PISCATAWAY TOWNSHIP SCHOOLS

CURRICULUM GUIDE

BIOLOGY

Honors/Academic/Conceptual

Grades 10-12

July 2006

Approved By The Piscataway Board of Education

Piscatway Township Schools

Grade: High School

Piscataway, New Jersey

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July 2007

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DISTRICT MISSION

The mission of Piscataway Township Schools is the continual development of each child's intellectual, aesthetic, social and physical abilities in a positive learning environment, which fosters self-esteem. Students will be confident, productive members of a changing, progressive society.

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PHILOSOPHY

This Biology program of study is designed for high school students as a college preparatory course. Initially, the fundamentals of safety, measurement and the scientific method are presented to students as essential, fundamental understandings. Subsequently, program concepts and applications are learned, consisting of: characteristics and structure of life; cell processes; genetics; evolution and classification; microbes, fungi and disease; plants; animals; ecology and the environment; and human systems.

As an academic program of study, Biology allows students to build a better understanding of the diversity and complexity of life around us as well as their interactions with each other. This program builds skills and shows how the study of Biology is fundamental to understanding life functions and interactions with the environment. Biology is inherent in all aspects of our world.

This program of study encompasses three levels of student learning intensity depending on the content rigor: Honors, Academic and Conceptual. The Conceptual level meets 5 periods per week while the Academic and Honors levels meet 6 times per week. The entire program consists of eight Units, with the depth and breadth consistent with the appropriate intensity level and satisfies the NJ State standards. The Conceptual level meets the minimum requirements for biology, the Academic level provides more depth of understanding at a moderate level and the Honors level addresses a broader scope, which significantly exceeds requirements. The Academic and Honors levels provide a solid basis for further advanced study in the sciences. All program levels incorporate laboratory inquiries and experiments as well as student analysis and reporting. All program levels also include the opportunity for individual project activity in biology.

The detailed curriculum plan that follows has been designed and included to build an awareness of the course content at each intensity level and includes a scope and sequence map.

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www.accessexcellence.org/AE/

www.biologycorner.com/

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www.discoverychannel.com

www.unitedstreaming.com

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UNIT I

Content Standard (s):

5.1.A.1 When making decisions, evaluate conclusions, weigh evidence, and recognize that arguments may not have equal merit.

5.1.A.2 Assess the risks and benefits associated with alternative solutions.

5.1.A.3 Engage in collaboration, peer review, and accurate reporting of findings.

5.1.A.4 Explore cases that demonstrate the interdisciplinary nature of the scientific enterprise.

5.1.B.1 Select and use appropriate instrumentation to design and conduct investigations.

5.1.B.2 Show that experimental results can lead to new questions and further investigations.

5.1.C.1 Understand, evaluate and practice safe procedures for conducting science investigations.

5.2.A.1 Recognize the role of the scientific community in responding to changing social and political conditions and how scientific and technological achievement effect historical events.

5.2.B.1 Examine the lives and contributions of important scientists who effected major breakthroughs in our understanding of the natural and designed world.

5.2.B.2 Discuss significant technological achievements in which science has played an important part as well as technological advances that have contributed directly to the advancement of scientific knowledge.

5.2.B.3 Describe the historical origin of important scientific developments such as atomic theory, genetics, plate tectonics, etc., showing how scientific theories develop, are tested, and can be replaced or modified in light of new information and improved investigative techniques.

5.4.A.1 Know that scientific inquiry is driven by the desire to understand the natural world and seeks to answer questions that may or may not directly influence humans, while technology is driven by the need to meet human needs and solve human problems.

5.4.B.1 Assess the impacts of introducing a new technology in terms of alternative solutions, costs, tradeoffs, risks, benefits and environmental impact.

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STAGE 1: DESIRED RESULTS

Understandings

Students will understand that …

District:

(1) SWUT science is an ongoing investigative process that demands a variety of safe methods, posing questions, explaining, and predicting outcomes about the universe. The methods chosen are based on honesty, the known and unknown, and the risks/benefits of the solution while communicating the results to others for their

(3) SWUT scientific investigation requires selection of suitable technology and use of appropriate mathematical methods based on quantitative needs and intended purpose to collect, analyze, and interpret data to test prediction/hypotheses.

(4) SWUT technology provides a manmade solution to a human problem or need and the development of technology is both similar to and different from the scientific process.

Course:

(1) SWUT experiments must be appropriately designed and implemented in order to communicate conclusions that are supported by observations and analysis.

(3) SWUT mathematical models and other patterns describe physical phenomena and can be used to predict real world events

(4) SWUT new technologies impact cost, tradeoffs, risk, benefits, the environment, and new knowledge

Essential Question(s):

Is it possible to create a completely safe laboratory environment?

How do errors and mistakes occur?

Is logic necessary in problem solving?

Are there patterns associated with the development of new knowledge?

Can new technology impact experimental design?

Knowledge & Skill

Students will know …

classroom safety rules and procedures the parts and application of the Scientific Method. the parts of an experiment, experimental design the proper way to analyze lab data and write a conclusion proper identification and use of laboratory equipment the SI (metric) system is used to measure scientific data. microscopes are used in Biology
Students will be able to… describe and demonstrate the proper usage of safety equipment in the classroom (E) identify unsafe situations (E) state/follow proper emergency procedures. (E) list the steps of the scientific method and apply it to a problem (E) identify independent & dependent variables and controls in various experiments (E) design and perform an experiment which includes controls and variables (E) organize and analyze data in charts and tables (E) construct and analyze a graph using proper format and scale. (E) analyze and build inquiry skills, develop hypotheses, and form conclusions (E) write a lab report in standard format using the scientific method(E) identify various pieces of lab equipment and describe their uses (E) use appropriate instruments and metric units when making measurements and collecting data. (E) describe the “evolution” of the modern compound microscope (E) label a diagram of a compound microscope and describe the function of each part (E) properly focus/adjust a compound light and dissecting (stereo-) microscope (E) calculate the total magnification of a microscope (E) compare the different types & uses of microscopes (E) prepare and stain a wet mount slide

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(E) = Essential Minimum Requirements For Basic Understanding Of Biology.

STAGE 2: ASSESSMENT

Performance Task Summary:

Rubric Titles (Key Criteria)

Problem Solving:

Design and perform an experiment that includes all steps of the scientific method/parts of an experiment to solve a non-biological problem and present in correct lab report format

5 pts:

-lists parts of scientific method and application to problem

-list parts of experiment and application to problem

-create blank tables/charts for data

-neatness

-follows correct lab report format

Points lost successively for each criteria point that is not met.

* Individual project may be modified or substituted as appropriate for course intensity level while maintaining minimum requirement of one project per unit.

