Bio 101 essay

Design

com • 888. 375. 5487 2 Table of Contents: Introduction:

Lab SafetyAlways follow the instructions in your laboratory manual and these general rules: eScience Labs, Inc.

designs every kit with safety as our top priority.

Nonetheless, these are science kits and contain items which must be handled with care. Safety in the laboratory always comes first!

Lab preparation ??

Please thoroughly read the lab exercise before starting! ??

If you have any doubt as to what you are supposed to be doing and how to d o it safely, please STOP and then: ?? Double? check the manual instructions. ?? Check www. esciencelabs. com for updates and tips.

?? Contact us for technical support by phone at 1? 88? ESL? Kits (1? 888? 375? 5487) or by email atcom. ??

Read and understand all labels on chemicals. ??

If you have any questions or concerns, refer to the Material Safely Data Shee ts (MSDS) available at www. esciencelabs.

com. The MSDS lists the dangers, storage requirements, exposure treatment and disposal instructions for each chemical. ?? Consult your physician if you are pregnant, allergic to chemicals, or have oth er medical conditions that may require additional protective measures.

Proper lab attire ?? Remove all loose clothing (jackets, sweatshirts, etc. and always wear closed? toe shoes. ?? Long hair should be pulled back and secured and all jewelry (rings, watches, necklaces, earrings, bracelets, etc.), should be removed. ?? Safety glasses or goggles should be worn at all times.

In addition, wearing soft contact lenses while conducting experiments is discouraged, as they can absorb pot entially harmful chemicals. ?? When handling chemicals, always wear the protective goggles, gloves, and a pron provided. 5 Performing the experiment ?? Do not eat, drink, chew gum, apply cosmetics or smoke while conducting an experi? ment. ?? Work in a well ventilated area and monitor experiments at all times, unless i nstructed otherwise. ?? When working with chemicals: ?? Never return unused chemicals to their original container or place chemicals in an unmarked container. ?? Always put lids back onto chemicals immediately after use. ?? Never ingest chemicals.

If this occurs, seek immediate help. Call 911 or “ Poison Control” 1? 800? 222? 1222 ?? Never pipette anything by mouth. ??

Never leave a heat source unattended. ??

If there is a fire, evacuate the room immediately and dial 911. Lab Clean? up and Disposal ?

If a spill occurs, consult the MSDS to determine how to clean it up.

?? Never pick up broken glassware with your hands.

Use a broom and a dustpan and dis? card in a safe area. ??

Do not use any part of the lab kit as a container for food. ??

Safely dispose of chemicals.

If there are any special requirements for disposal, it will be noted in the lab manual. ??

When finished, wash hands and lab equipment thoroughly with soap and water. Above all, USE COMMON SENSE! 6

Approximate Time and Additional Materials Needed for Each Lab

** Note: If you are allergic to latex, please contact us and we will send you vinyl gloves** Introduction: Lab 1: The Scientific Method Time: 1 hour

Materials: None Lab 2: Writing a Lab Report

Time: 1 hour (plus 24 hours preparation time and 7? 10 days for observation)

Materials: Paper towels, water, masking tape Lab 3: Data Measurement

Time: 1 hour Materials: Water Lab 4: Introduction to the Microscope

Time: 1 hour Materials: Access to ESL’s Student Portal Biological Processes:

Lab 5: The Chemistry of Life Time: 1 hour (plus 24 hours preparation time)

Materials: Variety of household substances, plastic wrap, water, cutting utensil Lab 6: Diffusion Time: 1. 5 hours

Materials: Water, watch or timer , viscous liquid from cupboardLab 7: Osmos is Time: 1 hour (plus 3 hours for observation)

Materials: Water, watch or timer, several types of potatoes, cutting utensil, paper towel Lab 8: Respiration Time: 1 hour (plus 2 hours preparation time)

Materials: Water, watch or timer, paper towel Lab 9: Enzymes

Time: 1 hour (plus 2 hours preparation time)

Materials: Water, watch or timer, string, ice, hot water, paper towel, ginger root, at least 2 other food sources (potato, apple, etc.

