



## ANSWER HINTS

### DNA Extraction LAB (*TEST Grade*)

**Read & Review the Scientific Method Below**  
 (*Logikos Thinking*)- Seven Simple Steps:

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

- **General Revelation:**
  - Romans Ch 1 says observing God’s WORLD demonstrates that:
  - God Exist, is Powerful, & Intelligent
- **Special Revelation:**
  - We need God’s WORD to know that He is good, since the world is infected by sin and suffering.

#### 2. Question

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

#### 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

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## 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.

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## 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.

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## 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**

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## 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).

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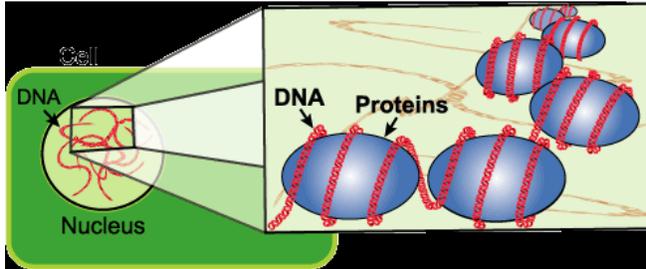
**Remember that evolution is ONLY a hypothesis, even though many people want to call it a theory.**

- ✓ 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”.

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Normally, a scientist starts from scratch and ends up 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 the experiment's description, back to the initial observations, questions, and 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?

- ALL CELLS HAVE DNA
- SOME ORGANISMS HAVE MORE DNA THAN OTHERS
- PLANT DNA IS PACKAGED INSIDE THE WALL, CELL MEMBRANE, NUCLEAR

**MEMBRANE, AND LOCKED AROUND HISTONE PROTEINS**

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

- WHAT KIND OF CELLS HAVE LOTS OF DNA (CHROMOSOMES)
- HOW CAN THE WALL, MEMBRANES, & HISTONES BE BROKEN DOWN OR DISSOLVED SO THE DNA CAN BE RELEASED AND GATHERED-

3. What **data** might the person have gathered (and from where) that would have helped him to develop a formal hypothesis regarding DNA extraction? **USE GOOGLE FOR SCIENCE, BIOLOGY, CHEM., SITES**

- WHAT IS ARE THE WALL, MEMBRANES, MADE OF?
- WHAT CAN BREAK DOWN THE WALL, ETC., & NOT BREAK APART THE DNA?
- WE CAN MECHANICALLY BREAK DOWN THE WALL WITH BLENDER, CHEMICALLY THE MEMBRANE WITH SOAP, CHEMICALLY THE HISTONES WITH PROTEIN ENZYME (MEAT TENDERIZER)

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

**IF . . . WE BLEND THE PEAS, ADD SOAP AND MEAT TENDERIZER, THEN . . . THEN WE CAN GATHER ENOUGH DNA TO SEE WITH OUR EYES.**

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## 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.

**THEOLOGICAL – GOD MADE PLANT CELLS WITH DNA ON DAY 3.**

**SCIENTIFIC – IT TAKES A CELL TO MAKE DNA, AND IT TAKES DNA TO MAKE A CELL.**

- **THERE'S NO NATURAL PROCESS FOR DNA OR A CELL TO FORM BEFORE THE OTHER.**

Where inside a eukaryotic cell do you find DNA? **NUCLEUS**

What structure surrounds the nucleus in a eukaryotic cell? **MEMBRANE**

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

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!

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

1. Describe the appearance of the DNA you extracted. Did it look like you expected?  
**WHITE, STRINGY, SLIMY,**
2. Why was it necessary to add **detergent** to the pea mixture? (Hint: Think of how soap affects grease.)  
**TO DISSOLVE THE LIPID MEMBRANES**
3. What purpose might the **enzymes** have served in this experiment?  
**TO DISSOLVE HISTONE PROTEINS**
4. In what way could the lab you preformed be useful to scientists?  
**TEST GENETIC DISEASES**  
**TEACH STUDENTS WITH HANDS-ON EXPERIENCE**  
**GENETIC ENGINEERING**  
**FORENSIC CSI INVESTIGATIONS**
  - **WHO COMMITED CRIME**
  - **WHO THE DADDY**