Self-Assessments	Other Evidence, Summarized

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Student interactive notebook (Avid strategy) Science lab journal (Avid strategy) Three item summary (Avid strategy)	Achieve 100% on the Lab Safety test Lab notes, drawings, experimental design Lab Write-ups Test/Quizzes Safety Scientific Method (experimental design, lab equipment, measurement and graphing) Microscope Review sheets

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STAGE 3: LEARNING ACTIVITIES

Learning Activities:

Safety Scavenger Hunt (see Unit I resources)

Lab: Safety Investigation (see Unit I resources)

Safety Quiz – teacher made (students MUST earn a 100%) (see Unit I resources)

Lab: Investigating a Grass Community (see Unit I resources)

Activity: Plotting Data Using Excel (see Unit I resources)

Lab: Lego® (Block) (See Prentice Hall text pg. 2)

Lab: microscopes (Laboratory Manual A, pg. 35)

Lab: Identifying Laboratory Equipment (Laboratory Manual A, pg. 23)

Lab: Measuring Objects Under the Compound Microscope (see Unit I resources)

United Streaming Videos on Science Network Drive (R):

Acids and Bases

How to Use a Microscope

Lab Safety Awareness

Microscope Introduction

Microscope Skills

Organic Chemistry

Scientific Method

* Suggested labs may be modified or substituted depending on the intensity level of the course

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UNIT 1 RESOURCES

SAFETY SCAVENGER HUNT

Team Members:

1)

2)

3)

4)

Directions:

Assign to one member of your team the role of “recorder”

Walk around the classroom with your team mates.

Observe and record as many unsafe situations as possible.

WORK QUIETLY – THIS IS A TEAM CONTEST☺

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Name _____ Date _____

Biology Period _____

Laboratory Safety Investigation

A. Safety Devices:

You and your team must examine room 141 and complete the information below for each piece of safety equipment found. Be complete!!

	Device	Location	Function
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____
6.	_____	_____	_____
7.	_____	_____	_____

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8. _____ _____ _____

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As you examine Room _____, list possible safety hazards found and what should be done to correct these dangerous conditions.

1.

_____

2.

_____

3.

_____

4.

_____

5.

_____

6.

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7.

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8.

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C. Identifying Safety Violations in Pictures

Study each of the following pictures and list any and all improper and unsafe techniques being used. Be prepared to describe the problems and how they should be corrected.

1. _____

_____

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2. _____

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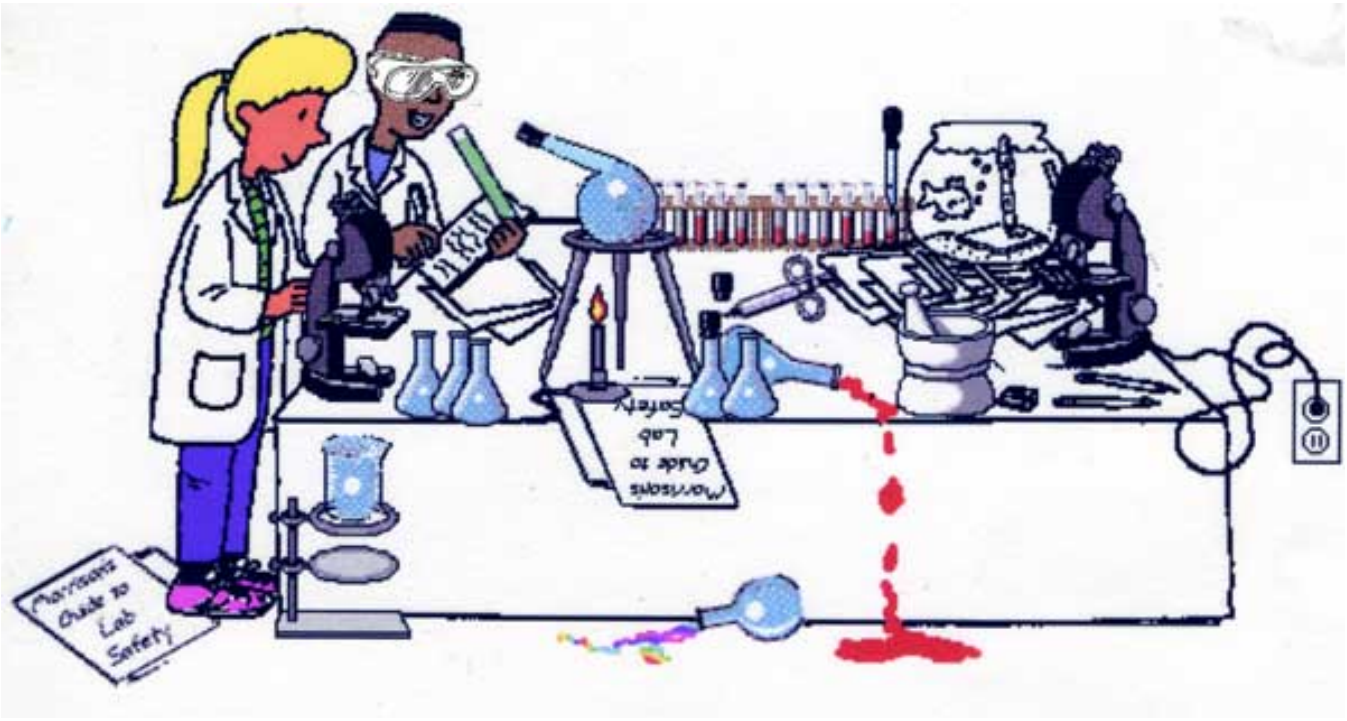

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Name: Period:

BIOLOGY LABORATORY SAFETY QUIZ

Multiple Choice: READ ALL OF THE CHOICES and then select the BEST choice and write the letter on the line.

_____1. Students may start a laboratory experiment as soon as the

student has read all of the directions carefully

materials are set out at each lab station

teacher tells the students they may begin

bell rings

_____2. When smelling a sample, you should

place the sample as close to your nose as possible and then inhale

fan the air over the sample (waft it) towards your nose

ask a lab partner to do it

use a cotton swab or cotton ball

_____3. Eating and drinking in the lab is

never allowed

allowed only before homeroom and after school

allowed only when you are really hungry or thirsty

allowed after the desks are wiped down with alcohol

_____4. When mixing acid to water, you ALWAYS add

acid to water

water to acid

both at the same time

all of the above

none of the above, you can never mix acid and water

_____5. When you perform a dissection, the safest way to carry the sharp dissecting tools is

in your hand

in a beaker with the points up

in a paper towel

flat in a dissecting tray

_____6. The only time that you DO NOT wear safety goggles is when you are

washing equipment

mixing chemicals

using the microscope

dissecting a specimen

_____7. The first thing you should do in the event of an accident is

clean up your mess

tell the teacher

wash the wound

call 911

_____8. In the event of a fire drill during a lab, you should

grab your backpack/pocketbook/jacket and leave

assign one person to stay and continue recording data

stay and finish the lab

turn off all equipment and leave the building

_____9. In order to conduct a lab before, during, or after school

a school nurse must be present

a teacher must be present

you just need to know what to do

a principal must be present

_____10. Horseplay or dangerous behavior in the laboratory may result in

serious injury

removal from the lab for the rest of the school year

an administrative disciplinary referral

failure for the laboratory section of the grade (20%)

all of the above

_____11. Glassware and lab equipment that has been heated

can be placed on paper towels to cool

must be handled with tongs or mitts

cools off quickly

can be placed in cold water to cool it off quickly

_____12. Electric hot plates

cannot start fires

cool off after the red coils turn black

can be just as dangerous as an open flame

can be used anywhere in the classroom

_____13. A stoppered (sealed) test tube can be heated ONLY if you

point it away from people

move it back and forth over the heat source

hold it still over the heat source

remove the stopper (seal)