) The Cell: Lab 10: Cell Structure & Function

Time: 1 hour (plus 24 hours for observation)

Materials: Water, square plastic food storage container, mixing bowl, house old items for use as cell structures (plums, raisins, etc.) Lab 11: Mitosis

Time: 1 hour Materials: None 7 Lab 12: Meiosis Time: 1. 5 hours

Materials: Blue and red markers Lab 13: DNA & RNA Time: 2 hours

Materials: Fruit, scissors Lab 14: Mendelian Genetics Time: 1. 5 hours

Materials: None Lab 15: Population Genetics Time: 1. 5 hours Materials: None 8 Additional Online Content Found at www.

esciencelabs. com Log on to the Student Portal using these easy steps: Introduction: ESL Safety Video ESL Scientific Processes Video How Big Is It? Introduction to the Microscope Measuring Volume Using a Unit Conversions Graduated CylinderBiological Processes: ESL Biological Processes Video The Structure of an Atom Acid/Base Reactions Diffusion and Osmosis Tutorial Docking Tutorial Visit our website, www. esciencelabs.

com, and click on the green button (says “ Register or

Login”) on the top right side of the page. From here, you will be taken to a login page. If you are registering your kit code for the first time, click the “ create and account” hyperlink. Locate the kitcode, located on a label on the inside of the kit box lid.

Enter this, along with other requested infor?

mation into the online form to create your user account. Be sure to keep rack of your username and password as this is how you will enter the Stu? dent Portal for future visits. This es? tablishes your account with the eScience Labs’ Student Portal. Have fun! The Cell: ESL Cell Video Cell Structure Crossword Puzzle Interactive Videos of Meiosis Interactive Videos of Mitosis Nature’s Review of RNA DNA Transcription & Translation 9 The Cell (continued): How Mutations Work Riken Center’s Developmental Biology Stem Cell Videos A Typical Animal Cell Construction of the Cell Membrane The Cell Cycle Cell Division DNA Extraction Virtual Lab Additional Resources: Stop Watch Conversion Tables 10 Introduction Lab 1The Scientific Method 11 12

Lab 1 : Scientific Method Concepts to explore:

Concepts to explore: ?? ?? ?? ?? ?? ?? ?? Data collection ?? Analysis Testable observations Hypothesis Null hypothesis Experimental approach Variables Controls Introduction What is science?

You have likely taken several classes throughout your career as a student, a nd know that it is more than just chapters in a book.

Science is a process that uses evidence to understand the history of the natural world and how it works.

It is constantly changing as we understand more about
the natural world, and continues to advance the understanding of the univer se. Science begins with
observations that can be measured in some way so that data can be collecte d in a useful manner by fol? lowing the scientific method.
Have you ever wondered why the sky is blue or why a plant grows toward a window? If so, you have al?
ready taken the first step down the road of discovery.

No matter what the question, the scientific
method can help find an answer (or more than one answer!).
Following the scientific method helps to
insure scientists can minimize bias when testing a theory.
It will help you to collect and organize infor?
mation in a useful way, looking for connections and patterns in the data.
As an experimenter, you
should use the scientific method as you conduct the experiments throughout this manual. Figure 1: The process of the scientific method 13
Lab 1 : Scientific Method
The scientific method process begins with the formulation of a
hypothesis – a statement of what the experimenter thinks will
happen in certain situations. A hypothesis is an educated guess –
a proposed explanation for an event based on observation(s).

A null hypothesis is a testable statement, that if proven true means
the hypothesis was incorrect. Both statements must be testable,
but only one can be true. Hypotheses are typically written in an

if/then format, such as: Hypothesis:

If nutrients are added to soil, then plants grown in it will

Figure 2: What affects plant growth?

grow faster than plants without added nutrients in the soil.

Null hypothesis: If nutrients are added to the soil, then the

plants will grow the same as plants in soil without added nutrients.

