



Name:

Date:

DNA Extraction LAB (*Test Grade*)

Mr. Galloway – LIFE SCIENCE

REVIEW of the Scientific Method Below
(Critical *Logikos* Thinking)- Seven Simple Steps:

1. Observe 2. Question 3. Gather	<u>4. Hypothesize</u>	5. Test 6. Analyze 7. Conclude
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1. Observe (Five Senses)

- **General Revelation:**
 - Romans Ch 1:20 says observing & studying God’s **WORLD** proves God Exist, is Powerful, & Intelligent: “For since the creation of the world His invisible attributes, His eternal power and divine nature, have been clearly seen, being understood through what has been made, so that they are without excuse.”
 - **Special Revelation:**
 - We need God’s **WORD** to know that He is good, since the world is infected by sin and suffering.
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2. Question

- Curiosity is the heart of science
 - To answer questions & solve problems
 - To know God and cooperate with Him
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3. Gather

- **Samples of a population for example**
 - Must be a large number & randomly selected
- **Measurable data collected**
 - SI units (System International, based on the metric system
 - SYSTEME INTERNATIONAL d’ UNITES
 - ✓ The SI is a Universal, Standardized form of measurement that is use by all Scientist around the world. It allows us to understand each others work and duplicate each others experiments to check the results.
 - ✓ SI Units are based on the metric system
 - ✓ Metric system is based on multiples of ten
 - ✓ This helps scientist all over the world communicate with data in the same form.
 - ✓ At the end of this PowerPoint the SI Units will be further discussed.
- **Organize the data**
 - Graphs, charts, etc

4. Hypothesis Formulated

- **Hypo – Thesis (Underlying belief)**
 - An “If . . . Then” statement that makes a testable prediction and could be proven false (falsifiable - the goal is to try and falsify it).
 - Good hypotheses can NOT be “proven” by tests. They can only be “supported” by tests.
- **Simple Example:**
 - If rose plants are sprayed with 5% weed killer, then 100% of the plants will die within two days.

5. Testing the Hypothesis

Surveys:

- The survey sample must be large & random

Lab tests:

- Blood or urine test, etc

Controlled Experiment - One of the most important types of tests

The “Controlled” Experiment includes:

- **Variables** = factors that can change (like temperature, amount of water, etc.)
 - Independent Variable** = manipulated variable, which is altered by the scientist
 - Dependent Variable** = responding variable, which depends on the independent variable.
- **Two groups** are tested in a controlled experiment (**control** and **experimental**)
 - Control Group:** NONE of the variables are changed or manipulated by the scientist
 - Experimental Group:** The scientist manipulates the independent variable to test how the dependent variable responds.

6. Analyze the Experiment’s Results

- **Similar methods as “Data Gathering”**
- **Measurable data collected**
 - Again, using SI units (System International)
- **Organize the data**
 - Using graphs, charts, to make the data more easily and quickly understood, etc
- **Making inferences about the results**

7. Formulate Conclusions

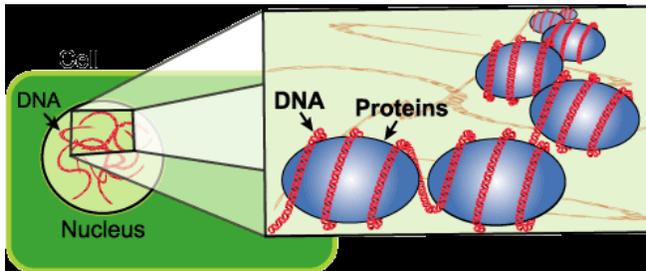
- **Conclusions** are based on your experiment’s results must be formed by logical (*logikos*) thinking.
- **A Theory:** A hypothesis is eventually called a THEORY when it has been supported by many repeated tests and never yet falsified. It is a broad comprehensive conclusion about what is “believed” to be true.
- **A Law:** A theory is eventually called a LAW when it has been tested for many years and never proven false (never falsified).

Remember that evolution is ONLY a hypothesis, even though many people want to call it a theory.

- ✓ Hypotheses are beliefs that must be tested
- ✓ Theories are hypotheses that have been supported by many tests, and have not been falsified by any significant tests.
- ✓ So much evidence contradicts the claims of evolution, that it is NOT worthy of the title “theory”.

Normally, a scientist starts from scratch, asking questions, developing a hypothesis, and **THEN** an experiment to test it. **HOWEVER**, in this LAB you already have the actual DNA experiment described for you in this packet. So, you will **practice** the process of formulating a hypothesis by looking **BACKWARDS** from this experiment's description, back to the initial observations, questions, & data that might have led someone to have created this experiment.

READ AHEAD TO GET AN OVERVIEW OF THE LAB EXPERIMENT AND THEN ANSWER THE FOLLOWING QUESTIONS:



1. What **observations** might have been made / learned about cells and DNA that could have led someone to question the possibility of extracting DNA?

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2. What **questions** might that person have asked regarding the possibility?

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3. What **data** might the person have gathered (and from where) that would have helped him to develop a formal hypothesis regarding DNA extraction?

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4. Formulate a hypothesis (an "If – then" prediction) about DNA extraction that could be tested by this experiment:
IF ...

THEN ...

THE LAB EXPERIMENT:

Materials:

Blender and Strainer, DNA source (split peas), Salt, Cold water, Detergent, Enzymes (meat tenderizer), Isopropyl (rubbing) alcohol

This picture at the left is for step # 10

Procedures:

1. Put the DNA source into a blender (any organic tissue containing DNA will do, but about 100 ml of split peas works well).
2. Add a large pinch of table salt (about 1/8 tsp).
3. Add twice as much cold water, as the DNA source material (about 200 ml)
4. Blend on high for 15 seconds.
5. Pour the thin pea mixture through a strainer into another container.
6. Add about 1/6 the amount of liquid detergent (about 2 tablespoons) as pea soup mixture and swirl (or flick it) until mixed.
7. Let the mixture sit for about 5-10 minutes.

Mid-Lab **BIO-LOGIC** Questions for Scientific Inquiry:
(and to pass the time while you wait for step # 8 😊)

What came first a cell or DNA? Explain your reasoning.

Where inside a eukaryotic cell do you find DNA?

What structure surrounds the nucleus in a eukaryotic cell?

What organic molecules make up the structure that surrounds the nucleus?

8. Pour the mixture into a test tube and fill to about 1/3 full.
9. Add a pinch of enzymes (meat tenderizer), to the test tube and **GENTLY** stir. Be careful when you stir. If you stir too hard, you will break up the DNA.



10. As in the picture above, tilt your test tube and **SLOWLY** pour isopropyl alcohol into the test tube **GENTLY** down the inside, so that it forms a layer on top of the mixture.

(The alcohol layer should be about equal to the pea soup layer.)

DO NOT STIR! The DNA will rise out of the pea layer and into the alcohol layer.

DO NOT let young kids drink this poisonous rubbing alcohol, if you do this lab at home!

GRADED Post-Lab Questions for Further “**Bio-Logical**” Analysis:

1. Describe the appearance of the DNA you extracted. Did it look like you expected?
2. Why was it necessary to add **detergent** to the pea mixture? (Hint: Think of how soap affects grease.)
3. What purpose might the **enzymes** have served in this experiment?
4. In what way could the lab you preformed be useful to scientists?