_____14. Science is all about discovery. During labs you

are allowed to do whatever you want with the materials at the lab station

must follow the directions of the teacher, unless otherwise instructed

are encouraged to be creative so long as you don't hurt anyone

should always taste the materials you are working with

_____15. Before you work in a lab, you should

read the procedure

remove long dangling jewelry

tie back long hair

wear appropriate safety equipment

all of the above

_____16. Broken glassware is discarded (thrown out) in the

sink

garbage can

recycling container

broken glass container

_____17. If there is a fire in the lab, the gas must be shut off immediately by

running to each lab station

pushing the large red shut off button at the front of the room

shutting off the electricity from the control panel

using a fire extinguisher

_____18. Glassware with a little chip or crack

can only be used by the teacher

must be discarded (thrown out)

can be used carefully

can be used so long as the crack doesn’t get bigger

_____19. If you cut yourself, you should

rinse it out immediately

cry

have a friend kiss it and make it better

tell the teacher

_____20. After using a hot plate or microscope, you should

turn them off and unplug them

keep them close to the edge

keep them on for the next class

place them in the sink

Matching: Write the letter of the symbol that matches each description

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A.


B.


C.


D.


E.

_____21. Indicates a caustic or corrosive substance (can damage surfaces)

_____22. Indicates that care should be taken in the presence of an open flame

_____23. Indicates the presence of or production of poisonous or noxious vapors/fumes

_____24. Indicates that the potential for an explosive situation is present

_____25. Indicates that goggles must be worn

Short Answer:

1) Describe the location of the eyewash, when it is used, and how it is used.

Location:

When it is used:

How it is used: (BE VERY SPECIFIC!!)

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2) What are TWO ways that the teachers (or students) can contact the front office?

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Name : _____Date: _____

Biology Period _____

INVESTIGATING A GRASS COMMUNITY

Background;

A grass community can be described as a living thing including all plants and animals living in a grass/weeded area. The animals that live in a grass community may include insects, worms, and other critters found both at the surface of the soil and within the roots of plants or below the roots. There is an important relationship between all organisms in this community.

Objectives;

1. What are the relationships between the organisms you found?

2. Which of the organisms present do you believe to be most successful and why?

Procedure;

Obtain a shovel full of the grass community.

Carefully separate all living organisms found in the sample and take note of where they are found. You will wear gloves, aprons, and goggles for this activity.

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Organize your numerical data into a table or chart similar to the one on the back of this sheet. Be sure to specify where organisms are found within the community.

You may use collections containers and the dissecting microscope to hold and examine the organisms.

Make a labeled, ½ page diagram for each species of organism found. You may choose to tape each variety of plant to a piece of white paper but make sure there are only 2-3 species per page.

Create a full page Bar Graph to represent the number of each type of organism found.

List the names of your lab partners below:

Organism	How Many Found	Location Where Found

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Plotting Data Using Excel

Once you have collected data you will want to plot a graph or chart to show trends or relationships clearly. With a little effort, Excel produces very nice charts. First enter the data you want to plot into two columns (or rows) and select (block) them.

Drawing the Graph. Click on the chart wizard  . This has four steps:

Graph Type. For a bar graph choose Column and for a scatter graph (also known as a line graph) choose XY(Scatter) then press Next. Do not choose Line.

Source Data. If the sample graph looks OK, just hit Next. If it looks wrong you can correct it by clicking on the Series tab, then the red arrow in the X Values box, then highlight the cells containing the X data on the spreadsheet. Repeat for the Y Values box.

Chart Options. You can do these now or change them later, but you should at least enter suitable titles for the graph and the axes and probably turn off the gridlines and legend.

Graph Location. Just hit Finish. This puts the chart beside the data so you can see both.

Changing the Graph. Once you have drawn the graph, you can now change any aspect of it by double-clicking (or sometimes right-clicking) on the part you want to change. For example you can:

move and re-shape the graph

change the background colour (white is usually best!)

change the shape and size of the markers (dots)

change the axes scales and tick marks

add a trend line or error bars (see below)

Lines. To draw a straight "line of best fit" right click on a point, select Add Trendline, and choose linear. In the option tab you can force it to go through the origin if you think it should, and you can even have it print the line equation if you are interested in the slope or intercept of the trend line. If instead you want to "join the dots" (and you don't often) double-click on a point and set line to automatic.

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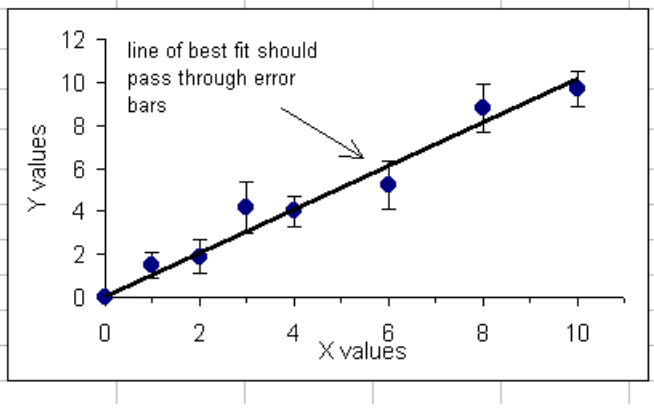
	A	B	C
1			
2	**x**	**y**	**CI**
3	0	0	0
4	1	1.5	0.6
5	2	1.9	0.8
6	3	4.2	1.2
7	4	4	0.7
8	6	5.2	1.1
9	8	8.8	1.1
10	10	9.7	0.8
11			



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Measuring Objects Under the Compound Light Microscope

Background Information:

1 millimeter = 1000 um or 1um = 1/1000mm

Objective:

How can you approximate the size of objects under Low, Medium, and High Power?

Procedure:

Place the mm scale of the transparent plastic ruler over the center of the stage opening

Use the Low Power objective to locate the mm lines and place them in the middle of the field of view. Position the ruler so that one of the mm lines is just touching the left edge of the field of view.

Draw a ½ page diagram that shows how the ruler looks. Label it as “Low Power View” and also add a label for the Total Magnification.

Now indicate the actual diameter measurement of the Low Power Field of view in both mm and um.

Now perform the same process under the Medium Power Objective. Draw a ½ page diagram and indicate its diameter measurement.

Try to view the ruler under High Power. You should see that it is not a very good way to directly measure the diameter of the Field of View.

Your big challenge now is to come up with the calculation to determine the High Power Field of View. You should base your sizing calculation on the measured field of view for your Low Power;

Here is a HINT:

If the total magnification is 6X, it will have ½ the field of view of the lens that has a total magnification of 3X.

After drawing the above two diagrams and calculating the field of view for you High Power Objective, do the following;

Draw a ½ page diagram of either an amoeba or paramecium under High Power.

Indicate at least 2 dimensions of the organism that you drew.

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UNIT II: CHARACTERISTICS & STRUCTURE OF LIFE

Content Standard (s):

5.5.A.1 Relate the structure of molecules to their function in cellular structure and metabolism.

5.5.A.2 Explain how plants convert light energy to chemical energy.

5.5.A.3 Describe how plants produce substances high in energy content that become the primary source of energy for life.

