Name:

Biology Notes Outline

Chapter 1 The Nature of Science

Biology

* What is Biology?
  + Biology = The study of and
    - We will focus on the structure and function of the parts of all living things.
      * Macromolecules
      * Cells
      * Ecosystems
      * Genetics

Observation vs. Inference

**Observation:**  Using one of the to make understand the world around you.

* + 1. Sight, touch, hearing, smell, (NOT in science class!)
    2. . Example: There is one TV in the room.
* Recorded as in an experiment. Data =

**Inference: Logical** interpretation/explanation.

* 1. Using to make sense of what you are observing
  2. **BASED** on observations
  3. **Example**: You entered the classroom and a new adult was by my desk. You might infer that I or that the person is a
  4. **Clues** You Are Making an Inference; I think.., Like…, Because…
  5. Used in writing the **CONCLUSION**  of a lab report.

Scientific Process

Scientific Process: = investigation

Steps:

1. Question:
   * 1. State/Identify a or (What you want to know/understand/find out)
2. Gather
3. Form a – educated **EXPLANATION** for an observation.
   * 1. Must be Must be and falsifiable.
     2. Usually in  **f**ormat.
     3. NOT a “guess”. NOT simply a prediction.

4. Test hypothesis with an

5. **Data:** Record **observations (“facts”)**

6. **Conclusion:** NOW analyze –

* 1. **Based** on **data**
  2. Decide if hypothesis was or not.
  3. **NOTE: A hypothesis is NOT “proven” – it is**
* This is a process that changes and doesn’t have to occur in order.
  + You can skip steps

Experiment Requirements

1. **Variable:** A quantity that can vary & can affect the experiment outcome
   1. **Independent** variable:
      * 1. What scientist
        2. Must have only independent variable.
        3. It is what you are Usually the part of hypothesis.

Experiment Requirements

B. **Dependent** variable: ; the outcome “depends” on what the independent variable causes.

* It is usually the part of the hypothesis.

C. **Constants:** All other variables are kept the for each test.

**Controlled Experiment:** Experiment that contains 2 set-ups, with ONLY ONE factor/variable different between the set-ups.

1. **Control Group:** to to.
   * 1. Used for comparison to the experimental group.
     2. Helps determine the effect of the independent variable in the experimental group.
2. **Experimental Group:** The group **containing** the independent variable – what you are testing.

I Have My Data (Recorded Observations) & Conclusion, Now What?

1. **Report** Those Findings!!
   1. Very Important Step
   2. **Why**?
      1. . – so YOU get the credit & not someone else
      2. Peers Check Work
      3. Repeat Experiments
      4. Build Off

When Experiments Are Not Possible

* When subjects need to not be disturbed
* .
* Too many
  + Example: It is difficult to run a controlled experiment during human medical studies….WHY?
  + Different ages, races, genetic makeup, pre existing medical conditions
  + Goal would be to try to find subjects that are as similar as possible (but it never will be truly controlled)

Theory vs. Law

* Theory vs. Law
* **Theory**: based on observations & investigations
  + Usually the simplest principle that unifies the many observations.
  + It explains it happens.
* NOTE: BOTH can be with data.

How a Theory Develops

* Theory occurs when a hypothesis
* In science, the word theory applies to a that unifies a broad range of observations
* Oh, that is just one person’s theory! (Poor use of the word theory)
* A theory is a well tested explanation that explains many observations

Characteristics of Life Cont…

* 1. Made of Cells
  + Cell:
    - Unicellular Organisms
* Entire organism is made up of
* Exp: Bacteria and protists
* Multicellular Organisms
* The organism is made up of
* Cells have
* 2. Reproduce
  + Reproduction is the
    - Asexual Reproduction
      * A single parent organism
        + Clone/Exact Copy
    - Sexual Reproduction
* . contribute genetic information
* Involves the combination of male and female sex cells
* 3. Obtain and Use Energy
  + Living organisms need energy to
    - Exp: Food Digestion, Photosynthesis, Healing Injuries
* 4. Maintain Homeostasis
  + Homeostasis = in the body that are necessary for life
    - * Body temperature, Blood volume, pH balance, Water balance, etc

Characteristics of Life Cont…

* 5. Pass on Genetic Information
  + Genes carry
    - Genes are
  + Heredity is the reason children resemble their parents
  + Mutations change DNA code and can be passed from generation to generation
* 6. Respond To Their Environment.
  + An example is a plant’s leaves and stems growing toward light
  + Organisms react to stimuli: Light, Temperature, Odor, Sound, Gravity, Heat, Water, Pressure, etc
* 7. Grow and Develop
  + Growth means
  + Development involves

* 8. Adapt to their Environment through Evolution.
  + Adaptation =
    - A process that

* + - Species obtain adaptations

Scientist:

|  |  |
| --- | --- |
| What is spontaneous generation? | What is biogenesis? |
| Describe the experiment your scientist performed relating to spontaneous generation. | |
| What was your scientists’ hypothesis? | What was the end result of your scientists work with spontaneous generation? |

Same Group Information: As a small group, go over the information you found regarding your scientists. Select 3 main points to share. Make sure everyone agrees that all information shared is accurate. You will be expected to share information with other people after this activity.

|  |  |
| --- | --- |
| Scientist Name: . | |
|  | |
| 1. |  |
| 2. |  |
| 3. |  |

Different Group Information: Share your main ideas with people that looked up other scientists. Record all information in the table below.

|  |  |
| --- | --- |
| Scientist Name: | Main Ideas |
| Redi |  |
| Leeuwenhoek |  |
| Needham |  |
| Spallanzani |  |
| Pasteur |  |

Recap and Review

Scientist:

|  |  |
| --- | --- |
| Explain citing specific evidence what your scientist did and contributed to the spontaneous generation debate. | Explain citing specific evidence how your scientists work fits into the bigger picture of scientists reviewing, retesting, and refining each other’s work. |