

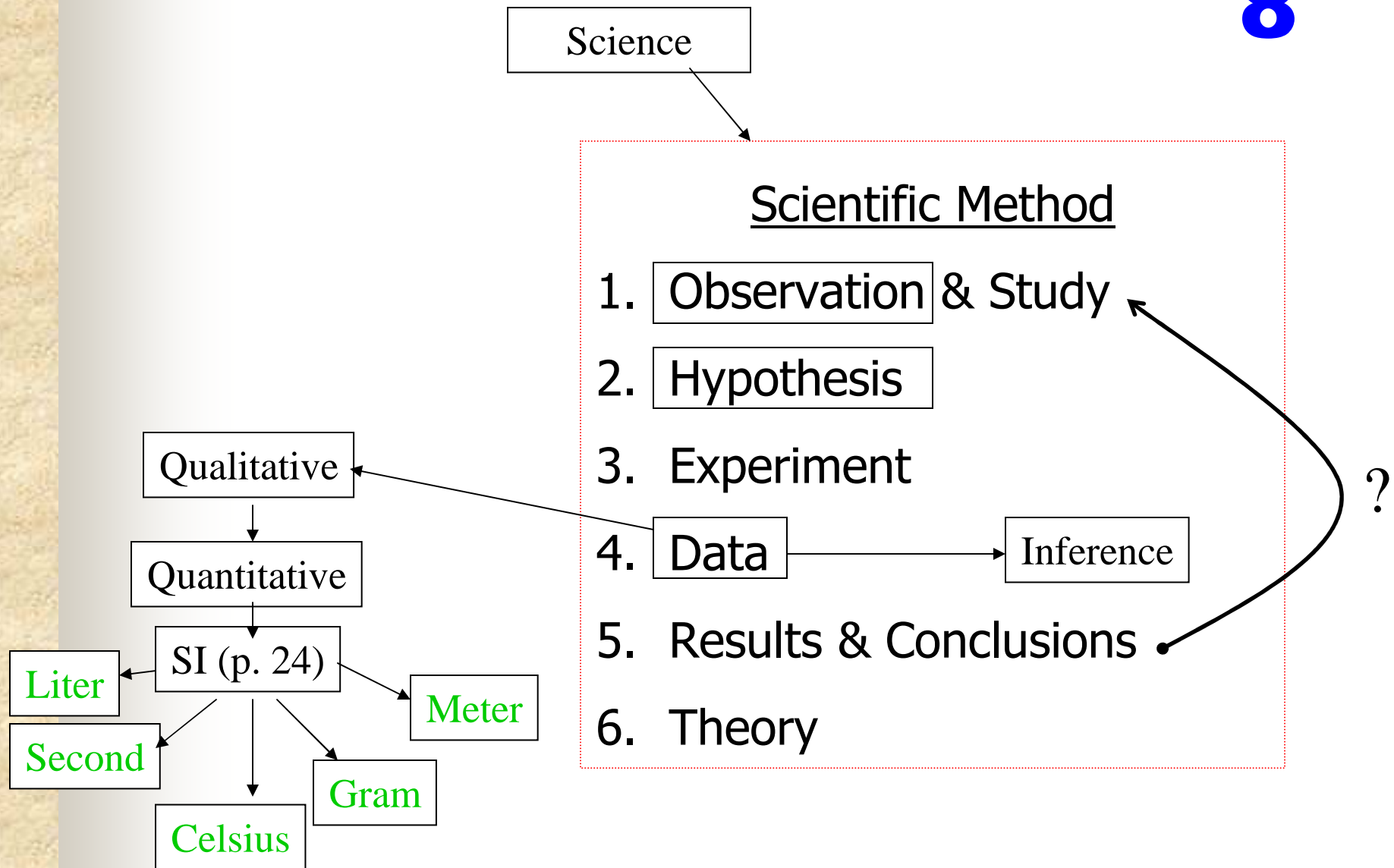
Chapter 1: Biology



The Nature of Life

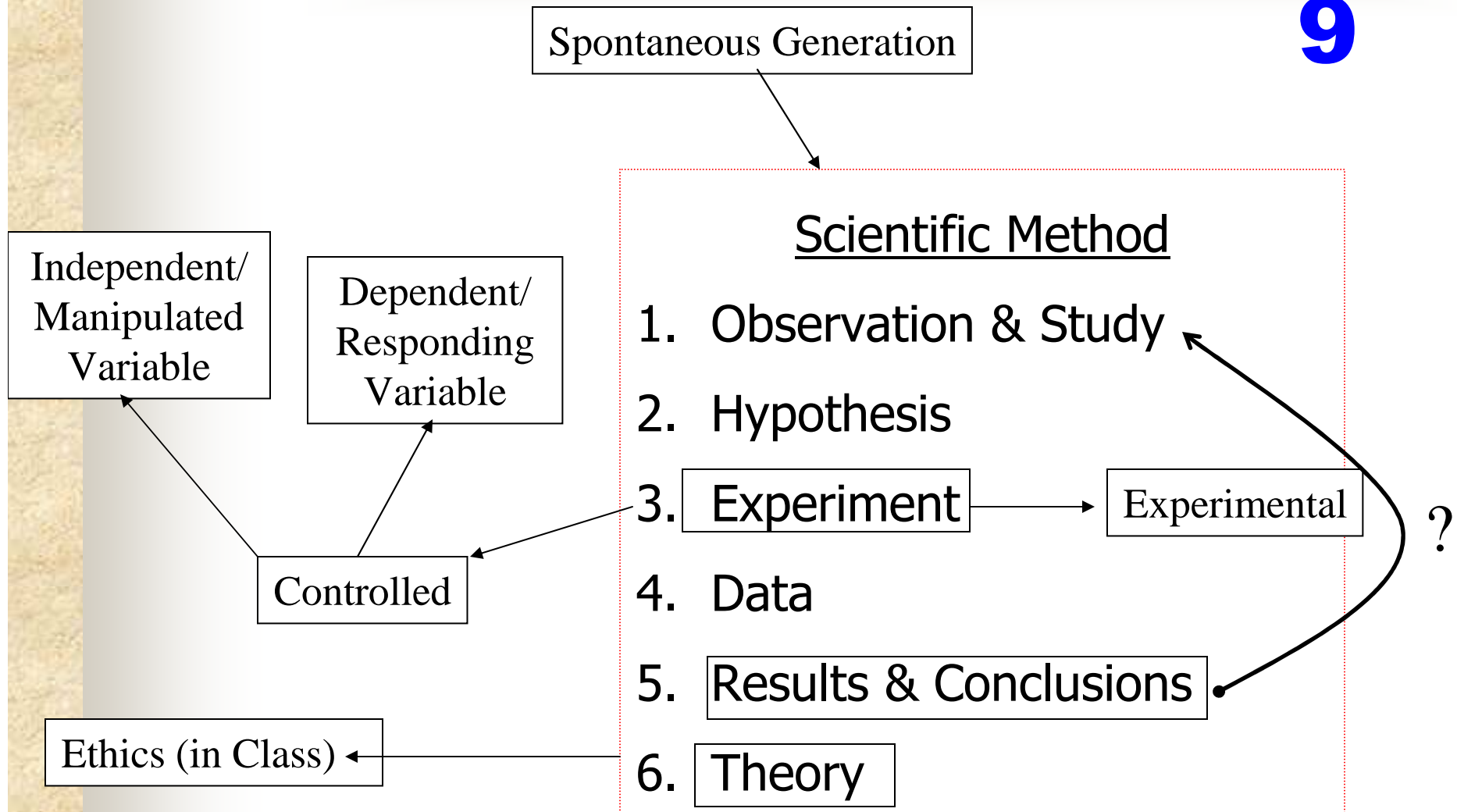