5.5.A.4 Relate disease in humans and other organisms to infections or intrinsic failures of system.

5.6.A.1 Know that atoms are made of a positive nucleus surrounded by negative electrons and that the nucleus, a tiny fraction of the volume of an atom, is composed of protons and neutrons, each almost 2,000 times more massive than an electron.

5.6.A.2 Know that the number of protons in the nucleus defines the element.

5.6.A.3 Know that an atom's electron arrangement, particularly the outermost electrons, determines how the atom can interact with other atoms.

5.6.A.4 Explain that atoms form bonds (ionic and covalent) with other atoms by transferring or sharing electrons.

5.6.A.5 Explain how the Periodic Table of Elements reflects the relationship between the properties of elements and their atomic structure.

5.6.A.6 Know that many biological, chemical and physical phenomena can be explained by changes in the arrangement and motion of atoms and molecules.

5.6.A.7 Recognize that the properties of matter are related to the structure and arrangement of their molecules and atoms, such as in metallic and nonmetallic crystals and carbon compounds.

5.6.A.8 Know that different levels of energy are associated with different arrangements of electrons.

5.10.A.1 Distinguish naturally occurring process from those believed to have been modified by human interaction or activity.
- Climate change
- Ozone production
- Erosion and deposition
- Threatened and endangered species

5.10.B.1 Assess the impact of human activities on the cycling of matter and the flow of energy through ecosystems.

5.10.B.2 Use scientific, economic, and other data to assess environmental risks and benefits associated with societal activity.

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STAGE 1: DESIRED RESULTS

Understandings

Students will understand that …

District:

(1) SWUT science is an ongoing investigative process that demands a variety of safe methods, posing questions, explaining, and predicting outcomes about the universe. The methods chosen are based on honesty, the known and unknown, and the risks/benefits of the solution while communicating the results to others for their

(3) SWUT scientific investigation requires selection of suitable technology and use of appropriate mathematical methods based on quantitative needs and intended purpose to collect, analyze, and interpret data to test prediction/hypotheses.

(6) The relationship among the structure of matter, its organization and its chemical and physical properties can be used to predict and explain the universe.

(7)The fundamental physical laws enable us to explain, predict, and control force, matter

and energy

Course:

(1) SWUT experiments must be appropriately designed and implemented in order to communicate conclusions which are supported by observations and analysis

(3) SWUT that mathematical models describe physical phenomena and can be used to predict real world events

(6) SWUT the structure of matter predicts its chemical and physical properties which can be used to explain all particle behaviors

(7) SWUT they can quantitatively predict what happens when forces act on objects.

Essential Question(s):

Is all life made of the same matter?

Does structure always control function?

Does abiogenesis occur in the universe today?

How can things which share common characteristics still be different?

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Do all atoms behave in a predictable manner?

Knowledge & Skill

Students will know …

the model of the atom

that atoms bond/combine in specific patterns

that water is an important molecule

the significance of the pH scale

the difference between acids and bases

what a functional group is and how it reacts chemically

the difference between structural and chemical formulas

macromolecules are built and broken down

the structure and function of carbohydrates, lipids, nucleic acids, and proteins

the history of disproving abiogenesis

that organic compounds evolved from simpler compounds

the first primitive cells formed from complex organic compounds

the events that led to the discovery of the cell and the development of the cell theory

that the structure of a cell determines its function

that all life shares common characteristics

the parts of cells and their functions

the difference between plant and animal cells

that eukaryotic cells evolved from prokaryotic cells

Students will be able to…

draw and label a model of an atom (E)

relate the model of an atom to the model of our solar system (E)

identify the atomic number, mass number, # of protons, neutrons, and electrons from information in the periodic table (E)

describe the patterned arrangement of atoms in the periodic table

predict how atoms will react chemically based on their atomic structure (E)

describe and illustrate the differences between ionic and covalent bonds (E)

illustrate that molecules of water weakly bond with other water molecules and create the unique characteristics of water

explain water dissociation (E)

identify the characteristics of acids and bases (E)

describe the pH scale and give examples of substances with low, medium and high pH (E)

explain the testing process to determine if substances are acidic or alkaline (E)

list the four main elements found in organic compounds, what makes a compound organic (E)

identify functional groups by their formula

define polymer, give examples, identify monomers (E)

list the importance and composition of the four major types of organic compounds (E)

draw and identify structural formulas of molecules of biological importance based upon the chemical formula

explain the difference between dehydration synthesis and hydrolysis reactions, give examples of, illustrate (E)

distinguish between anabolic and catabolic reactions and give examples of each (E)

explain/illustrate/identify the two models of enzyme activity: lock and key and induced fit

list the scientists who contributed to disproving abiogenesis and summarize their experiments (E)

list the compounds found on the early earth and explain how they can be rearranged to form simple then complex organic compound. (E)

explain how the first primitive cells can form from organic compounds.

identify the scientists involved in the development of the cell theory and their contributions (E)

list and describe the parts of the cell theory (E)

describe the differences between eukaryotic and prokaryotic cells and give examples of each (E)

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describe the structure and function of major cell structures and organelles for plants and animals(E)

create a cell analogy (E)

label and compare the structures in plant/animal cells (E)

describe the endosymbiont hypothesis and explain how mitochondria and chloroplast structure/function is evidence which supports that hypothesis (E)

(E) = Essential Minimum Requirements For Basic Understanding Of Biology.

STAGE 2: ASSESSMENT

Performance Task Summary:	Rubric Titles (Key Criteria)
Molecular Model Kits; given a list of chemical formulas for 15 organic/inorganic compounds, students will build each compound and make a structural drawing of each.	5 pts: 1 pt - using correct number and type of atoms for each compound 1 pt - proper arrangement of atoms 1 pt- correct number of bonds for each element 2 pts- drawing Points lost successively for each criteria point that is not met.
Stem Cell research project Students will research stem cell technology and formulate supported opinions of it's continuation in the form of a four page research paper using a	5 pts:

minimum of 4 sources dated 2004 or later. * Individual project may be modified or substituted as appropriate for course intensity level while maintaining minimum requirement of one project per unit.	- length(meets minimum length) - format (grammatically correct) - content accurate and complete - educated opinion(supported by research) - proper bibliography and citations Points lost successively for each criteria point that is not met.

