Chapter 1 Review Problems

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1.1) Classify each of the following statements as a **theory** or as a **law**.

a) A description that predicts what happens, but does not explain *why* it happens.

b) An explanation that has been tested and verified.

c) After many experiments, scientists explain that matter is composed of atoms.

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1.1) Classify each of the following statements as a **theory** or as a **law**.

a) A description that predicts what happens, but does not explain *why* it happens.

b) An explanation that has been tested and verified.

c) After many experiments, scientists explain that matter is composed of atoms.

HINT:

- A **theory** involves an ***explanation*** (or a model).
- A **law** is a general statement about something that repeatedly occurs, but ***does not*** explain why.

For more help: See chapter 1 part 1 video or chapter 1 section 2 in the textbook.

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1.1) Classify each of the following statements as a **theory** or as a **law**.

a) A description that predicts what happens, but does not explain *why* it happens. **law**

b) An explanation that has been tested and verified. **theory**

c) After many experiments, scientists explain that matter is composed of atoms. **theory**

Explanation:

- A **theory** involves an ***explanation*** (or a model).
- A **law** is a general statement about something that repeatedly occurs, but ***does not*** explain why.

For more details: See chapter 1 part 3 video or chapter 1 section 4 in the textbook.

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1.2) Write an "**N**" above any digit that is **not** significant, and write an "S" above any digit that is significant in the value shown below.

0.03060

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1.2) Write an "**N**" above any digit that is **not** significant, and write an "S" above any digit that is significant in the value shown below.

0.03060

HINT: To find which digits are significant:

- If the decimal point is present, as it is in this problem, starting from the left and moving right, all numbers (including zeros) beginning with the first non-zero number are significant.
- Any other zeros in a number are not significant.

For more help: See chapter 1 part 3 video or chapter 1 section 4 in the textbook.

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1.2) Write an "N" above any digit that is **not** significant, and write an "S" above any digit that is significant in the value shown below.

$$\overset{N}{0}.\overset{N}{0}\overset{S}{3}\overset{S}{0}\overset{S}{6}\overset{S}{0}$$

EXPLANATION: To find which digits are significant:

- If the decimal point is present, as it is in this problem, starting from the left and moving right, all numbers (including zeros) beginning with the first non-zero number are significant.
- Any other zeros in a number are not significant.

For more details: See chapter 1 part 3 video or chapter 1 section 4 in the textbook.

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1.3) Write an “**N**” above any digit that is **not** significant, and write an “S” above any digit that is significant in the value shown below.

10.05200

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1.3) Write an “**N**” above any digit that is **not** significant, and write an “S” above any digit that is significant in the value shown below.

10.05200

HINT: To find which digits are significant:

- If the decimal point is present, as it is in this problem, starting from the left and moving right, all numbers (including zeros) beginning with the first non-zero number are significant.
- Any other zeros in a number are not significant.

For more help: See chapter 1 part 3 video or chapter 1 section 4 in the textbook.

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1.3) Write an “N” above any digit that is **not** significant, and write an “S” above any digit that is significant in the value shown below.

S S S S S S S

10.05200

EXPLANATION: To find which digits are significant:

- If the decimal point is present, as it is in this problem, starting from the left and moving right, all numbers (including zeros) beginning with the first non-zero number are significant.
- Any other zeros in a number are not significant.

For more details: See chapter 1 part 3 video or chapter 1 section 4 in the textbook.

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1.4) Write an "**N**" above any digit that is **not** significant, and write an "S" above any digit that is significant in the value shown below.

7200

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1.4) Write an “**N**” above any digit that is **not** significant, and write an “S” above any digit that is significant in the value shown below.

7200

HINT: To find which digits are significant:

- If the decimal point is **absent**, as in this problem, starting from the right and moving left, all numbers (including zeros) *beginning with the first non-zero number* are significant.
- Any other zeros in a number are not significant.

For more help: See chapter 1 part 3 video or chapter 1 section 4 in the textbook.

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1.4) Write an “N” above any digit that is **not** significant, and write an “S” above any digit that is significant in the value shown below.

S S N N
7200

EXPLANATION: To find which digits are significant:

- If the decimal point is absent, as in this problem, starting from the right and moving left, all numbers (including zeros) beginning with the first non-zero number are significant.
- Any other zeros in a number are not significant.

