Station 1

Scientific notation: Put the following in correct scientific notation:

1. 56 000 000 000
2. 0.000 98
3. -0.198 765
4. 650 000 000
5. 0.000 000 000 000 060 7

Take the following out of scientific notation:

4. 2.56×10^{-6}
5. 9.03×10^{8}
6. -3.00×10^{-3}

Scientific notation: Answer each in correct scientific notation and with correct SF:

7. $(7.6 \times 10^{-11})\ (6.1 \times 10^{9})$
8. $\dfrac{3.58x10^{-12}}{6.0x10^{8}}$
9. $8.97 - 2.1097$
10. $31.29 + 901.2$
11. $(9.8 \times 10^{-34})\ (7 \times 10^{14})$
12. $\dfrac{5.6x10^{8}}{3.19x10^{12}}$

Station 2

Significant figures: Determine the number of sig figs in the following numbers:

1. 608 cm
2. 200 kg
3. 0.007 00 m
4. 310.000 000 pg
5. 809 000 km
6. 0.089 0 μL

Sig figs: Answer the following calculations with the correct units and sig figs:

7. 89.04 + 304.6
8. $(3.5x10^3)*(300)$
9. 4.5m * 3.00 m
10. $\frac{8.700\ cm}{3.2\ cm}$
11. 7.80 m + 4 m + 78.2 m
12. 0.64 mm – 4.3 mm - 0.200 mm

Station 3

Measure the following. Make sure all measurements include the correct number of digits and appropriate units!

1. 100 mL graduated cylinder
2. 50 mL graduated cylinder
3. 25 mL graduated cylinder
4. 10 mL graduated cylinder
5. Ruler
6. Triple beam balance
7. Electronic balance

Station 4

Complete the following conversions. Show all work! Be sure your answers contain units and correct SF.

1. How many cm are in 5.6×10^{-4} km?
2. If you run at 7.5 mi/hr, how many minutes will it take to run 12.0 miles?
3. How many micrograms are in 45.6 kilograms?
4. Convert 35.38 mL to L.
5. How many inches are in 4.5×10^{-4} miles? (5280 ft = 1 mi)

Station 5

Complete the following conversions. Show all work! Be sure your answers contain units and correct SF.

6. How many seconds are in one century? Use 3 SF in answer (1 century = 100 years, 1 year = 365 days)

7. How many meters are in 1050 cm?

8. A cheetah can run at a speed of 27 m/s for up to 460 m. How far will your favorite chemistry teacher run during the same time? (Average speed 2.9 m/s)

Station 6

1. Describe the picture at right qualitatively and quantitatively.

2. Three different students collected the following data for the density of a piece of plastic:

	Student A	Student B	Student C
Trial 1	1.54 g/cm^3	1.40 g/cm^3	1.70 g/cm^3
Trial 2	1.60 g/cm^3	1.68 g/cm^3	1.69 g/cm^3
Trial 3	1.57 g/cm^3	1.45 g/cm^3	1.71 g/cm^3
Average	1.57 g/cm^3	1.51 g/cm^3	1.70 g/cm^3

   The accepted value should be 1.59 g/cm^3. Discuss each student's accuracy and precision.

3. Calculate the percent error for student C's average density.

4. You measure the length of a nail. Your measurements are 4.69 cm, 3.72 cm, and 8.15 cm. Are these measurements accurate (true length = 5.00 cm)? Precise?

5. Give some accurate measurements. Give some precise measurements. Give some measurements that are both. Some that are neither.

Station 7

1. What is the law of conservation of mass?

2. Give an example of the law of conservation of mass.

3. Design an experiment (NOT alka seltzer!) that can be used to support the law of conservation of mass.

4. Hydrogen peroxide decomposes into oxygen and hydrogen. If 68.0 g of hydrogen peroxide decomposes and forms 4.0 g hydrogen, how much oxygen will be produced?

