SPH3U UNIVERSITY PHYSICS

REVIEW: MATH SKILLS

Scientific Notation (P.650)

Scientific Notation

In science we frequently encounter numbers which are difficult to write in the traditional way - velocity of light, mass of an electron, distance to the nearest star. **Scientific notation**, or standard notation, is a technique, using powers of ten, for concisely writing unusually large or small numbers.

| Expression | Common decimal notation | Scientific notation |
|-----------------------------|--|--------------------------------------|
| 124.5 million kilometres | 124 500 000 km | 1.245 x 10 ⁸ km |
| 154 thousand picometres | 154 000 pm | 1.54 x 10⁵ pm |
| 602 sextillion molecules | 602 000 000 000 000 000 000 000 molecules | 6.02 x 10 ²³ molecules |
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| Scientific Notation | | | | |
|---|--|--------------------------------------|--|--|
| SCIENTIFIC NOTATION (P.650) uses powers of ten to write large/small numbers | | | | |
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| August 22, 2012 | 31/R - Scientific Notation | 2 | | |
| August 22, 2012 3UR - Scientific Notation 2 | | | | |



Scientific Notation

August 22, 2012

In scientific notation, the number is expressed by:

- 1. writing the correct number of significant digits with one non-zero digit to the left of the decimal point, and then
- 2. multiplying the number by the appropriate power (+ or -) of ten (10).

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3

4

 Scientific Notation

 For example,
 2 394
 0.067

 =
 2.394 x 1000
 =
 6.7 x 0.01

 =
 2.394 x 10³
 =
 6.7 x 10⁻²

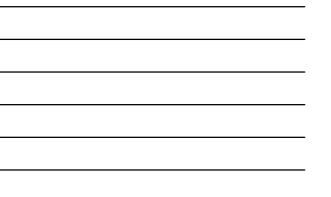
Scientific notation also enables us to show the correct number of significant digits. As such, it may be necessary to use scientific notation in order to follow the rules for certainty (discussed later).

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| Scientific Notati | ion | |
|-----------------------------|--|---|
| PRACTICE | | |
| 1. Express each of the foll | 1. Express each of the following in scientific notation. | |
| (a) 6 807 | 6.807 x 10 ³ | |
| (b) 0.000 053 | 5.3 x 10 ⁻⁵ | |
| (c) 39 879 280 000 | 3.987928 x 10 ¹⁰ | |
| (d) 0.000 000 813 | 8.13 x 10 ⁻⁷ | |
| (e) 0.070 40 | 7.040 x 10 ⁻² | |
| (f) 400 000 000 000 | 4 x 10 ¹¹ | |
| (g) 0.80 | 8.0 x 10 ⁻¹ | |
| (h) 68 | 6.8 x 10 ¹ | |
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| August 22, 2012 | 3UR - Scientific Notation | 5 |

2

| Scientific Nota | tion | |
|--|---------------------------|---|
| PRACTICE | | |
| 2. Express each of the following in common notation. | | |
| (a) 7 × 10 ¹ | 70 | |
| (b) 5.2×10^3 | 5 200 | |
| (c) 8.3×10^9 | 8 300 000 000 | |
| (d) 10.1 × 10 ⁻² | 0.101 | |
| (e) 6.386 8 × 10 ³ | 6 386.8 | |
| (f) 4.086 × 10⁻³ | 0.004 086 | |
| (g) 6.3×10^2 | 630 | |
| (h) 35.0 × 10 ⁻³ | 0.035 0 | |
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| August 22, 2012 | 3UR - Scientific Notation | 6 |
| August 22, 2012 | Sold Scientific Notation | 0 |



| Scientific Notation With Calculators | |
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| On many calculators, scientific notation is entered using a special key, labelled EXP or EE . This key includes " x 10 " from the scientific notation; you need to enter only the exponent. For example, to enter | |
| 7.5 x 10 ⁴ press 7.5 EXP 4 | |
| 3.6 x 10 ⁻³ press 3.6 EXP +/- 3 | |
| NOTE! Depending on the type of calculator you have, the "+/-" signs may need to be entered <u>after</u> the relevant number. | |
| August 22, 2012 3UR - Scientific Notation 7 | |