There are often many ways to test a hypothesis.

When designing an experiment to test a hypothesis

there are three rules to follow:

If plants grow quicker when nutrients are added,

then the hypothesis is accepted and the null hypothesis is rejected. 1.

The experiment must be replicable.

2. Only test one variable at a time. 3. Always include a control.

Variables are defined and measurable components of an experiment.

Controlling the variables in an

experiment allows the scientist to quantitate the changes that occur so that

results can be measured and conclusions drawn.

There are three types of variables:

Independent Variable: The variable that the scientist changes to a predeterm

ined value in order to test the hypothesis.

There can only be one independent variable in each

experiment in order to pinpoint the change that affects the outcome of the e

xperi? ent.

Dependent Variable: This variable is measured in regards to conditions of the inde? pendent variable—it depends on the independent variable.

There can be more than one dependent variable in each experiment. 14

Lab 1 : Scientific Method

Controlled Variable: This variable, or variables (there could be many) reflect t he factors

that could influence the results of the experiment, but are not the planned ch anges the scientist is expecting (by changing the independent variable).

These variables must be

controlled so that the results can be associated with some change in the ind ependent variable.

When designing the experiment, establish a clear and concise procedure.

Controls must be identified to

eliminate compounding changes that can influence the results.

Often times, the hardest part of design?

ing an experiment is not figuring out how to test the one factor you focus on, but in trying to eliminate the often hidden influences that can skew results.

Taking notes when conducting an experiment is im?

portant, whether it is recording the temperature, humidity, time of day, or an other environmental con? dition that may have an impact on the results.

Also remember that replication is fundamental to scien? tific experiments.

Before drawing conclusions, make sure your data is repeatable.

In other words, make

sure the experiment provides significant results over multiple trials.

Often, the best way to organize data for analysis is as a table or a graph.

Remember, any table or graph should be able to stand on its own.

In other words, another scientist should be able to pick up the table

or graph and have all of the information necessary to interpret it, with no oth

er information. Table: A well? organized summary of data collected.

Only include information relevant to the hypothesis (e. g.

don't include the color of the plant because it's not relevant to what is being

tested). Al?

ways include a clearly stated title, label your columns and rows and include t

he units of meas? urement. For our example:

Table 1: Plant Growth with and without Added Nutrients Variable Control

(without nutrients) Independent Height Wk1 (mm) Height Wk 2 (mm)

Height Wk 3 (mm) Height Wk 4 (mm) 3. 4 3. 6 3. 7 3. 5 3.

7 4. 1 4. 0 4. 6 (with nutrients)

Graph: A visual representation of the relationship between the independent a

nd dependent variable.

Graphs are useful in identifying trends and illustrating findings.

Rules to remember: ??

The independent variable is always graphed on the x?

axis (horizontal), with the depend? ent variable on the y axis (vertical). ??

Use appropriate numerical spacing when plotting the graph, with the lower n

umbers starting on both the lower and left hand corners.

?? Always use uniform or logarithmic intervals.

For example, if you begin by numbering, 0,

10, 20, do not jump to 25 then to 32. 15 Lab 1 : Scientific Method ??

Title the graph and both the x and y axes such that they correspond to the ta ble from which they come.

For example, if you titled your table “ Heart rate of those who eat vegetables and those who do not eat vegetables”, be sure to title the graph t he same. ?? Determine the most appropriate type of graph.

Typically, line and bar graphs are the most common.

Line graph: Shows the relationship between variables using plotted points th at are connected with a line.

There must be a direct relationship and dependence between each point con nected.

More than one set of data can be presented on a line graph.

Figure 3 uses the data from our previous table: Height

(mm)Figure 3: Plant growth, with and without nutrients, over time

Bar graph: Used to compare results that are independent from each other, as opposed to a continuous series.

Since the results from our previous example are continuous, they are not ap propriate for a bar graph. Figure 4 shows the top speeds of four cars.

