“Concept-mapping” is a tool for assisting and enhancing many of the types of thinking and learning. To do a map, write the main idea in the center of the page– it may be a word, a phrase, or a couple of juxtaposed ideas, for example– then place related ideas on branches that radiate from this central idea.

Hints for drawing a map

- Use unlined paper, since the presence of lines on paper may hinder the non-linear process of mapping. If you must use lined paper, turn it so the lines are vertical.
- Connect words or phrases or lists with lines to the center or to other "branches."
- When you get a new idea, start again with a new “spoke” from the center.
- Look for all possibilities to add cross-links to the map. Cross-links show how completely one understands the relationships among concepts.
- Use connecting words to label the linking lines so that the relationship between any two concepts is a clear and complete thought. Use as few words as it takes to make the connection between the concepts clear.
- Write down everything you can think of without judging or editing– these activities will disrupt the mapping process. In general, ordering and analyzing are “linear” activities and will disrupt the mapping process. If you’re not ready to place a concept in the map, write it down on a separate list. Then revisit this list later, placing the items on it in the map.
- If you come to a standstill, look over what you have done to see if you have left anything out.
- You may want to use color-coding, to group sections of the map.
- A concept map does not have to be symmetrical.
- Concept maps show which concepts are more important by their placement on the map and by what concepts branch off them.
- There are no perfectly correct concept maps, only maps that come closer to the meanings you have for those concepts. As the mapmaker, you must make it correct for you.

Some organizational patterns that may appear in a concept-map

- **Branches.** An idea may branch many times to include both closely and distantly related ideas.
- **Arrows.** You may want to use arrows to join ideas from different branches.
- **Groupings.** If a number of branches contain related ideas, you may want to draw a circle around the whole area.
- **Lists.**
- **Explanatory/Exploratory notes.** You may want to write a few sentences in the map itself, to explain, question, or comment on some aspect of your map– for example, the relationship between some of the ideas.
Advantages Of mapping

Here we’re using a map to organize the topics we’ve studied so far. It is a great study aid. In most courses you will encounter a large number of ideas, some are essential and others are secondary. It is important to identify the central concepts and see how the secondary ones are merely offshoots of those first ideas. In our class this may mean differentiating between a fundamental concept in physics and an example that is only applicable in a small number of situations. At first glance the two may appear to be on equal footing, but, hopefully, after making a concept make you will be able to discern the difference. It can be a good idea to make a concept map after reading a chapter, listening to a lecture or performing an experiment. It helps a person organize the ideas in a way that is meaningful them (it will most likely be different than somebody’s organizational structure).

Mapping can be used as a type of brainstorming. Both mapping and brainstorming may be used to encourage the generation of new material, such as different interpretations and viewpoints: however, mapping relies less on intentionally random input, whereas, during brainstorming, one may try to think up wild, zany, off-the-wall ideas and connections. Brainstorming attempts to encourage highly divergent “lateral” thinking, whereas mapping, by its structure, provides opportunity for convergent thinking, fitting ideas together, as well as thinking up new ideas, since it requires all ideas to be connected to the center, and possibly to one another. Paradoxically, the results of brainstorming usually appear on paper as lists or grids– both unavoidably linear structures: top to bottom, left to right. Mapping is less constrictive– no idea takes precedence arbitrarily (e.g. by being at the “top’ of the list).

Here are some advantages of mapping, which will become more apparent to you after you have practiced this technique a few times:

- It clearly defines the central idea, by positioning it in the center of the page.
- It allows you to indicate clearly the relative importance of each idea.
- It allows you to figure out the links among the key ideas more easily. This is particularly important for creative work such as essay writing.
- It allows you to see all your basic information on one page. As a result of the above, and because each map will look different, it makes recall and review more efficient.
- It allows you to add in new information without messy scratching out or squeezing in. It makes it easier for you to see information in different ways, from different viewpoints, because it does not lock it into specific positions.
- It allows you to see complex relationships among ideas, such as self-perpetuating systems with feedback loops, rather than forcing you to fit non-linear relationships to linear formats, before you have finished thinking about them.
- It allows you to see contradictions, paradoxes, and gaps in the material– or in your own interpretation of it– more easily, and in this way provides a foundation for questioning, which in turn encourages discovery and creativity.
Before our Electricity Unit test you will be asked to complete a concept map on
the material we’ve covered so far this semester (both units). The goal is for this to help
you organize your thoughts and see the connections while studying for the test.
Throughout this semester there will be many connections between chapters and units.
Understanding those connections is vital to studying electricity and magnetism.

In addition to the general concept map guidelines found in the other handout, here
are a few more:

1. Each arrow or line that connects two ideas should have a short (1-3 word) explanation
of the connection. For example, on the arrow that leads from” Newton’s Second
Law” to “Oscillations” you might right “one application”. Of course, the more
specific you are the better.

2. Concepts that are on “different levels of importance” should have different symbols.
For example, Newton’s Second Law is a fundamental concept in mechanics whereas
simple harmonic vibrations is an application or special case where Newton’s Second
Law is used. Concepts that represent special cases should be in ovals. Concepts that
are fundamental should be placed in rectangular boxes. If the concept is extremely
fundamental (Newton’s Second Law, for example), the box should be a different
color or bold. Part of the rational for this is to try and prevent what happened on our
first test- where people used the formula for an electric field due to a point charge (a
special case) when it wasn’t applicable. Also, let me just say that there should only
be a couple “fundamental concepts”. One could even make a strong claim that there
will only be five such concepts this entire semester- these represent Maxwell’s
Equations and the Lorentz Force equation. (BTW: Gauss’ Law is one of Maxwell’s
equations.)

3. It is not sufficient to simply put an equation in a box/ oval. One should write out the
concept in words to help explain what the equation is describing. It certainly is fine
(and probably a good idea) to include the equations with the words, just not in place
of them.

4. If your map grows beyond one sheet of paper simply place a number on each sheet to
represent where the sheets should be connected. You could think of the numbers as
being the “door” or “gateway” from one portion of the map to another. It might look
something like: on the sheet where the arrow is going “out the door”: → (2), and on
the other sheet draw the “incoming arrow” (that leads from the door to a comment):
(2) →. This is also a useful technique to jump from one side of a sheet to another
without having to draw a long arrow that would just clutter the map.