Station 1

Scientific notation: Put the following in correct scientific notation:

1. 56 000 000 000 $5.6 \cdot 10^{10}$
2. 0.000 98 $9.8 \cdot 10^{-4}$
3. -0.198 765 $-1.98765 \cdot 10^{-1}$
4. 650 000 000 $6.5 \cdot 10^{8}$
5. 0.000 000 000 000 060 7 $6.07 \cdot 10^{-14}$

Take the following out of scientific notation:

4. 2.56×10^{-6} .00000256
5. 9.03×10^{8} 903000000
6. -3.00×10^{-3} -.00300

Scientific notation: Answer each in correct scientific notation and with correct SF:

7. $(7.6 \times 10^{-11})(6.1 \times 10^{9})$ .4636 = .46
8. $\frac{3.58 \times 10^{-12}}{6.0 \times 10^{8}}$ $5.96667 \cdot 10^{-21} = 6.0 \cdot 10^{-21}$
9. ~~$8.9 \times 10^{7} - 2.1 \times 10^{5}$~~ $8.97 - 2.1097 = 6.8603 = 6.86$
10. ~~$3.29 \times 10^{4} + 1.21 \times 10^{5}$~~ $31.29 + 901.2 = 932.49 = 932.5$
11. $(9.8 \times 10^{-34})(7 \times 10^{14})$ $= 6.86 \cdot 10^{-19} = 7 \cdot 10^{-19}$
12. $\frac{5.6 \times 10^{8}}{3.19 \times 10^{12}}$ $= 1.75549 \cdot 10^{-4} = 1.8 \cdot 10^{-4}$

Station 2

Significant figures: Determine the number of sig figs in the following numbers:

1. 608 cm 3
2. 200 kg 1
3. 0.007 00 m 3
4. 310.000 000 pg 9
5. 809 000 km 3
6. 0.089 0 µL 3

Sig figs: Answer the following calculations with the correct units and sig figs:

7. 89.04 + 304.6 393.64 = 393.6
8. $(3.5 \times 10^3) * (300)$ 1050000 = 1000000 $(1 \cdot 10^6)$
9. 4.5m * 3.00 m ~~13.5 m²~~ 14 m²
10. $\frac{8.700\ \text{cm}}{3.2\ \text{cm}}$ 2.71875 = 2.7
11. 7.80 m + 4 m + 78.2 m = 90. m
12. 0.64 mm – 4.3 mm - 0.200 mm = -3.86 = -3.9 mm

Station 3

Measure the following. Make sure all measurements include the correct number of digits and appropriate units!

1. 100 mL graduated cylinder should have 1 decimal
2. 50 mL graduated cylinder 1 decimal
3. 25 mL graduated cylinder 1 decimal
4. 10 mL graduated cylinder 2 decimal
5. Ruler 2 decimal
6. Triple beam balance 2 decimal
7. Electronic balance 2 decimal (don't add additional decimals)

Station 4

Complete the following conversions. Show all work! Be sure your answers contain units and correct SF.

1. How many cm are in 5.6×10^{-4} km?
2. If you run at 7.5 mi/hr, how many minutes will it take to run 12.0 miles?
3. How many micrograms are in 45.6 kilograms?
4. Convert 35.38 mL to L.
5. How many inches are in 4.5×10^{-4} miles? (5280 ft = 1 mi)

① $5.6 \cdot 10^{-4}\ \text{km} \left| \frac{1000\ \text{m}}{1\ \text{km}} \right| \frac{100\ \text{cm}}{1\ \text{m}} = 5.6 \cdot 10^{1}\ \text{cm} = 56\ \text{cm}$

② $12.0\ \text{mi} \left| \frac{1\ \text{hr}}{7.5\ \text{mi}} \right| \frac{60\ \text{min}}{1\ \text{hr}} = 96\ \text{min}$

③ $45.6\ \text{kg} \left| \frac{1000\ \text{g}}{1\ \text{kg}} \right| \frac{1 \cdot 10^{6}\ \mu\text{g}}{1\ \text{g}} = 4.56 \cdot 10^{10}\ \mu\text{g}$

⑭ $35.38\ \text{mL} \left| \frac{1\ \text{L}}{1000\ \text{mL}} \right. = 3.538 \cdot 10^{-2}\ \text{L} = .03538\ \text{L}$

⑤ $4.5 \cdot 10^{-4}\ \text{mi} \left| \frac{5280\ \text{ft}}{1\ \text{mi}} \right| \frac{12\ \text{in}}{1\ \text{ft}} = 28.512 = 29\ \text{in}$

Station 5

Complete the following conversions. Show all work! Be sure your answers contain units and correct SF.