Since there is no relationship between each car, each result

is independent and a bar graph is appropriate. 16 Lab 1 : Scientific Method

Speed (kph) Figure 4: Top speed for Cars A, B, C, and D

Interpretation: Based on the data you collected, is your hypothesis supporte d or refuted? Based on the data, is the null hypothesis supported or refuted?

If the hypothesis is supported, are there other vari?

ables which should be examined?

For instance, was the amount of water and sunlight consistent be?

tween groups of plants ? or, were all four cars driven on the same road?

Exercise 1:

Dissolved oxygen is oxygen that is trapped in a fluid, such as water.

Since virtually every living organism

requires oxygen to survive, it is a necessary component of water systems su

ch as streams, lakes and riv? ers in order to support aquatic life.

The dissolved oxygen is measure in units of ppm—or parts per mil? ion.

Examine the data in Table 2 showing the amount of dissolved oxygen presen

t and the number of

fish observed in the body of water the sample was taken from; finally, answe

r the questions below. 17 Lab 1 : Scientific Method Table 2: Water quality vs.

fish population Dissolved Oxygen (ppm) 2 4 6 10 12 14 16 18

Number of Fish Observed 0 8 0 1 3 10 12 13 15 10 12 13 1.

Based on the information in Table 2, what patterns do you observe? 2.

Develop a hypothesis relating to the amount of dissolved oxygen measured i

n the water sample and the number of fish observed in the body of water. .

What would your experimental approach be to test this hypothesis? 4.

What are the independent and dependent variables? 5.

What would be your control? 6.

What type of graph would be appropriate for this data set? Why? 7.

Graph the data from the table above. 18 Lab 1 : Scientific Method 8.

Interpret the data from the graph made in Question 7. Exercise 2:

Determine which of the following observations are testable.

For those that are testable: ?? Write a hypothesis and null hypothesis ??

What would be your experimental approach? ??

What are the dependent and independent variables? ?? What is your control? ?? How will you collect your data? ??

How will you present your data (charts, graphs, types)? ??

How will you analyze your data? 1.

When a plant is placed on a window sill, it grows faster than when it is placed on a coffee table in the middle of the living room. 2.

The teller at the bank with brown hair and brown eyes and is taller than the other tellers. 3.

I caught four fish at the seven o'clock in the morning but didn't catch any at noon. 4.

The salaries at Smith and Company are based on the number of sales and Billy makes 3, 000 dollars more than Joe.

19Lab 1 : Scientific Method 5.

When Sally eats healthy foods and exercises regularly, her blood pressure is lower than when she does not exercise and eats fatty foods. 6.

The Italian restaurant across the street closes at 9 pm but the one two blocks away closes at 10 pm. 7.

Bob bought a new blue shirt with a golf club on the back for twenty dollars. 8.

For the past two days the clouds have come out at 3 pm and it has started raining at 3: 15 pm. 9.

George did not sleep at all last night because he was up finishing his paper.

10. Ice cream melts faster on a warm summer day than on a cold winter day.

1. How can you apply scientific method to an everyday problem?

Give one example. 20 Introduction Lab 2 Writing a Lab Report 21 22

Lab 2: Writing a Lab Report Concepts to explore: ?? What is a lab report? ??

The parts of a lab report ?? How to write a lab report Introduction

A lab report is a scientific paper describing an experiment, how it was done and the results of the study.

Experiments are performed to test whether what one thinks may hap? pen, actually does. The lab report lays out the results of the experi? ment and can be used to communicate the findings to other scien? tists. It allows the findings of one scientist to be examined, repli? cated, refuted or supported by another scientist. Though most lab reports go unpublished, it is important to write a report that accu? rately characterizes the experiment performed.
Even if what is described never reaches the public or the scientific community, the report lays the foundation for other experiments.

It also provides a written record of what was done, so that others can un? derstand what the investigator was thinking and doing.
Figure 1: Lab reports are an essential part of science,
providing a means of report? ing experimental findingsParts of a Lab Report:

Title: A short statement summarizing the topic of the report.

Abstract: A brief summary of the methods, results and conclusions.