For more details: See chapter 1 part 3 video or chapter 1 section 4 in the textbook.

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1.5) Identify how many significant figures are in each of these values.

a) 32
b) 302
c) 0.504
d) 0.0504
e) 630
f) 600
g) 6030
h) 600.
i) 5.0603 x 10^5

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1.5) Identify how many significant figures are in each of these values.

a) 32
b) 302
c) 0.504
d) 0.0504
e) 630
f) 600
g) 6030
h) 600.
i) 5.0603×10^5

HINT: To find which digits are significant:

- If the decimal point is **present**, starting from the left and moving right, all numbers (including zeros) beginning with the first non-zero number are significant.
- If the decimal point is **absent**, starting from the right and moving left, all numbers (including zeros) beginning with the first non-zero number are significant.
- Any other zeros in a number are not significant.
- For scientific notation, 10^n is not significant.

For more help: See chapter 1 part 3 video or chapter 1 section 4 in the textbook.

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1.5) Identify how many significant figures are in each of these values.

a) 32 two significant figures

b) 302 three significant figures

c) 0.504 three significant figures

d) 0.0504 three significant figures

e) 630 two significant figures

f) 600 one significant figure

g) 6030 three significant figures

h) 600. three significant figures

i) 5.0603 x 10^5 five significant figures

EXPLANATION: To find which digits are significant:

- If the decimal point is **present**, starting from the left and moving right, all numbers (including zeros) beginning with the first non-zero number are significant.
- If the decimal point is **absent**, starting from the right and moving left, all numbers (including zeros) beginning with the first non-zero number are significant.
- Any other zeros in a number are not significant.
- For scientific notation, 10^n is not significant.

For more details: See chapter 1 part 3 video or chapter 1 section 4 in the textbook.

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1.6) Round each number to **two** significant figures.

a) 233.356

b) 0.002353

c) 1.005

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1.6) Round each number to **two** significant figures.

a) 233.356

b) 0.002353

c) 1.005

HINT: If the left-most digit that is to be dropped is the number five or greater (5 through 9), round up. Round up by adding "1" to the last (right-most) un-dropped digit.

For more help: See chapter 1 part 3 video or chapter 1 section 4 in the textbook.

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1.6) Round each number to **two** significant figures.

a) 23|3.356 ➡ **230 or 2.3×10^2** Note: In order to keep the "2" in the hundreds decimal place, we must add a "0" **or** use scientific notation.

b) 0.0023|53 ➡ **0.0024 or 2.4×10^{-3}**

c) 1.0|05 ➡ **1.0**

EXPLANATION: If the left-most digit that is to be dropped is the number five or greater (5 through 9), round up. Round up by adding "1" to the last (right-most) un-dropped digit.

For more details: See chapter 1 part 3 video or chapter 1 section 4 in the textbook.

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1.7) Round each number to **three** significant figures.

a) 0.046549

b) 2044.987

c) 3.0007

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1.7) Round each number to **three** significant figures.

a) 0.046549

b) 2044.987

c) 3.0007

HINT: If the left-most digit that is to be dropped is the number five or greater (5 through 9), round up. Round up by adding "1" to the last (right-most) un-dropped digit.

For more help: See chapter 1 part 3 video or chapter 1 section 4 in the textbook.

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1.7) Round each number to **three** significant figures.

a) 0.046549 → **0.0465 or 4.65 x 10^{-2}**

b) 2044.987 → **2040 or 2.04 x 10^3** Note: In order to keep the "2" in the hundreds decimal place, we must add a "0" **or** use scientific notation.

c) 3.0007 → **3.00**

EXPLANATION: If the left-most digit that is to be dropped is the number five or greater (5 through 9), round up. Round up by adding "1" to the last (right-most) un-dropped digit.

For more details: See chapter 1 part 3 video or chapter 1 section 4 in the textbook.

