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| **Set 0. Measurements** |

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| **Skill 0.01: Differentiate between quantity and unit**  **Skill 0.02: Be able to correctly record a measurement**  **Skill 0.03: Understand the relationship between equipment accuracy and reported measurements.** |

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| **Skill 0.01: Differentiate between quantity and unit** |

**Skill 0.01 Concepts**

**Units** describe the **quantity** being measured. Common units encountered in chemistry are shown in table 1.

**Table 1**. Base SI units used in chemistry

|  |  |  |
| --- | --- | --- |
| Quantity | Unit | Abbreviation |
| Length | Meter | m |
| Mass | Kilogram | kg |
| Time | Second | s |
| Temperature | Kelvin | K |
| Amount | Mole | mol |
| Pressure | Atmospheres | atm |

**Skill 0.01 Example 1**

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| Identify the measuring device. Then identify the quantity (length, mass, volume, etc) and corresponding unit that could be used to describe measurements taken with the following instruments: |
| |  |  |  |  | | --- | --- | --- | --- | | Object | Device | Quantity | Unit | |  |  |  |  | |  |  |  |  | |

**Skill 0.01 Exercise 1**

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| **Skill 0.02: Be able to correctly record a measurement** |

**Skill 0.02 Concepts**

A measurement must always reflect the accuracy of the measuring instrument.

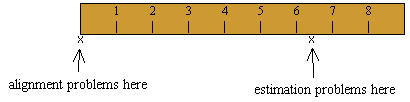
Sample 1:



cm

You can see that the measurement is somewhere in between 3 and 4 cm. It appears to be *about* half-way and so you might record the measurement as 3.5 cm or 3.4 cm. Notice the last digit is estimated, but is still included. The number of significant figures in this measurement is 2 (the certain digit “3” plus the last estimated digit).

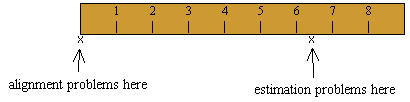
Sample 2:



cm

This measurement is between the 0 and 1 and so you might record the measurement as 0.3 cm or 0.4 cm. Notice that in both measurements the only digit recorded is estimated. The number of significant figures in this measurement is 1 (1 estimated digit).

Sample 3:



cm

This measurement appears to be exactly on the 3. However it should be reported as 3.0 cm NOT simply 3. This is because every measurement taken with this device can be recorded to the tenths. 3.0 cm reflects the accuracy of the instrument whereas 3 does not. The number of significant figures in this measurement is therefore 2.

**Skill 0.02 Example 1**

|  |  |  |
| --- | --- | --- |
| Record the measurement for each of the following (INCLUDE UNITS!) | | |
| (a) | (b) | (c) |

**Skill 0.02 Exercise 1**

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| **Skill 0.03: Understand the relationship between equipment accuracy and reported measurements.** |

**Skill 0.03 Concepts**

The number of digits in a measurement can be used to communicate information about the measuring device used to take the measurement.

Consider the two rulers shows.

|  |  |  |
| --- | --- | --- |
| A | cm  5.0 5.1 5.2 5.3 | A measurement taken with ruler A should be reported as 5.00 cm. |
| B | cm  5 6 7 8 | A measurement taken with ruler B should be reported as 5.0 cm. |

Evaluation of the measurements indicate that ruler A provides the most accuracy. Had the 2 zeros beyond the five not been recorded on the other hand, it would have appeared that ruler B was the more accurate measuring device.

Measurement A = 5.00 cm

Measurement B = 5.0 cm

**Skill 0.03 Example 1**

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| --- | --- | --- |
| For each data set, identify the measurement taken from the most accurate measuring device. | | |
| (a) 1.0 g, 1.00 g, 1.000 g | (b) 12 cm, 123 cm, 1234 cm | (c) 1 g, 0.1 g, 0.01 g, 0.001 g |

**Skill 0.03 Exercise 1**