It should not exceed 200 words and should be the last part written.

Introduction: This is an overview of why the experiment was conducted.

There are three key parts:

Background: Provides an overview of what is already known and what questi ons remain unre? solved regarding the topic of the experiment.

Assume the reader needs a basic introduction to 23

Lab 2: Writing a Lab Report

the topic and provide the information necessary for them to under?

tand why and how the experiment was performed.

Objective: Explain the purpose of the experiment.

For example; " I

want to determine if taking baby aspirin every day prevents second

heart attacks". Hypothesis: This is your "

guess" as to what will happen when you do the experiment.

Materials and Methods: These are detailed descriptions of what was used

Figure 2: Follow the guide?

to conduct the experiment, what was actually done (step by step) and how

lines in this introduction it was done.

The description should be exact enough that someone read?

when writing a lab report. ing the report can replicate the experiment.

Make sure to include all the

equipment and supplies used, even they seem obvious and did not seem to

play a large role. When

describing the methods, go in order from the first step to the last.

Do not list the procedures used in a

numerical fashion, but write them in complete sentences and paragraphs, m

uch like you would if speaking.

Results: This is the data obtained from the experiment.

This section should be clear, concise and to the point.

In this section tables and graphs are often appropriate and frequently are the best way to present the data.

Do not include any interpretations, only the raw data.

Discussion: This is where the scientist (you) can interpret the data you obtai ned and draw conclusions.

Was your hypothesis (“ guess”) supported or refuted?

Discuss what these findings mean, look at com?

mon themes, relationships and points that perhaps generate more questions.

If fewer second heart

attacks were reported when baby aspirin was taken, but only in women, this would lead to additional questions.

When appropriate, discuss outside factors (i. e.

temperature, time of day, etc.) that may

have played a role in the experiment and what could be done to control thos e in future experiments.

Conclusion: A short, pointed summary that states what has been learned fro m this experiment.

References: Any articles, books, magazines, interviews, newspapers, etc.

, that were used to support

your experimental protocols, discussions and conclusions, should be cited in this section. Important Points to Keep in Mind ??

Do not confuse the sections of your paper.

Pay attention to the difference between the results

and discussion section. ?? Be clear, concise and complete. 24

Lab 2: Writing a Lab Report ??

If your results are inconclusive, as are most experiments, say so. ??

Proof read your report.

A lab report is expected to be able to withstand scrutiny.

?? Do not plagiarize; give credit to all references used.

Experiment 1: Design an experiment

The following experiment is meant to be designed by you!

With the beans provided in the kit, you will

design and execute an experiment to test several factors that influence seed germination. Whatever

your experimental design, be sure to include controls and make sure it is rep roducible! Materials 100 beans 10 5 x 8in bags Permanent marker Ruler Paper towels* Water* Masking tape* *You must provide

Notes about bean germination: ??

The time to germination will decrease if you soak the beans overnight ??

It may take 7? 10 days for the beans to ‘ sprout’ ??

Make sure the paper towels remain moist for the duration of your experiment

Procedure 1.

Think of 10?

20 variables that may affect seed germination, recording them in Table 3. 2.

From your list of variables in Table 3, select three to test.

Form a hypothesis for why each affects seed germination. 3.

To germinate the beans, place one folded paper towel, moistened but not so aking wet, into the 5 x 8in bag.

Place 10 beans in a horizontal line on the paper towel (between the paper to wel and bag).

. Label each bag with the variable being tested. 25

Lab 2: Writing a Lab Report

Table 3: Variables that may influence seed germination Variable

Hypothesized Effect 5.

Hang each bag vertically using masking tape in the environment you select.

6.

Create a table for your data, including title, units, and any other useful infor

mation. 7.

Select the appropriate type of graph, and report the data you collected.

8. Write a lab report for this experiment in the space provided. 26

Lab 2: Writing a Lab Report 27 Lab 2: Writing a Lab Report 28 Introduction

Lab 3 Data Measurement 29 30

Lab 3: Data MeasurementConcepts to explore: ?? The metric system ??