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1.8) Perform the following calculations. Be sure to round your answer to the ***correct number of significant figures***.

a) $$\frac{(6.626 \text{ x } 10^{-34})\ (2.9979 \text{ x } 10^{8})}{4.310 \text{ x } 10^{-7}} = \ ?$$

b) $$\frac{(6.022 \text{ x } 10^{23})\ (0.759)}{20.18} = \ ?$$

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1.8) Perform the following calculations. Be sure to round your answer to the ***correct number of significant figures***.

a) $$\frac{(6.626 \times 10^{-34})\,(2.9979 \times 10^{8})}{4.310 \times 10^{-7}} = ?$$

b) $$\frac{(6.022 \times 10^{23})\,(0.759)}{20.18} = ?$$

HINT:

- When doing **multiplication and/or division** with measured values, the answer should have the *same number of significant figures* as the measured value with the ***least*** number of significant figures.
- When doing **addition and/or subtraction** with measured values, the answer should have the ***same precision*** as the least precise measurement (value) used in the calculation.

For more help: See chapter 1 part 4 video or chapter 1 section 4 in the textbook.

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1.8) Perform the following calculations. Be sure to round your answer to the ***correct number of significant figures***.

a)

$$\frac{\boxed{\overset{\text{4 sig. figs.}}{(6.626 \times 10^{-34})}}\boxed{\overset{\text{5 sig. figs.}}{(2.9979 \times 10^{8})}}}{\boxed{\underset{\text{4 sig. figs.}}{4.310 \times 10^{-7}}}} = \boxed{\begin{array}{c}\mathbf{4.609 \times 10^{-19}} \\ \text{4 sig. figs.}\end{array}}$$

b)

$$\frac{\boxed{\overset{\text{4 sig. figs.}}{(6.022 \times 10^{23})}}\boxed{\overset{\text{3 sig. figs.}}{(0.759)}}}{\boxed{\underset{\text{4 sig. figs.}}{20.18}}} = \boxed{\begin{array}{c}\mathbf{2.26 \times 10^{22}} \\ \text{3 sig. figs.}\end{array}}$$

EXPLANATION:

- When doing **multiplication and/or division** with measured values, the answer should have the *same number of significant figures* as the measured value with the ***least*** number of significant figures.

For more details: See chapter 1 part 4 video or chapter 1 section 4 in the textbook.

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1.9) Perform the following calculations. Be sure to round your answer to the ***correct number of significant figures***.

a) $9 + 2.8 =$ **?**

b) $0.135 + 0.6 =$ **?**

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1.9) Perform the following calculations. Be sure to round your answer to the ***correct number of significant figures***.

a) $9 + 2.8 =$ **?**

b) $0.135 + 0.6 =$ **?**

HINT: A common mistake is for student to use the multiplication/division rule *instead of* the addition/subtraction rule. Both rules are shown below:

- When doing **multiplication and/or division** with measured values, the answer should have the *same number of significant figures* as the measured value with the ***least*** number of significant figures.
- When doing **addition and/or subtraction** with measured values, the answer should have the ***same precision*** as the least precise measurement (value) used in the calculation.

For more help: See chapter 1 part 4 video or chapter 1 section 4 in the textbook.

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1.9) Perform the following calculations. Be sure to round your answer to the ***correct number of significant figures***.

a) 9 + 2.8 = **12**

9 ← **least precise value (precise to the one's decimal place)**
\+ 2.8

11.8 (unrounded)
12 (correctly rounded to the one's decimal place)

b) 0.135 + 0.6 = **0.7**

0.135
\+ 0.6 ← **least precise value (precise to the tenth's decimal place)**

0.735 (unrounded)
0.7 (correctly rounded to the tenth's decimal place)

EXPLANATION: A common mistake is for student to use the multiplication/division rule *instead of* the addition/subtraction rule. The rule for significant figures in addition/subtraction problems is:

- When doing **addition and/or subtraction** with measured values, the answer should have the ***same precision*** as the least precise measurement (value) used in the calculation.

For more details: See chapter 1 part 4 video or chapter 1 section 4 in the textbook.

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1.10) Perform the following calculations. Be sure to round your answer to the ***correct number of significant figures***.

a) 101 - 99.1 = **?**

b) 0.5 + 9.8 = **?**

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1.10) Perform the following calculations. Be sure to round your answer to the ***correct number of significant figures***.

a) 101 - 99.1 = **?**

b) 0.5 + 9.8 = **?**

HINT: A common mistake is for student to use the multiplication/division rule *instead of* the addition/subtraction rule. Both rules are shown below:

- When doing **multiplication and/or division** with measured values, the answer should have the *same number of significant figures* as the measured value with the ***least*** number of significant figures.
- When doing **addition and/or subtraction** with measured values, the answer should have the ***same precision*** as the least precise measurement (value) used in the calculation.