Self-Assessments	Other Evidence, Summarized
Student interactive notebook (Avid strategy) Science lab journal (Avid strategy) Three item summary (Avid strategy) Gallery Walk activity	Periodic quizzes Unit tests: Organic compounds test Origin of life/spontaneous generation Cell test Various inquiries found in the student workbook associated with the textbook In class cooperative (group) work

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STAGE 3: LEARNING ACTIVITIES

Learning Activities:

Activity: Primordial Soup Can Label (see Unit II resources)

Lab: Testing For Acids & Bases with indicators (see Unit II resources)

Lab: Acids / Bases Inquiry using computer probeware (see Unit II resources)

Lab: If it Tastes Good, Is it Bad for You? (see Unit II resources)

Reading/Activity: Reading Food Labels (see Unit II resources)

Reading/Activity: Using and Understanding Nutritional Facts Panel (see Unit II resources)

Lab: Organic Compound Testing (see Unit II resources)

Lab: Plant Cell Type Comparison (see Unit II resources)

Lab: Enzymes in Living Things (see Unit II resources)

Lab: Organic molecule building (molecular model kits)

Lab: Spontaneous Generation (simulate Redi, Spallanzani)

Activity: Jello Cell Creations

United Streaming Videos on Science Network Drive (R):

Acids and Bases

Atomic Structure and the Periodic Table

Carbon the Element of Life

Cells: Bill Nye

Cells: Thru the Lens

Characteristics of Life

Chemical Bonding

Hydrogen Bonds

Organic Chemistry

Steroids: The Hormonal Time Bomb

The Cell Structure and Function

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Name: Period:

ACTIVITY: PRIMORDIAL SOUP LABEL

Objectives:

Students will be able to:

Create a soup can label for “Primordial Soup”

Describe the contents of “Primordial Soup”

Give directions – what to add to create “life” according to Oparin

Procedure:

Cut out a piece of plain paper that will fit around your soup can with a ½” overlap.

Create a FULL COLOR label for your can using the piece of paper from step one that includes:

A company name

Name of the soup (“Primordial Soup”)

A logo (symbol or picture that represents the soup)

An ingredient list

Directions (what you must add to the soup, what you will get as a result)

Directions:	Company Name	Ingredients:	½”
	Logo		

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Name of Soup

GRADING RUBRIC:

	Point Value	Points Lost
Correct Size	2	
Company Name	2	
Logo (symbolic of soup)	5	
Soup Name	2	
Ingredients (accurate)	10	
Directions (accurate) / Results	10	
Full Color	2	
Neatness	2	
Spelling errors (-1 each)		

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	Max. Total = 35	

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Grade: High School

Name: Period:

TESTING FOR ACIDS / BASES USING INDICATORS

Objectives:

List three different properties of acids and bases.

Describe the use of a pH scale.

Explain the action of a buffer and give examples of where they may be useful.

Background Information:

The science laboratory is not the only place where acids and bases are found. Many items commonly found at home are acids or bases. For example, many of the foods you eat contain acids. Many commonly used cleaning products owe their effectiveness to the fact that they are alkaline, or contain bases.

Indicators are special chemicals that can show whether a given substance is an acid, a base, or neither. Indicators usually react with an acid or a base to form a slightly different chemical with a different color. Two examples of indicators are litmus paper (blue or red) and pH paper. Blue litmus paper turns red in an acid and stays blue in a base. Red litmus paper turns blue in a base and stays red in an acid. The pH paper indicator turns different colors at each of several pH values ranging from 0 to 14.

The pH scale indicates the relative concentration of hydrogen ions and hydroxide ions in a solution. Acidic solutions have more hydrogen ions than it does hydroxide ions and basic solutions contain more hydroxide ions than it does hydrogen ions. Buffers are chemical substances that neutralize the effects of a substance by adding small amounts of acid or base to a solution.

In this investigation, you will predict whether a substance is an acid, a base or neutral and then we will test these substances using litmus paper and pH paper.

Materials:

12 different common household items	blue litmus paper	pH paper
red litmus paper	cotton swabs	

Procedure:

Predict whether each specimen will be considered an acid, a base, or neutral.

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Determine whether each specimen is an acid, a base, or neutral by referring to the background information, acids and bases note sheet, pH scale chart, and the results we collect as a class.

Data:

Sample Name	Prediction Acid/Base/Neutral	Results			Conclusion Acid/Base/Neutral
		Red Litmus	Blue Litmus	pH paper	
1 Soda					
2 Mouth Wash					
3 Coffee					
4 Milk of Magnesia					
5 Detergent					
6 Vinegar					
7 Ammonia					
8 Milk					
9 Orange Juice					
10 Hot sauce					
11 Water					
12 Bleach					

Analysis Questions:

1. Which Substance or substances are the strongest acid(s)? Explain your answer.

2. Which Substance or substances are the strongest base(s)? Explain your answer.

Conclusion:

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Name _____ Date _____

Honors Biology Period _____

Text Pages 40-42

ACIDS / BASES INQUIRY LAB

Background Information:

Acids, Bases, and neutral solutions are found in most living things. However, if these solutions are misplaced within a living system, it usually results in the death of the cell or organism.

The environment of cells and multicellular organisms needs to remain in a state of homeostasis.

Acid solutions will dissociate to form H+ or H3O+ ions (hydronium). Bases will dissociate to form OH- or hydroxide ions. pH is the scale used to measure the acidity and basicity of solutions. The scale runs from very acidic 0 thru neutral 7 to very alkaline or basic 14. In this laboratory investigation you will be testing the pH of solutions using various means. One indicator is Phenolphthalein , It turns pink/purple in very basic solutions and colorless in slightly basic and in acidic solutions. (Clear pH 0-8/9, Pink pH 10-14) The use of pH paper will be described by your instructor as will the use of the pH probes that are connected to the computers.

Materials:

Solutions W, A, B, C, D, E.

forceps

pH paper

Phenolphthalein dropper bottle

6 test tubes and rack

pipettes

10ml graduate

computer probe

Objectives:

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How can one determine the alkalinity and acidity of solutions?

How can one determine if an acid is stronger than another or one base is stronger than another?

Discussion Questions:

1. Why was water used in the W test tube?

2. Why did solution E in Part III act differently than solutions A and B in Part I AND why is this type of solution important to living things?

What is the difference between regular aspirin and buffered aspirin? (Research)

Vocabulary: (must be used in the conclusion; bold and underlined)

acid, base, alkaline, neutralize, buffer, indicator, concentration, aqueous, hydronium ion, hydroxide ion, pH, homeostasis, phenolphthalein

Procedure:

Part I Testing for Acids and Bases

Solution W & A:

1. Obtain 6 TT; Clean and label them W and A thru E. Fill W with 5 ml of water and fill the test tube A with 5ml of solution A.

2. Test solution W and A with ½ piece of pH paper. Hold the pH paper with forceps and slide it into the test tube. Record results. W =_____ A=_____

3. Check the pH again using the computer probe W = _____ A= _____

4. Add 2 drops of phenolphthalein to both test tubes and record results.

Is solution W an acid or base? _____

Is A an acid or base? _____

Solution A has a pH of about _____

What color does phenolphthalein turn for W and A? W= _____A=_____

Solution B:

5. Fill TT B with 5ml of solution B.

6. Test solution B with ½ piece of pH paper. Record results. _____

7. Test solution B again with the computer probe: Results: _____

8. Add 2 drops of phenolphthalein to the test tube and record results.

Is solution B an acid or base? _____

Solution B has a pH of about _____

What color does phenolphthalein turn for this solution? _____

9. Add the contents of TT A to TT B and record the pH using ½ piece of pH paper. _____

10. Use the computer probe to check the contents of A plus B; _____

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Part II

Solution C & D

11. Fill TT C with exactly 5ml of solution C. Add 2 drops of Phenolphthalein. Record Results here; _____ Is it Acid or Base? _____