Converting units ?? Techniques for obtaining accurate measurements

Introduction

Biology relies heavily on the use of numbers, measurements and calculations

. Consequently, scientists

use a universal measuring standard called the metric system.

Because the metric system is based on

units of ten, it simplifies making conversions within that system.

The basic units of measurement in the metric system are: ??

Gram: when measuring mass. ?? Liter: when measuring liquid volume. ??

Meter: when measuring distance.

Note: In the table below meters are shown as an example.

The prefixes remain the same with liter or gram.

Each basic unit can be divided or expanded upon using the following prefixes

: Prefix Nano (n) Micro (µ) Milli (m) Centi (c) Deci (d) Prefix Abbreviation 10?

9 Multiplier used to convert TO meters 0. 000000001 1000000000 ? 6 0.

000001 1000000 ? 3 0. 001 1000 ? 2 0. 01 100 ? 1 0.

1 10 10 10 10 10 Deka (da) 101 Multiplier used to convert TO meters 10

Hecto (h) 102 Kilo (k) Mega (M) Giga (G) Multiplier used to convert

FROM meters Abbreviation Multiplier used to convert FROM meters 0. 1 100

0. 01 3 1000 0. 001 6 1000000 0. 000001 9 1000000000 0. 000000001 10

10

10To convert between units, multiply using the conversions above (conversio

ns can also be made by divi? 31 Lab 3: Data Measurement

sion, though not with this table). Multiplication Example: ??

To convert 200 meters (m) to kilometers (km): multiply 200 m x 0. 001 = .

2 km ?? To convert 450 millimeters (mm) to meters (m):

multiply 450 mm x 0 . 001 = . 45 m Figure 1: accurate data measurement is

key to reproducible science.

When converting from units less than a meter to greater than a meter (or the

other way around), first convert to a meter and then to the final unit.

To convert 40, 000 cm to kilometers: ? multiply 40, 000 cm x 0.

01 = 400 m ?? multiply 400 m x 0. 001 = 0. 4 km ?? 40, 000 cm = 0.

4km Exercise: 1) Convert the following: 3 m = __________ cm

83 m = __________ µm 41, 692 m = __________ mm

110 kilometers = __________ m = ____________ mm 3. 7 hectometers = _________ m = ____________ cm 451, 000, 000 µm = _________ m = ___________ dam 2)

Imagine a field is about 100 meters long.

If you run a 5K race how many meters is it? Approxi? mately how many “ fields” does this equate to? 32 Lab 3: Data Measurement

Length, Area, Volume, Mass and Temperature Length is measured in meters.

The area of a square or rectangle is measured by multiplying length (in meters) by width (in meters). The unit of measurement is m2, which reads “ meters squared” or “ square meters”.

When you see this notation, it is an indication that the measurement is descr ibing area. Example: If a box is 12 cm long and 24 cm wide, its area is:

12 cm X 24 cm = 288 cm2

Volume can be measured by multiplying length (m) by width (m) by height (m). The unit of measure? ment is m3, which reads “ meters cubed” or “ cubic meters”.

When you see this notation, it is an indica?

tion that the measurement is describing volume. Example:

If the same box is 4 cm high, its volume would be:

If we wanted to convert this to meters: 12 cm X 24 cm X 4 cm = 1, 152 cm3

1, 152 cm3 X 0. 01 = 11. 52 m3 Exercise: 3) Measure the following objects.

A) Your computer screen (in meters) Length______________

Width ______________ Area _______________ Volume ____________

B) A 100 mL beaker: (in millimeters) Length _____________ Width _____________

Area ______________ Volume ___________

C) Your lab kit box lid: (in centimeters) Length _____________ 33

Lab 3: Data Measurement Width _____________ Area _______________

Volume ____________ Mass is the amount of matter an object possesses.

Figure 2: Be aware of the margin of error possible with instruments

It is the metric systems measurement of weight

and is expressed in grams (g). When using instru?

ments, such as a scale, there is always a margin of error.