Chapter 1.1 Map

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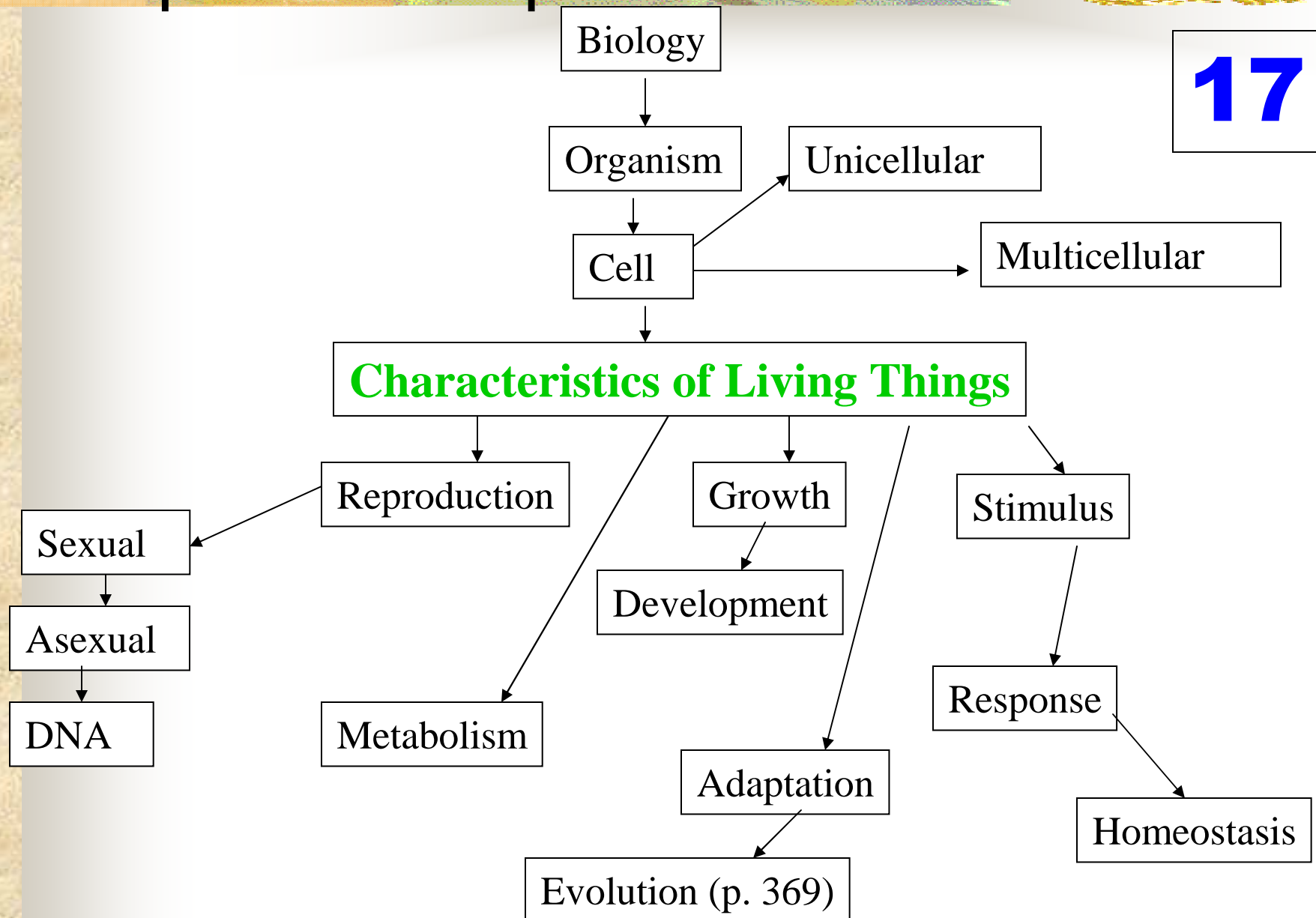
Chapter 1.2 Map

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Chapter 1.3 Map

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1.1 What Is Science?