12. Check TT C with the computer probe: _____

13. Fill TT D with exactly 5ml of Solution D. Add 2 drops of Phenolphthalein. Record Results

here: _____ Is it Acid or Base? _____

14. Check TT D with the computer probe: _____

15. Review: Which solution in Part I was an Acid? (A or B) _____

16. Add drops of the acid solution (A or B?) you used in Part I to the test tube C until it becomes clear. Swirl or stir the TT after each drop. COUNT how many drops it takes to turn clear and record. _____

17. After it becomes clear, test the solution with pH paper and record the pH _____

18. Now check again using the computer probe: _____

19. Add drops of the acid solution (A or B?) you used in Part I to the test tube D until it becomes clear. Swirl or stir the TT after each drop. COUNT how many drops it takes to turn clear and record. _____

20. Test the clear solution with pH paper and record the pH _____

21. Test the solution again with the computer probe: _____

Part III Solutions in Living Things (E)

22. Pour 5ml of Solution E into another clean test tube. Check the pH with the computer probe and record: _____

23. Choose either solution (A or B) and add 5 drops to Solution E. Check the pH again using the probe. _____

24. Add 5 more drops of the same solution (A or B) and check the pH. _____

25. Add 5 more drops of the same solution (A or B) and check the pH. _____

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Follow Up Questions:

1. How did you determine Solution A to be an acid or base?

2. How did you determine Solution B to be an acid or base?

3. What chemical property will dictate a solution to be an acid, base, or neutral?

4. What does the pH scale actually measure?

5. What is the purpose of the phenolphthalein in this lab?

6. What was the purpose of Part II of this lab?

7. What did you find out by performing Part II of the lab?

8. How is solution E different than the other solutions? Be specific.

9. What was the effect of adding test tube A to TT B? Explain.

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LABORATORY: IF IT TASTES GOOD, IS IT BAD FOR YOU?

Objectives:

What ingredients do all (or most of) the tested foods have in common? (list at least 4)

What makes foods with similar ingredients taste different?

What makes foods “yummy” or “yucky”? (Refer to taste test and ingredient list!)

What makes a food nutritious/healthy? (Refer to definition of healthy!)

Which of the testd foods was the most nutritious/healthy? (Refer to definition of healthy and ingredient lists/nutritional value)

Was it also yummy or yucky? (refer to taste test!)

Why? (Refer to ingredient list)

Background:

Refer to the handouts:

Reading Food Labels

Guidance on How to Understand and Use the Nutrition Facts Panel on Food Labels

Materials:

Five different food types

Ingredient and Nutrition Labels from the five food types

Procedure:

Conduct your group taste test and record your observations. CAUTION: READ INGREDIENT LABELS CAREFULLY. WATCH FOR KNOWN FOOD ALLERGIES!!

Rank each of the five foods as to yummiest (5 = most yummy, 1 = least yummy). You cannot use a number twice (that is, two foods cannot both be ranked 5).

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Copy the first 12 ingredients for each product onto the “Ingredients” Data Table. DO NOT LIST “GRANOLA” – LIST THE THINGS THAT MAKE UP GRANOLA. DO LIST CHOCOLATE – DO NOT LIST THE INGREDIENTS OF CHOCOLATE.

Copy the nutritional Information for each product onto the “Nutrition” Data table.

HOW TO WRITE UP THIS LAB:

Title (use the one above or make up your own)

Objectives: Copy the questions onto your lab report.

Background: Give some relevant info about ingredient and nutrition labels. (What info do you find on these labels? What constitutes nutritional/healthy food?)

Data: See attached

Conclusion: Answer each of the objective questions, one paragraph per question. Make sure you refer to the data you gathered!!

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Grade: High School

TASTE TEST RANKING (1 – 5)

NAME OF TEAM MEMBER	NAME OF FOOD				
	Chocolate Rice Cakes	Choc. Chip Granola Bars	Granola with Raisins Cereal	Honey Raisin Granola Bar	100 Grand Candy Bar
AVERAGE RANK					

INGREDIENTS

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	NAME OF FOOD				
INGREDIENTS	Chocolate Rice Cakes	Choc. Chip Granola Bars	Granola with Raisins Cereal	Honey Raisin Granola Bar	100 Grand Candy Bar
Ingredient 1					
Ingredient 2					
Ingredient 3					
Ingredient 4					
Ingredient 5					
Ingredient 6					

Ingredient 7					
Ingredient 8					
Ingredient 9					
Ingredient 10					
Ingredient 11					
Ingredient 12					

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Nutritional Information	NAME OF FOOD				
	Chocolate Rice Cake	Choc. Chip Granola Bar	Granola with Raisins Cereal	Honey Raisin Granola Bar	100 Grand Candy Bar
Calories					
Calories from Fat					
	%DV	%DV	%DV	%DV	%DV
Total Fat					
Saturated Fat					
Cholesterol					
Sodium					
Total Carbohydrate					
Dietary Fiber					

Sugars	grams	grams	grams	grams	grams
Protein	grams	grams	grams	grams	grams
Vitamin A					
Vitamin C					
Calcium					
Iron					
Vitamin D					

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NOTE: if %DV is not given, then record the GRAMS (do not forget to include the unit “g” when recording grams!!)

IF THE AMOUNT OF THE NUTRIENT IS TOO SMALL TO MEASURE OR REPORT, THEN LEAVE THAT BOX EMPTY

Name: Period:

Reading Food Labels

1. In what year was the Nutrition Labeling and Education Act passed?

2. If you buy a sub at Subway, must they provide with nutritional information?

-eat a meal on an airplane?

-buy a package of cookies from the grocery store?

3. RDA stands for _____ _____ _____

4. In what order are the ingredients listed?

The ingredient present in the lowest amount first and the greatest amount last?

The ingredient present in the greatest amount first and the least amount last?

In alphabetical order?

From the most nutritious ingredient to the least nutritious ingredient?

5. All flours are _____ flour. If you are looking for “whole wheat” bread, the ingredient list should say _____-_____ flour or _____ grain.

6. Five different ways sugar can be listed as an ingredient are:

a.

b.

c.

d.

e.

7. Fat free means that a food must have less than _____ grams of fat per serving.

8. Calorie free means that a food must have less than _____ calories per serving.

9. When a food is advertised as “low” fat, that means that you can eat it _____ without exceeding the guidelines for fat.

10. When a food is described as “high” for a particular ingredient, that means that is contains _____ per cent or more of the Daily Value for that nutrient.

11. “Good Source” means that the food contains between _____ and _____ percent of that nutrient.

12. “Reduced” means that the food has been altered to contain at least _____ percent less of a nutrient or calories than the normal version of the food.

13. “Light” means that the food has been altered to contain _____ fewer calories or _____ the fat of the normal unaltered food.

14. “Healthy” means the food is low in _____ and _____ _____ and contains limited amounts of _____ and _____. It must also contain at least _____ percent more of vitamins _____ or _____, iron, _____, protein, or _____. Sodium content must not exceed _____ mg per serving.

15. “Fresh” means that the food is _____ and has never been _____ or heated and contains no _____.

Name: Period:

Guidance on How to Understand and Use Nutrition Facts Panel on Food Labels

1. According to page 3: Calories provide a measure of how much _____ you get from a serving of that type of food.

2. Eating too many calories per day is linked to _____ and _____.

3. According to page 4: What three nutrients should be limited?

a.

b.

c.

