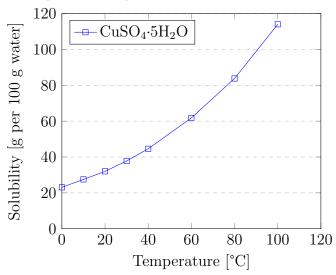Things to Memorize: Graphing Motion

Basics of Graphs

Temperature dependence of CuSO$_4$·5H$_2$O solubility

- Graphs should include the following things:
  - A Title that describes what the graph is about.
  - Labels and units on each axis.
  - Numbers should be evenly spaced at regular intervals.
  - All data should be within the graph, and should take up at least half of the graph.

- Don't connect the dots of data from an experiment. Instead, draw a **Best-Fit Line** or **Best-Fit Curve** through your data points.

- To find the slope of a graph, use the slope formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$

- To find area under the line or curve:
  - approximate it using
    * rectangles ($A = b \times h$)
    * triangles ($A = \frac{1}{2}b \times h$)
    * trapezoids ($A = (\frac{b_1 + b_2}{2}) \times h$)
  - If you know the equation and some calculus, you can find $\int_A^B f(x)dx$

Position vs Time Graphs

- To determine how far from the detector an object is located, look at the vertical axis of the position-time graph.

- To determine how fast an object is moving, look at the slope of the position-time graph.

- To determine which way the object is moving, look at which way the position-time graph is sloped.

  - A position-time graph with a positive slope (like a forward slash /) means the object is moving in the positive direction (away from the detector).
  - A position-time graph with a negative slope (like a back slash \) means the object is moving in the negative direction (toward the detector).

- To determine the type of acceleration an object is moving with, look at how the graph is curved.

  - A straight line on a position-time graph means that the object is not accelerating.
  - A curve that is concave-up (like the mouth of a ☺) on a position-time graph means the object has positive acceleration.
  - A curve that is concave-down (like the mouth of a ☹) on a position time graph means the object has negative acceleration.

Velocity vs Time Graphs

- To determine how fast an object is moving, look at the vertical axis of the velocity-time graph.

- To determine which way the object is moving, look at whether the velocity-time graph is above or below the horizontal axis.

  - An object is moving in the positive direction (away from the detector) if the velocity-time graph is above the horizontal axis.
  - An object is moving in the negative direction (toward the detector) if the velocity-time graph is below the horizontal axis.

- To determine how far an object travels, determine the area between the velocity-time graph and the horizontal axis.

- On a velocity-time graph it is not possible to determine how far from the detector the object is located.

- Most everyday motion can be represented with straight segments on a velocity-time graph.