- Science is an organized way of using evidence to learn about the natural world.
 - Body of knowledge that scientist have built up over the years.



1.3 Studying Life

- *Biology* is the study of all things living.
 - A Biologist is the person who studies living things.
- What does it mean to be living?
 - All **organisms** are made up of one or more cells
 - Ex. Cells, Organs
 - All living things are made up of cells
 - Unicellular or multicellular

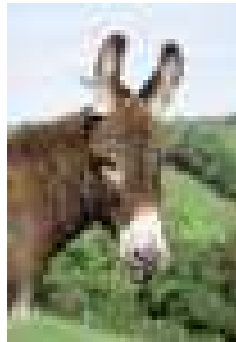
1.3 Studying Life

- What does it mean to be living?
 - Reproduction (species)
 - All living things reproduce with their own kind to produce more of their own kind
 - Two Types:
 - Asexual: single parent cell
 - Sexual: two cells from different parents unite
 - DNA code determines the inherited traits.



Horse=VIABLE

+



Donkey=VIABLE

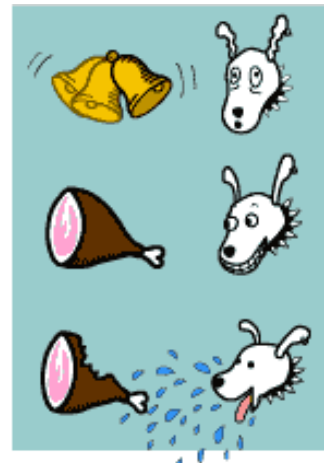


Mule=STERILE

1.3 Studying Life

- What does it mean to be living?
 - Stimulus and Response (homeostasis)
 - The stimulus is what happens, while the response is how an organism reacts to that situation, whether voluntarily or not.
 - It is called homeostasis when an animal regulates its internal environment because of external or internal factors.

Example:
Pavlov's dog
and bell.



Stimulus=Bell

Response=Salivation

1.3 Studying Life

■ What does it mean to be living?

■ Growth vs. Development

- Organisms often **grow** throughout their lives.
 - Ex. I was 5'2" and now I'm 5'4"!
 - An alligator grows its whole life.
- Organisms **develop** within their lives.
 - Pupa to butterfly
 - Puberty
 - No change in size, in fact can get *smaller*

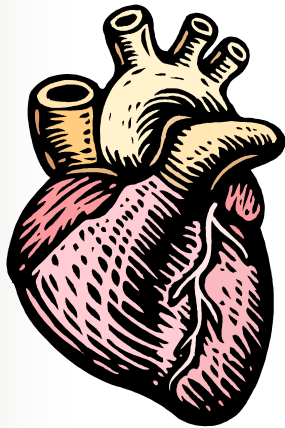


1.3 Studying Life

■ What does it mean to be living?

■ Metabolism

- The combination of chemical reactions through which an organism builds up or breaks down materials as it carries out it's life processes.
 - Ex: Respiration, digestion, etc

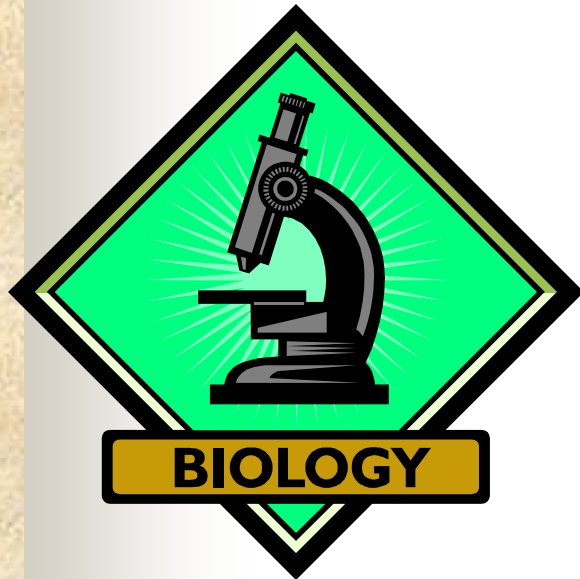


1.3 Studying Life

- What does it mean to be living?
 - Adaptation from previous generations
 - Adaptations are **genetic changes** in an organism that are passed on to their offspring.
 - Ex. A giraffe born with a longer neck, or a cat that can see better at night.
 - These adaptations cause the species to “**evolve**” or change over time.