4. According to page 4: The nutrients listed first on a nutrient label are the ones that Americans generally eat in _____ amounts or even eat _____ _____ of.

5. Eating too much fat, saturated fat, cholesterol, or sodium can lead to _____ disease, _____ or _____ blood pressure.

6. What five nutrients should you "get enough" of?

a.

b.

c.

d.

e.

7. Consuming enough calcium can reduce the risk of _____ in which _____ become brittle and break as one gets older.

8. According to page 5: "Diet" means all of the different foods you eat in a _____.

9. Percent Daily Values (%DV) are based on recommendations for a _____ calorie diet.

10. According to page 7: What three nutrients have no %DV's?

a.

b.

c.

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SUMMARIZE:

Nutrient labels tell you:

the serving _____

how many _____ there are per container

how much of each type of nutrient expressed in _____ (mass) or as % _____ _____

a list of the _____ in the food: the ingredient _____ in the list makes up the greatest quantity by weight

Piscatway Township Schools

Grade: High School

Name _____ Date _____

Biology Period _____

ORGANIC COMPOUND TESTING

Background:

Cells are the fundamental unit of all life. It is able to perform all the tasks required by you and I but at a much smaller level. Cells contain many organic compounds that function in many ways. In this lab, you will play CSI detective to identify the makeup of some unknown organic substances found by your instructor.

Objective Questions:

How do you know if the unknown is a monosaccharide like glucose?

How do you know if the unknown is a polysaccharide like starch?

How do you know if the unknown is a protein like gelatin?

How do you know if the unknown is a lipid like oil?

What is the identity of each unknown that you tested? Explain how you know.

Procedure:

I. Monosaccharide Test

1. Obtain 2 clean TTs and place 20 drops of water in one and 20 drops of glucose in the other.

Place both TTs into a “hot water bath” for 5 minutes

Draw a before and after picture of the color changes for both test tubes.

A Monosaccharide like glucose will turn _____ when the above test is done to it.

II. Polysaccharide Test

Obtain 2 clean TTs and place 20 drops of water in one and 20 drops of starch in the other

Add 3 drops of Iodine to each.

Draw a before and after picture of the color changes for both test tubes

A polysaccharide like starch will turn _____ when the above test is done to it.

III. Lipid Test

Obtain a piece of brown paper bag.

Place a drop of water and a separate drop of oil on different areas of the paper bag.

Hold the paper above your head and look at the bottom of the paper.

Draw a picture of what you see.

How are the two drops different as you observe them from below? _____

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Grade: High School

IV. Protein Test

Obtain 2 clean TTs and place 10 drops of water in one and 10 drops of gelatin in the other.

Have your instructor add 5 drops of Biuret to each test tube.

Draw a before and after picture of the color changes for both test tubes.

Protein will turn _____ when combined with Biurett solution.

V. Unknowns

Take a sample of an unknown solution and run all the above tests on it.

Record your results in the table below

Circle the category of organic compound that matches the unknown.

Unknown Letter	Unknown Results
A.	Monosaccharide: Polysaccharide: Lipid: Protein:
B.	Monosaccharide:

	Polysaccharide: Lipid: Protein:
C.	Monosaccharide: Polysaccharide: Lipid: Protein:
D.	Monosaccharide: Polysaccharide: Lipid: Protein:

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Grade: High School

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Grade: High School

Name _____ Date _____

General Biology Period _____

Plant Cell Type Comparison

Objective Questions:

What is the general shape of most plant cells?

What are the most obvious structures found in plant cells AND what are their functions?

Why did we add iodine to the onion cells?

Why is it important for plant cells to have a cell wall?

What are the similarities between onion and Anacharis cells? Difference?

Procedure:

Part I Cork Cells

Look at the prepared slide of cork cells under Low, Medium, and High power.

Draw a ½ page diagram with a title and the proper labels and magnification

(cell wall, empty space)

Part II Onion Skin Cells

Peel a thin slice of onion skin and place it on a clean slide. Add a drop of water and a cover slide

View the onion cells under Low then Medium and High power.

Draw a ½ page labeled diagram of a single cell under High power

(cell membrane, cell wall, cytoplasm)

Now add make a new slide and use a drop of iodine instead of water.

View the cells under High power.

Draw a ½ page labeled diagram of a single stained onion cell.

(cell membrane, cell wall, cytoplasm, nucleus)

Part III Anacharis Cells

Pick a single Anacharis leaf and place it on a clean slide.

Add a drop of water and a cover slip and focus under low power.

Now view under Medium and High Power

Draw a ½ page diagram of a single Anacharis Cell.

(cell wall, cell membrane, cytoplasm, chloroplasts)

Part IV Tomato Pulp Cells

Make a wet mount slide from the tomato pulp solution

View under low and then medium power.

Draw a ½ page diagram of a single tomato pulp cell

(cell wall, cell membrane, cytoplasm, plastid, vacuole)

Piscatway Township Schools

Grade: High School

Name Period:

Enzymes In Living Things

Objectives

What are enzymes and how do they work?

What are the conditions that effect the operation of enzymes?

Theoretically, would it be possible for your body to never have to replenish its enzyme supply?

What is the enzyme used in this laboratory exercise and what chemical reaction was it controlling?

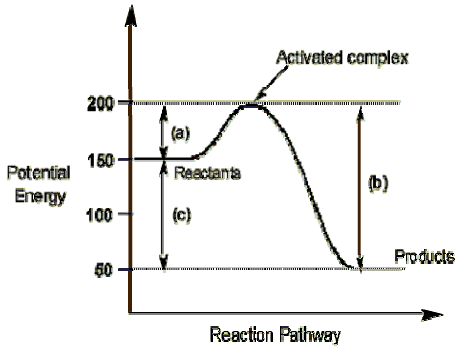
Vocabulary

Substrate	Product	Denature	pH scale
organic compound	Amino acids	Lock and key model	active site

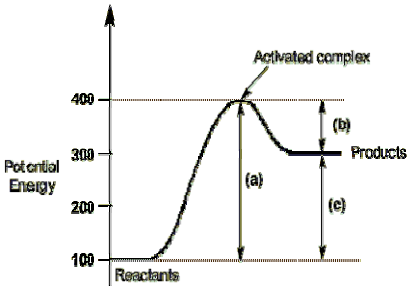
Introduction

Cells make poisonous chemicals all the time but they do not die. Enzymes help to break down these poisonous chemicals into harmless substances. Enzymes are organic compounds that help to speed up the rate of reactions that would other wise be too slow. Enzymes are not altered by reactions. There is a different enzyme to control the rate for each reaction in the cells of your body. In this experiment, you will study the enzyme catalase. It is responsible for controlling the rate at which Hydrogen Peroxide (H2O2) breaks down. Peroxide is a byproduct of normal cellular activity but is a poison to cells.

In an exothermic reaction, the energy of the products is less than the energy of the reactants (energy is released) and in an endothermic reaction the energy of the products is greater than the energy of the reactants (energy is absorbed).



←Exothermic Reaction



Piscatway Township Schools

Grade: High School

You should read in your textbook and notes about the pH scale and enzymes. Find the chemical reaction for the breakdown of H2O2. Show it on your answer sheet.

