1 cm = 0.01 m, and 1 inch = 2.54 cm, express the distance in feet.
   \[ UA = 136 \text{ m} \]
   \[ IA = 136 \text{ m} \]
   \[ CF = \frac{1 \text{ cm}}{0.01 \text{ m}} \]
   \[ CF = \frac{1 \text{ ft}}{12 \text{ in}} \]
   \[ UA = 136 \text{ m} \times \frac{1 \text{ cm}}{0.01 \text{ m}} \times \frac{1 \text{ ft}}{12 \text{ in}} \]
   \[ UA = 446.2 \text{ ft} \]

BONUS g) A pitcher throws a ball at 45 m/s, how fast is this in mi/hr? See the info below for help.

1 ft = 12 in
1 yd = 3 ft
1 mi = 5280 ft

\[ UA = 45 \text{ m/s} \times \frac{60 \text{ s}}{1 \text{ min}} \times \frac{60 \text{ mins}}{1 \text{ hr}} \times \frac{100 \text{ cm}}{1 \text{ m}} \times \frac{1 \text{ in}}{2.54 \text{ cm}} \times \frac{1 \text{ in}}{12 \text{ in}} \times \frac{1 \text{ mi}}{5280 \text{ ft}} \]

\[ UA = 100.7 \text{ mi/hr} \]
More unit conversions

1. If there are \(6.02 \times 10^{23}\) atoms in one mole, how many atoms are there in 5.8 moles?
\[
UA = \text{atoms} \\
\text{1} \; \text{mole} = 5.8 \; \text{mol} \\
\text{CF} = \frac{6.02 \times 10^{23}}{1 \; \text{mol}} \\
UA = 5.8 \; \text{mol} \left(\frac{6.02 \times 10^{23} \; \text{atoms}}{1 \; \text{mol}}\right) \\
UA = 3.5 \times 10^{24} \; \text{atoms}
\]

2. If there’s \(6.02 \times 10^{23}\) atoms in one mole and there’s 22.4L in a mole of gas, how many atoms are there in 30 litres of a gas?
\[
UA = \text{atoms} \\
\text{1} \; \text{mol} = 22.4 \; \text{L} \\
\text{CF} = \frac{6.02 \times 10^{23} \; \text{atoms}}{1 \; \text{mol}} \\
UA = 22.4 \; \text{L} \left(\frac{1 \; \text{mol}}{22.4 \; \text{L}}\right) \left(\frac{6.02 \times 10^{23} \; \text{atoms}}{1 \; \text{mol}}\right) \\
UA = 8 \times 10^{23} \; \text{atoms}
\]

3a. How many mg in 47 g?
\[
47 \; \text{g} \left(\frac{1000 \; \text{mg}}{1 \; \text{g}}\right) \\
= 47 \times 10^3 \; \text{mg}
\]

b. How many ms in 5 s?
\[
5 \; \text{s} \left(\frac{1000 \; \text{ms}}{1 \; \text{s}}\right) \\
= 5 \times 10^3 \; \text{ms}
\]

c. How many Litres are in 5 micro litres?
\[
5 \; \mu\text{L} \left(\frac{1 \; \text{mL}}{1000 \; \mu\text{L}}\right) \left(\frac{1 \; \text{L}}{1000 \; \text{mL}}\right) \\
= 5 \times 10^{-6} \; \text{L}
\]

d. How many micrograms in 7.8 kg
\[
7.8 \; \text{kg} \left(\frac{1000 \; \text{g}}{1 \; \text{kg}}\right) \left(\frac{1 \; \text{g}}{1000 \; \text{mg}}\right) \left(\frac{1000 \; \mu\text{g}}{1 \; \text{g}}\right) \\
= 7.8 \times 10^9 \; \mu\text{g}
\]

e. How many cm in 14 Mm?
\[
14 \; \text{Mm} \left(\frac{1 \times 10^6 \; \text{cm}}{1 \; \text{Mm}}\right) \left(\frac{100 \; \text{cm}}{1 \; \text{m}}\right) \\
= 14 \times 10^8 \; \text{cm}
\]

e. How many kg/m are in 5 Mg/cm?
\[
7 \; \text{kg} \left(\frac{100 \; \text{cm}}{1 \; \text{m}}\right) \left(\frac{10^6 \; \text{g}}{1 \; \text{kg}}\right) \left(\frac{1 \; \text{kg}}{1000 \; \text{g}}\right) \\
= 5 \times 10^5 \; \text{kg/m}
\]
1. State the distance (in centimetres) indicated, give the uncertainty, and give the number of significant figures.

\[ \text{a)} \quad 17 \quad 18 \quad 10 \quad 15 \quad 100 \quad 110 \quad \text{b)} \quad 17.5 \pm 0.01 \quad 11.1 \pm 0.1 \quad 106.5 \pm 0.2 \quad 1.5 \pm 0.1 \quad 124.6 \pm 0.01 \]

2. Answer each of the questions for the following measuring situations:

   a. A student weighing a beaker on an electronic balance sees the following number:

   \[ 123.62 \text{ g (with the last digit fluctuating between } 123.6\text{ g or 123.7 g)} \]

   uncertainty

   What is the uncertainty in this measurement? \[ 123.6 \pm 0.01 \text{ g} \]

   b. A student weighs a beaker on a triple-beam balance and records:

   \[ 56 \text{ g} \]

   Is this measurement showing the correct amount of precision? Explain why or why not? No, a triple-beam balance measures to 0.1 g so the uncertain digit should be 0.01.

   c. A student places water into a 25 ml graduated cylinder as shown:

   \[ 15 \text{ ml} \]

   What is the correct reading and what is the uncertainty?

   \[ 13.5 \pm 0.1 \]

   d. A student place some water in a 100 ml graduated cylinder as shown:

   \[ 80 \text{ ml} \]

   What is the reading and the uncertainty associated with this graduated cylinder?

   \[ 66.0 \pm 0.4 \text{ ml} \]