1.1 & 1.2 What is science and how do scientists work?



- *The Scientific Method*: The steps that biologists use to gather information and answer questions.
 - *Observation*
 - gathering information using your senses.

1.1 & 1.2 What is science and how do scientists work?

- An explanation for something that can be tested is called a *hypothesis*.
 - A good definition is *an educated guess*.
 - “I think my fish are dying because I haven’t cleaned their tank.”
 - “I think the earth revolves around the sun.” (Copernicus)
 - *Inference*: logical interpretation based on prior knowledge
 - “At 1:12 PM Old Faithful will erupt again.”

1.1 & 1.2 What is science and how do scientists work?

- *Experiment*: A series of steps that test the hypothesis by collecting specific information.
 - Experiments are important in testing a hypothesis.

1.1 & 1.2 What is science and how do scientists work?

- *Control or Control Group*: the group in the experiments in which everything is kept the same.
 - Done so that scientists can know **exactly** what would have happened if they **didn't do anything** to their test subject.
- *Experimental Group*: group in experiments being manipulated.

1.1 & 1.2 What is science and how do scientists work?

- *Manipulated/Independent Variable*: This variable is changed *by the scientist*.
 - Ex. Give some plants water and others bleach, and yet another group Miracle Gro[©]. The independent variable is what the scientist is changing in the experiment- do the plants get water? Bleach? Miracle Gro[©]?
 - X axis on a graph

1.1 & 1.2 What is science and how do scientists work?

- *Responding/Dependent Variable*: This variable changes on its own.
 - Ex. How much did the plants grow that were given water? How about bleach?
 - How much they grew would be a dependent variable.
 - How long they lived during the experiment would also be a dependent variable.
 - Y axis on a graph

1.1 & 1.2 What is science and how do scientists work?



- A theory is a hypothesis that has been supported by many scientists over and over again over a long period of time.
 - A scientific theory is very different from a theory in everyday life!
 - Some Scientific Theories:
 - Theory of DNA Structure (Watson and Crick)
 - Theory of a Round Earth (Ancient Egyptians)
 - Heliocentric Theory (Copernicus)
 - Theory of Evolution of Species (Darwin)
 - Theory of Relativity (Einstein)