For more help: See chapter 1 part 4 video or chapter 1 section 4 in the textbook.

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1.10) Perform the following calculations. Be sure to round your answer to the ***correct number of significant figures***.

a) 101 - 99.1 = **2**

101 ← **least precise value (precise to the one's decimal place)**
- 99.1

1.9 (unrounded)

2 (correctly rounded to the one's decimal place)

b) 0.5 + 9.8 = **10.3**

0.5
+ 9.8

both values have the *same* precision (precise to the tenth's decimal place)

10.3 (correctly rounded to the tenth's decimal place)

EXPLANATION: A common mistake is for student to use the multiplication/division rule *instead of* the addition/subtraction rule. The rule for significant figures in addition/subtraction problems is:

- When doing **addition and/or subtraction** with measured values, the answer should have the ***same precision*** as the least precise measurement (value) used in the calculation.

For more details: See chapter 1 part 4 video or chapter 1 section 4 in the textbook.

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1.11) Perform the following calculations. Be sure to round your answer to the ***correct number of significant figures***.

a) $\dfrac{29.12}{3.26} = ?$

b) $9 + 2.8 - 0.135 = ?$

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1.11) Perform the following calculations. Be sure to round your answer to the ***correct number of significant figures***.

a) $\dfrac{29.12}{3.26} = ?$

b) $9 + 2.8 - 0.135 = ?$

HINT: A common mistake is for student to use the multiplication/division rule *instead of* the addition/subtraction rule. Both rules are shown below:

- When doing **multiplication and/or division** with measured values, the answer should have the *same number of significant figures* as the measured value with the ***least*** number of significant figures.
- When doing **addition and/or subtraction** with measured values, the answer should have the ***same precision*** as the least precise measurement (value) used in the calculation.

For more help: See chapter 1 part 4 video or chapter 1 section 4 in the textbook.

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1.11) Perform the following calculations. Be sure to round your answer to the ***correct number of significant figures***.

a)

4 sig. figs.

$$\frac{29.12}{3.26}$$

3 sig. figs.

= 8.93 3 sig. figs.

b) 9 + 2.8 - 0.135 = **12**

9 ← **least precise value (precise to the one's decimal place)**

+ 2.8

- 0.135

11.665 (unrounded)

12 (correctly rounded to the one's decimal place)

EXPLANATION: A common mistake is for student to use the multiplication/division rule *instead of* the addition/subtraction rule. The rule for significant figures in addition/subtraction problems is:

- When doing **multiplication and/or division** with measured values, the answer should have the *same number of significant figures* as the measured value with the ***least*** number of significant figures.

- When doing **addition and/or subtraction** with measured values, the answer should have the ***same precision*** as the least precise measurement (value) used in the calculation.

For more details: See chapter 1 part 4 video or chapter 1 section 4 in the textbook.

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1.12) While studying abroad in France, you offer to bake your grandmother's famous cookies for other students in your program. You have a recipe that requires 5.95 lb. (pounds) of flour, but of course in France you will need to purchase flour in kilograms (kg). How many kilograms of flour does the recipe require?

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HINT: This is a unit conversion problem. You need to know the relationship between kilograms and pounds: 1 kg = 2.20 lb.

For more help: See chapter 1 part 5 video or chapter 1 section 5 in the textbook.

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ANSWER: **2.70 kg**

CLICK HERE to see the **complete solution** for this problem

For more details: See chapter 1 part 5 video or chapter 1 section 5 in the textbook.

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1.12) While studying abroad in France, you offer to bake your grandmother's famous cookies for other students in your program. You have a recipe that requires 5.95 lb. (pounds) of flour, but of course in France you will need to purchase flour in kilograms (kg). How many kilograms of flour does the recipe require?