This is a result of either human or mechanical error.

Therefore, it is prudent to perform meas?

urements at least three times to find the average (most precise) measureme

nt. Exercise: 4) Determine the mass of the objects listed below (in grams).

Pay attention to the units. Since you

do not have a metric scale, we will provide you data to work with.

A) Baseball Mass (measurement 1): ____. 45__kg

Mass (measurement 2): ____145.

05_ g Mass (measurement 3): 145, 750. 77 mg Mass (average): __________g

Convert: ___________kg B) Piece of fruit Mass (measurement 1): ____310____ g

Mass (measurement 2): ___0. 318____kg Mass (measurement 3): __309,

143___ mg Mass (average): __________cg Convert: ___________ g

Volume is a three dimensional measurement of how space is occupied.

Previously we expressed vol? ume in m3 (cubic meters).

However, the measurement can be reported in units of cubic length or liters.

To convert from one to the other, the conversion 1 cm3 = 1ml is used.

34 Lab 3: Data MeasurementExample: NOTE:

To determine the volume of a measurable object, multiply

length x width x height. If a wooden block is 15 cm long, 20

cm wide and 4 cm high, the volume can be found by: When an object is solid

and does not have measurable sides (i. e. a solid marble), water

displacement can be used to determine the volume.

Volume = 15 cm x 20 cm x 4 cm = 1, 200 cm3 = 1, 200 ml = 1.

2 L A graduated cylinder is often used to measure volumes.

The graduated cylinder is filled with water and

this initial volume is recorded.

The object is added carefully and the new volume is recorded. The dif?

erence of these two volumes is the volume of the object!

Ex: The initial water level in a graduated cylinder is 25.

8mL. After an irregularly shaped object is

placed into the cylinder, the water level reads 42. 9mL.

What is the volume of the irregularly shaped object? Answer: 17.

1mL or 17. 1cm3 When measuring a liquid there is a certain place

that one must measure ? the bottom of the me? niscus.

The meniscus is the curved line that a

liquid makes when placed in a narrow con? tainer.

When looking for the bottom of the me? niscus, one must look straight at it.

When one’s line of sight is too high, then the reading that is

eceived is too low. When one’s line of sight is

too low, then the reading received is too high.

35 Lab 3: Data Measurement Exercise:

Determine the volume of the following objects.

If you cannot do so by measuring the dimensions, use a different technique.

A) The chemical box inside of your kit: Length: ________ m Width: _________ m

Height: _________ m Volume: ________ L B) Test tube: Length: _________m

Width: __________ m Height: __________ m Volume: _________ L

C) Pick an object from your home. Object: ______________. Length: _________ m

Width: __________ m Height: __________ m Volume: _________ LExercise 1.

If you want to determine the volume of a swimming pool, name two ways yo u cou ld do this. 2. Measure the volume of a soup bowl from your cupboard.

Volume: _________ mL 36 Lab 3: Data Measurement

Temperature is a measure of the amount of heat present in an object.

We use the Fahrenheit scale in the U.

S. , but the scientific standard is Celsius.

In Celsius, water boils at 100o C and freezes at 0o C. To

convert between Fahrenheit and Celsius, use the following equation: o

C = 5/9 (o F – 32o) Example: the human body has a temperature of 98. 6o F:

o C = 5/9 (98. 6o F – 32o) C = 37 Exercise: 1. Convert the following:

121 o F = _______________ o C 32o F = ________________ o C

0 o F = ________________ o C 77 o F = ________________ o C 2.

With your thermometer, measure the temperature of the following objects:

A) Glass of cold tap water: _______________ o C

B) Your kitchen: _______________ o C

C) Inside your freezer: _______________ o C

D) Palm of your hand (wrap your hand around the thermometer, but do not s queeze): _____________ o C 37 Introduction Lab 4

Introduction to the Microscope 39 40 Lab 4: Introduction to the Microscope

Concepts to explore: ?? ??