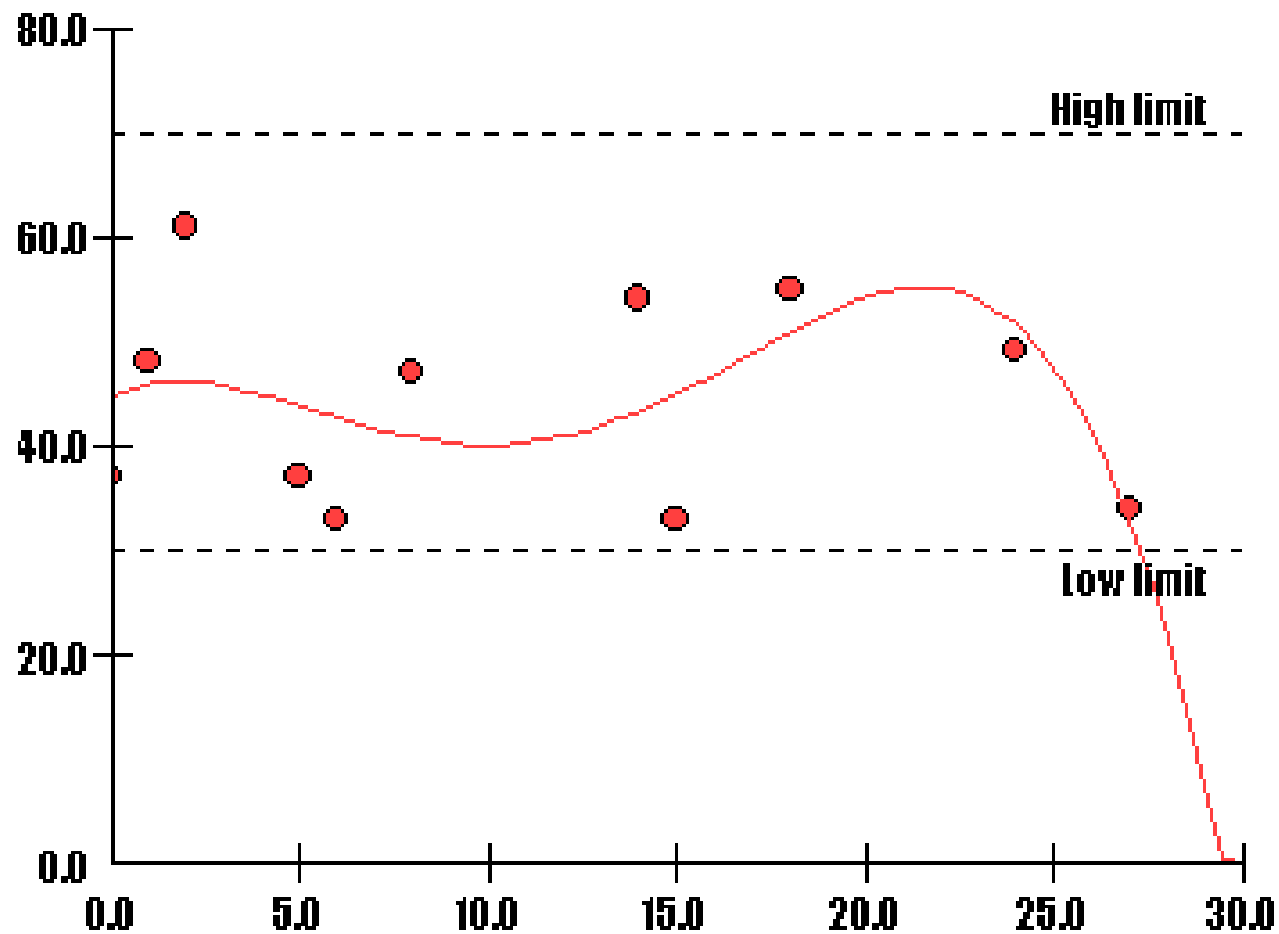
1.1 & 1.2 What is science and how do scientists work?

- *Quantitative Research*: Research that provides a scientist with concrete numbers or numerical data.
 - It is common to produce a graph or a table from this type of research.
 - Quant. Research is done using “SI” measurements- all in the metric system.
 - Meters, centimeters, etc.