ANSWER: **2.70 kg**

$$\begin{array}{c|c|} 5.95\ \cancel{\text{lb}}. & 1\ \text{kg} \\ \hline & 2.20\ \cancel{\text{lb}}. \end{array} = \mathbf{2.70\ kg}$$

EXPLANTION: This is a unit conversion problem. You needed to know the relationship between kilograms and pounds: 1 kg = 2.20 lb.

For more details: See chapter 1 part 5 video or chapter 1 section 5 in the textbook.

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1.13) Calculations for doses of medication are unit conversion problems. The medication label on Rocephin, a broad-spectrum antibiotic, shows a dosage of 50.0 mg Rocephin per kg of bodyweight for infants. How many mg of Rocephin should be administered to an infant that has a 7.55 kg bodyweight.

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HINT: Convert from units of "mg Rocephin" to "kg of bodyweight."

For more help: See chapter 1 part 5 video or chapter 1 section 5 in the textbook.

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1.13) Calculations for doses of medication are unit conversion problems. The medication label on Rocephin, a broad-spectrum antibiotic, shows a dosage of 50.0 mg Rocephin per kg of bodyweight for infants. How many mg of Rocephin should be administered to an infant that has a 7.55 kg bodyweight.

ANSWER: 378 mg Rocephin

CLICK HERE to see the **complete solution** for this problem

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1.13) Calculations for doses of medication are unit conversion problems. The medication label on Rocephin, a broad-spectrum antibiotic, shows a dosage of 50.0 mg Rocephin per kg of bodyweight for infants. How many mg of Rocephin should be administered to an infant that has a 7.55 kg bodyweight. **ANSWER: 378 mg Rocephin**

EXPLANATION: Convert from units of "mg Rocephin" to "kg of bodyweight."

$$\frac{7.55\ \cancel{\text{kg bodyweight}}}{\ } \left| \underbrace{\frac{50.0\ \text{mg Rocephin}}{1\ \cancel{\text{kg bodyweight}}}} \right| = \mathbf{378\ mg\ Rocephin}$$

Use the dosage 50.0 mg Rocephin = 1 per kg of bodyweight as a conversion factor.

For more details: See chapter 1 part 5 video or chapter 1 section 5 in the textbook.

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1.14) Identify the "base unit" and the "metric prefix" in each of these metric system units shown below by writing a "B" above the the base unit and an "M" above the metric prefix.

a) mL

b) kg

c) nm

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1.14) Identify the "base unit" and the "metric prefix" in each of these metric system units shown below by writing a "B" above the the base unit and an "M" above the metric prefix.

a) mL

b) kg

c) nm

HINT: Here is an example as a hint for this problem. One way to simplify working with large or small numbers is to use metric prefixes. For example, the volume of blood required for diabetics to measure blood glucose levels in modern glucometers is about 0.0000005 L. Instead of writing all those zeros, it is much more practical to use a **metric prefix** and write:

$$0.5\ \underbrace{\mu}_{\text{The Metric Prefix}}\underbrace{\text{L}}_{\text{The Base Unit}}$$

Here we see the micro (μ) prefix. The metric prefix tells the fraction or multiple of the base unit(s). For example: $1 \text{ x } 10^{6}\ \mu\text{L} = 1\text{ L}$

The **base unit** can be any metric unit: liter (L), gram (g), meter (m), joule (J), second (s), calorie (cal), etc.

For more help: See chapter 1 part 7 video or chapter 1 section 5 in the textbook.

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1.14) Identify the “base unit” and the “metric prefix” in each of these metric system units shown below by writing a “B” above the the base unit and an “M” above the metric prefix.

a) $\overset{M}{\mathrm{m}}\overset{B}{\mathrm{L}}$

b) $\overset{M}{\mathrm{k}}\overset{B}{\mathrm{g}}$

c) $\overset{M}{\mathrm{n}}\overset{B}{\mathrm{m}}$

EXPLANATION: **Metric prefixes** precede the base units. The **base unit** can be any metric unit: liter (L), gram (g), meter (m), joule (J), second (s), calorie (cal), etc.

For more details: See chapter 1 part 7 video or chapter 1 section 5 in the textbook.

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1.15) Write the following numbers in scientific notation.

a) 534.7

b) 0.005680

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1.15) Write the following numbers in scientific notation.

a) 534.7

b) 0.005680

HINT: Convert from regular (standard) numerical notation to scientific notation as follows.