6. How many seconds are in one century? (1 century = 100 years, 1 year = 365 days)
7. How many meters are in 1050 cm?
8. A cheetah can run at a speed of 27 m/s for up to 460 m. ~~How long will it take your favorite chemistry teacher, running at a speed of 2.9 m/s, to run the same distance?~~

(6) $\frac{1 \text{ century}}{1 \text{ century}} \left| \frac{100 \text{ yrs}}{1 \text{ yr}} \right| \frac{365 \text{ days}}{1 \text{ day}} \left| \frac{24 \text{ hr}}{1 \text{ hr}} \right| \frac{60 \text{ min}}{1 \text{ min}} \left| \frac{60 \text{ s}}{} \right.$

$= 3.1536 \cdot 10^9 \text{ s} = \boxed{3.15 \cdot 10^9 \text{ s}}$

(7) $\frac{1050 \text{ cm}}{} \left| \frac{1 \text{ m}}{100 \text{ cm}} \right. = \boxed{10.5 \text{ m}}$

(8) $\frac{460 \text{ m}}{} \left| \frac{1 \text{ s}}{27 \text{ m}} \right. = 17 \text{ s}$

$\frac{17 \text{ s}}{} \left| \frac{2.9 \text{ m}}{1 \text{ s}} \right. = \boxed{49 \text{ m}}$

Station 6

1. Describe the picture at right qualitatively and quantitatively.
   quant examples - volume, mass, # bubbles
   qual ex - shape, color

2. Three different students collected the following data for the density of a piece of plastic:

	Student A	Student B	Student C
Trial 1	1.54 g/cm^3	1.40 g/cm^3	1.70 g/cm^3
Trial 2	1.60 g/cm^3	1.68 g/cm^3	1.69 g/cm^3
Trial 3	1.57 g/cm^3	1.45 g/cm^3	1.71 g/cm^3
Average	1.57 g/cm^3	1.51 g/cm^3	1.70 g/cm^3

   The accepted value should be 1.59 g/cm^3. Discuss each student's accuracy and precision.

3. Calculate the percent error for student C's average density.

4. You measure the length of a nail. Your measurements are 4.69 cm, 3.72 cm, and 8.15 cm. Are these measurements accurate (true length = 5.00 cm)? Precise?
   no no

5. Give some accurate measurements. Give some precise measurements. Give some measurements that are both. Some that are neither.

(2) Student A
fairly precise - measurements are close to each other
fairly accurate - close to accepted

Student B
not precise, not accurate

Student C
Precise, not accurate

(3) $\frac{|A-E|}{A} \cdot 100 = \frac{|1.59-1.70|}{1.59} \cdot 100 = 6.9\%$

(5) Accurate measurements should be close to true value
Precise measurements - have a lot of decimals
a group of measurements that are close to each other

Station 7

1. What is the law of conservation of mass?
2. Give an example of the law of conservation of mass.
3. Design an experiment (NOT alka seltzer!) that can be used to support the law of conservation of mass.
4. Hydrogen peroxide decomposes into oxygen and hydrogen. If 68.0 g of hydrogen peroxide decomposes and forms 4.0 g hydrogen, how much oxygen will be produced?

① Mass is conserved - during a reaction, mass stays the same
mass before = mass after

② Ms. Liefer + Ben & Jerry's = 

70.00kg + .37 kg = 70.37 kg

③ Design your own. should be a closed system if necessary

④ Hydrogen peroxide → oxygen + hydrogen
68.0 g → 64.0 g + 4.0 g