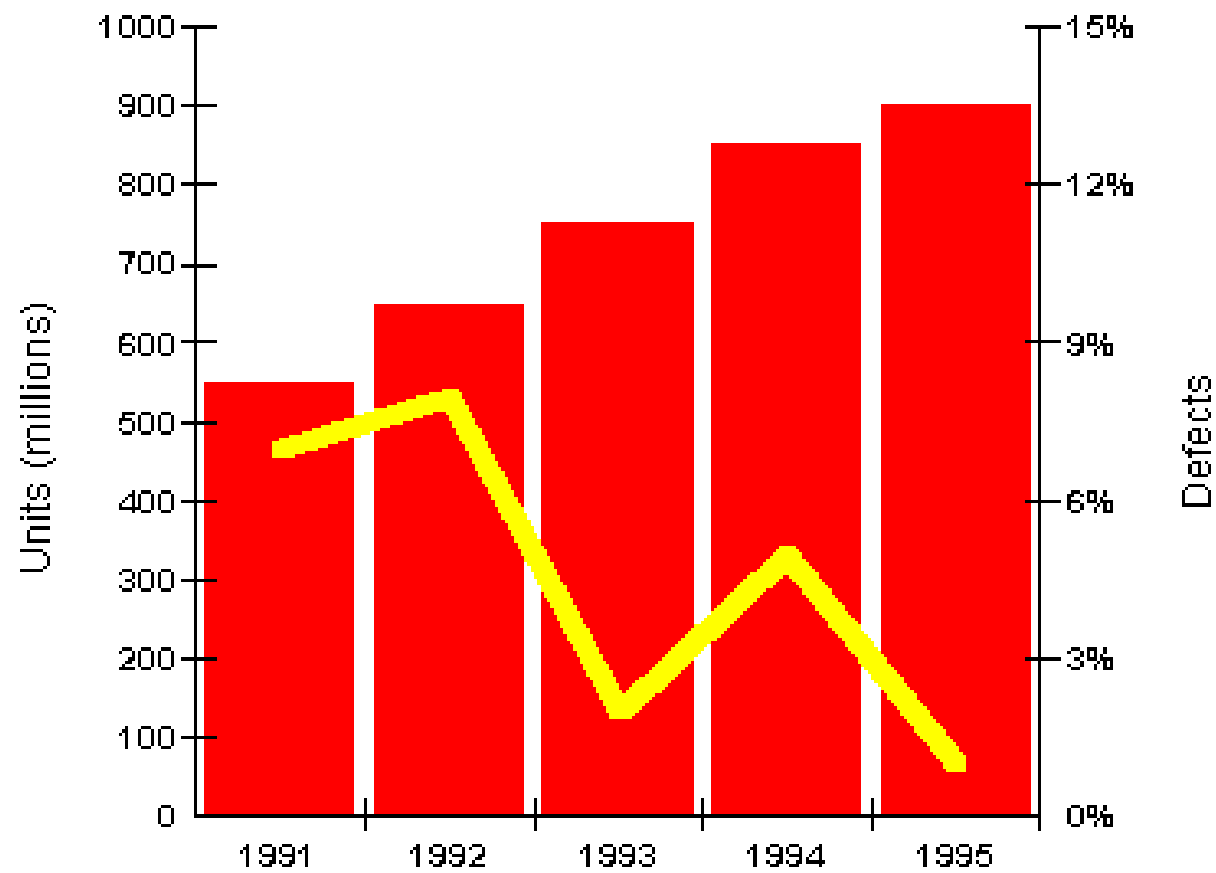
Charts and Graphs



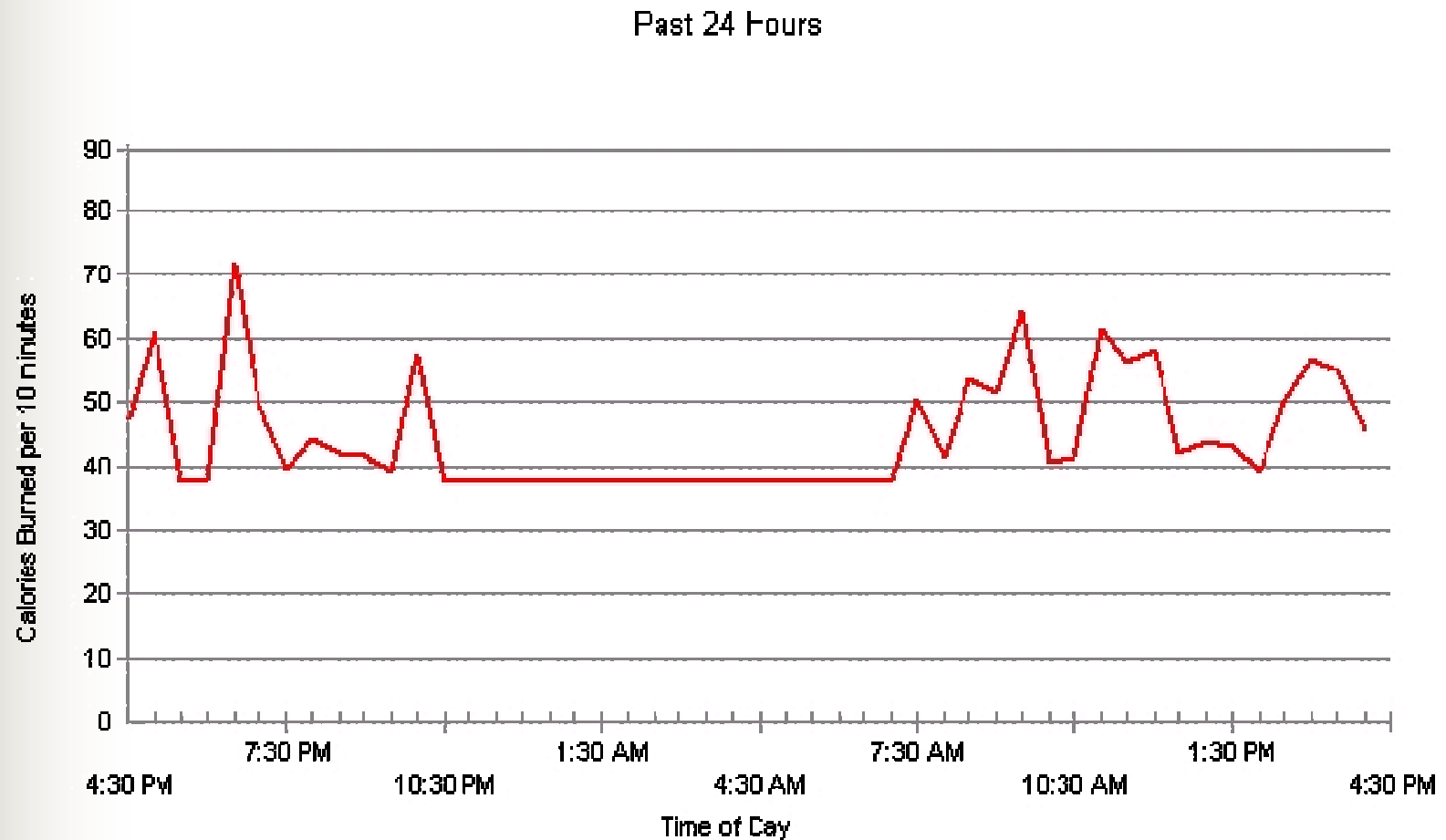
Charts and Graphs



Charts and Graphs



Charts and Graphs



1.1 & 1.2 What is science and how do scientists work?

- *Qualitative/Descriptive Research*: Research that will not produce numerical data.
 - Ex. "After four hours, the ape seemed to calm down a lot. After several hours he was actually asleep."
 - Impossible to make graphs or charts from this type of data.

1.1 & 1.2 What is science and how do scientists work?

- *Ethics*: The belief system of what's right or wrong among a group of people in a society.
 - Important in scientific research.
 - People can think "scientists made the nuclear bomb which has killed tons of people," or "stem cell research is the destruction of human life."
 - Society is responsible for the ethical use of scientific discoveries.

1.1 & 1.2 What is science and how do scientists work?

- Science has had an impact on all of our lives.
- What we call **technology** is the application of scientific research to help with society's needs and problems.
- Can also be destructive!
 - Ex. Modern medicine can help people live longer in an area where food is scarce and where they end up starving to death.



Important Study Tips

- What is evolution?
- Stimulus/Response/Homeostasis
- Growth/Development/Adaptations
- Quantitative/Descriptive Research
- Scientific Method!:
 - Research & Observation/Hypothesis/Experiment/
Data/Conclusion/Theory??
- Control Group/Experimental Group
- Dependent/Independent Variable
- Graphing/Understanding a graph