Step 1: Move the decimal point to the right of the first (left-most) non-zero number.

- Multiply the resulting number by 10 raised to an exponent.
- The exponent will be equal to the number of decimal places moved.

Step 2: When you move the decimal point to the left, the exponent is positive.

Step 3: When you move the decimal point to the right, the exponent is negative.

For more help: See chapter 1 part 2 video or chapter 1 section 4 in the textbook.

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1.15) Write the following numbers in scientific notation.

a) 534.7 **5.347×10^{2}** The decimal point was moved two places to the left, so the exponent is “2”

b) 0.005680 **5.680×10^{-3}** The decimal point was moved three places to the right, so the exponent is “-3”

EXPLANATION: Convert from regular (standard) numerical notation to scientific notation as follows.

Step 1: Move the decimal point to the right of the first (left-most) non-zero number.

- Multiply the resulting number by 10 raised to an exponent.
- The exponent will be equal to the number of decimal places moved.

Step 2: When you move the decimal point to the left, the exponent is positive.

Step 3: When you move the decimal point to the right, the exponent is negative.

For more details: See chapter 1 part 2 video or chapter 1 section 4 in the textbook.

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1.16) Change the numbers below from scientific notation to regular notation

a) 1.323×10^5

b) 4.509×10^{-3}

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1.16) Change the numbers below from scientific notation to regular notation

a) 1.323×10^5

b) 4.509×10^{-3}

HINT: Converting from Scientific Notation to Regular Notation

Step 1: Note the value of the exponent.

Step 2: The value of the exponent will tell you which direction and how many places to move the decimal point.

- If the value of the exponent is ***positive***, remove the power of ten and move the decimal point that value of places to the ***right***.
- If the value of the exponent is ***negative***, remove the power of ten and move the decimal point that value of places to the ***left***.

For more help: See chapter 1 part 2 video or chapter 1 section 4 in the textbook.

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1.16) Change the numbers below from scientific notation to regular notation

a) 1.323 x 10^5 **132300** The exponent was ***positive* 5**, remove the power of ten and move the decimal point **5** places to the ***right***.

b) 4.509 x 10^{-3} **0.004509** The exponent was ***negative* 3**, remove the power of ten and move the decimal point **3** places to the ***left***.

EXPLANATION: Converting from Scientific Notation to Regular Notation

Step 1: Note the value of the exponent.

Step 2: The value of the exponent will tell you which direction and how many places to move the decimal point.

- If the value of the exponent is ***positive***, remove the power of ten and move the decimal point that value of places to the ***right***.
- If the value of the exponent is ***negative***, remove the power of ten and move the decimal point that value of places to the ***left***.

For more details: See chapter 1 part 2 video or chapter 1 section 4 in the textbook.

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1.17) Convert 71 microliters (μL) to its equivalent in milliliters (mL). Use the correct number of significant figures.

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Click here to **check your answer**

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1.17) Convert 71 microliters (μL) to its equivalent in milliliters (mL). Use the correct number of significant figures.

HINT: In order to convert from μL to mL, the relationship between these units must be known. Use the “equality table” to find the relationship for conversions within the metric system.

The value for the micro (μ) metric prefix is 1 x 10^6. The value for the micro (m) metric prefix is 1000. The equivalence statement is therefore:

1 x 10^6 microliters (μL) = 1000 milliliters (mL)

This equivalence statement is used a the conversation factor.

The values in the equality table are defined/exact and therefore have an infinite number of significant figures.

Equality Table for Conversions within the Metric System

1 base unit (no metric prefix)	
10 d (deci)	0.1 da (deca)
100 c (centi)	0.01 h (hecto)
1000 m (milli)	0.001 k (kilo)
1 x 10^6 μ (micro)	1 x 10^{-6} M (mega)
1 x 10^9 n (nano)	1 x 10^{-9} G (giga)

For more help: See chapter 1 part 7 video or chapter 1 section 5 in the textbook.

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1.17) Convert 71 microliters (μL) to its equivalent in milliliters (mL). Use the correct number of significant figures.

ANSWER: 0.071 mL

CLICK HERE to see the **complete solution** for this problem

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ANSWER: 0.071 mL

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$$\begin{array}{c|c|} 71\ \cancel{\mu\text{L}} & 1000\ \text{mL} \\ \hline & \underbrace{1 \text{ x } 10^6\ \cancel{\mu\text{L}}} \end{array} = \mathbf{0.071\ mL}$$

Use the equivalence statement (**1 x 10^6 μL = 1000 mL**) as the conversation factor.

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For more details: See chapter 1 part 7 video or chapter 1 section 5 in the textbook.

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1.18) Convert 0.00969 meters (m) to its equivalent in nanometers (nm). Use the correct number of significant figures.

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Go to next question

1.18) Convert 0.00969 meters (m) to its equivalent in nanometers (nm). Use the correct number of significant figures.

HINT: In order to convert from meters to nanometers, the relationship between these units must be known. Use the "equality table" to find the relationship for conversions within the metric system.

In this case, the meter (m) is the base unit. When there is no metric prefix preceding the base unit, we use a value of "1" for the base unit in the equivalence statement. The value for the nano metric prefix is 1 x 10^9. The equivalence statement is therefore:

1 meter (m) = 1 x 10^9 nanometers (nm)

This equivalence statement is used a the conversation factor.

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For more help: See chapter 1 part 7 video or chapter 1 section 5 in the textbook.

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1.18) Convert 0.00969 meters (m) to its equivalent in nanometers (nm). Use the correct number of significant figures.

ANSWER: 9690000 nm

CLICK HERE to see the **complete solution** for this problem

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$$\frac{0.00969\ \cancel{\text{m}}}{} \;\Bigg|\; \frac{1 \times 10^9\ \text{nm}}{1\ \cancel{\text{m}}} \;\Bigg| = \mathbf{9690000\ nm}$$

Use the equivalence statement (**1 m = 1 x 10^9 nm**) as the conversation factor.

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For more details: See chapter 1 part 7 video or chapter 1 section 5 in the textbook.

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1.19) Convert the following temperatures:

a) 175 ^{o}C = ________________ K

b) 36 ^{o}C = ________________ ^{o}F

c) 98.6 ^{o}F = ________________ ^{o}C

d) 87 ^{o}F = ________________ K

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This is the last chapter 1 review problem

1.19) Convert the following temperatures:

a) 175 ^{o}C = ____________________ K

b) 36 ^{o}C = ____________________ ^{o}F

c) 98.6 ^{o}F = ____________________ ^{o}C

d) 87 ^{o}F = ____________________ K

HINT: To convert from one temperature unit to another, use the equations given in the table below.

Temperature Units and Related Unit Conversions

Temperature Scale	Unit Symbol	Related Unit Conversions
Celsius (also known as centigrade)	^{o}C	^{o}C = K - 273.15 ^{o}C = (^{o}F - 32) ÷ 1.8
Fahrenheit	^{o}F	^{o}F = (1.8 x ^{o}C) + 32 To convert ^{o}F to K, first convert to ^{o}C, then to K
Kelvin	K	K = ^{o}C + 273.15 To convert K to ^{o}F, first convert to ^{o}C, then to ^{o}F

Note that the 1.8, 32, and 273.15 in the table are ***exact values*** and have an *infinite number of significant figures*.

For more help: See chapter 1 part 8 video or chapter 1 section 5 in the textbook.

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Click here to **check** **your answer**

This is the last chapter 1 review problem

1.19) Convert the following temperatures:

a) 175 ^{o}C = **448** K

b) 36 ^{o}C = **97** ^{o}F

First do the multiplication, (1.8 x 36) = 65 (2 sig figs), then do the addition (65 + exactly 32) = 97

c) 98.6 ^{o}F = **37.0** ^{o}C

First do the subtraction, (98.6 - exactly 32) = 66.6, then do the division (66.6/exactly 1.8) = 37.0. Remember, exact numbers have an infinite number of significant figures; exactly 32 is 32.00000000000000..... ; exactly 1.8 is 1.800000000000000......

d) 87 ^{o}F = **304** K

First convert 87 ^{o}F to 31^{o}C , then convert 31 ^{o}C to 304 K

For more details: See chapter 1 part 8 video or chapter 1 section 5 in the textbook.

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End of Chapter 1 Review Problems