Though out this lab you will be asked to rate the speed of reactions. Use a 0-5 scale with 0 meaning no reaction and 5 the fastest.

Procedure:

Part I

Place 2ml of hydrogen peroxide into a clean test tube.

A. Is the peroxide bubbling?

Using forceps and scissors, cut a small piece of liver and add it to the test tube. Push it all the way down with a glass stirring rod. Use a glowing wooden splint to test for the presence of flammable gas.

B. What was the result of the splint test? What gas is being released?

Recall that a reaction that absorbs heat is endothermic and one that gives off heat is exothermic. Feel the temperature of the test tube.

C. Has it gotten warmer or colder? Is it endo or exothermic?

Part II

4. Pour off the liquid from the test tube in part one into a second tube.

D. What is the liquid composed of?

E. What do you think would happen if more liver were added to the test tube? WHY?

5. Add another 2ml of peroxide to the liver remaining in the test tube.

F. Can you observe any reaction?

G. What do you think would happen if you poured of this liquid and added more peroxide to the remaining liver?

H. Are enzymes reusable?

Part III.

Put equal quantities of liver into three clean test tubes.

Pour 2ml of peroxide into three additional test tubes.

Put one TT of liver and one of peroxide in to the following

I. Ice bath zero degrees (C)

II. Warm water bath 37 degrees (C)

III. Boiling water bath 37 degrees (C)

After three minutes pour each test tube of peroxide into the corresponding tube of liver and observe the results.

Record the reaction rates (0-5) in chart

K. What is the optimum temperature for catalase?

L. Why did the reaction proceed slowly at 0 degrees?

M. Why did the reaction not occur at 100 degrees?

Part IV

Smash up some liver and record it's pH. Add the smashed liver to 2 mL of hydrogen peroxide. Record the reaction rate.

N. What was the result of the smashing that accounts for this result?

Add some vinegar to some smashed liver and record the pH.

Add 2 mL of hydrogen peroxide and record the reaction rate.

Add some ammonia to some smashed liver and record the pH.

Add 2ml of peroxide and record the reaction rate.

O. What is the optimum pH?

P. What is the effect of High or Low pH on enzyme activity.

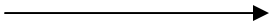
Piscatway Township Schools

Grade: High School

Name Period

Enzymes In Living Things Data and Answer Sheet

Balanced Equation for the breakdown of H2O2 Reaction:



_____

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_____

_____

_____

Data Charts

CHART 1

Temperature	Rate of Enzyme Activity (0-5)
0°	
37°	
100°	

CHART 2		
Sample	pH	Rate of Enzyme Activity (0-5)
Plain		
With vinegar		
With ammonia		

Piscatway Township Schools

Grade: High School

Spontaneous Generation

Materials Needed

low-salt broth (chicken or beef, home-made or purchased)

2 250-mL Erlenmeyer flasks

2 1-hole rubber stoppers with bent glass tubing inserted (see diagram)

Procedure

Students should work in teams of 2 to 3 people. Each team should perform the following steps.

Mark Erlenmeyer flasks accordingly:

flask with stopper and glass tube going straight up

flask with stopper and glass tube bent in S-curve

Place about 50 mL of broth in each Erlenmeyer flask.

Place appropriate lids on flasks.

Boil broth in flasks with appropriate lids on them for 30 min., then let cool.

For the next several lab periods, observe the flasks and record any changes in color, turbidity, smell, etc.

Piscatway Township Schools

Grade: High School

THE INCREDIBLE, EDIBLE CELL

by Todd Howard & Nick Hoffman
Wallace High School Science Department

This activity is designed to reinforce the concepts of cell structures and functions. The student produces a cell model from various food items. Each food item will represent a specific part (organelle) of the cell. When the lab is completed, the cell model is edible.

This activity was developed since it is difficult for students to visualize cells as three dimensional structures. Most of the student exposure to cell structure is through diagrams in textbooks and it is hard for them to portray the cells as multidimensional.

In our procedure, we will refer to brand names since this is what we used. Other generic or different brand names are okay. You can substitute any other items if you have trouble finding some items in your location.

Before Day of Activity:
Follow the package directions to mix up batches of Jello gelatin mix. Pick a light colored flavor (we used kiwi-strawberry). Darker colors will make it difficult to see the inside of the cell when the model is completed. Every 6 oz package will make up 4 or 5 cells. Add some unflavored Knox gelatin to the Jello to make it set up a little stiffer (just regular Jello fell apart during our first test). Pour the Jello/Knox mixture into individual 9 oz Solo brand plastic cups until they are about two-thirds full. Put them into a refrigerator to set. We had cups that were still set ten days after the activity.

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Obtain the other food materials to represent the organelles that will be studied. For our cell models, we tried to choose food items that would appear similar to the diagram the students had to use as a guide. Our list included:

2 blue or green pieces of fruit roll up .. Golgi Bodies

2 red or yellow pieces of fruit roll up .. Endoplasmic Reticulum

1 teaspoon of round cake sprinkles .. Ribosomes

4 hot tamales .. Mitochondria

4 chocolate covered raisins .. Vacuoles

1 gum ball .. Nucleus

Supplies for Organelles
We made up sets of this material and put them in small Dixie cups that could be handed out to each group (we worked in pairs). Each group will also need a paper plate and a plastic knife (make your decision about whether this part is age level appropriate).

Day of Activity:
For each group, provide the following:

1Jello/Knox mixture in plastic cup

1 paper plate

1 small Dixie cup full of cell parts (organelle) materials

1 plastic knife

1 plastic spoon

Procedure for Activity:

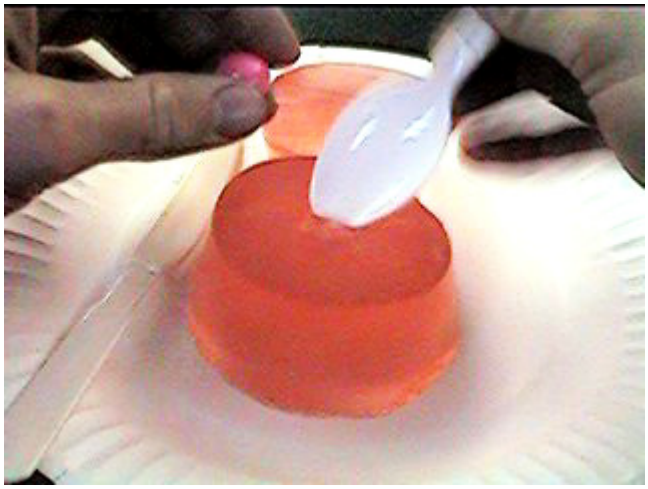
Remove the Jello from the plastic cup onto the paper plate. We had some problem with this. The students may need to run the knife around the very outside edge of the Jello to loosen it. There are some suggestions that you might spray the cup with Pam or some other non-stick material. We did not get a chance to try this yet. Running warm water over the cup may also loosen the Jello.

Cut the Jello/Knox in half as shown in the diagram below and remove the top half.

Turn over the top and set it on the plate beside the bottom half as shown in Picture 1.

Picture 1

Use the spoon to dig out a hole in the bottom half of the Jello/Knox cytoplasm (Picture 2). Just pushing the food pieces into the Jello causes it to crack and come apart, making for a very messy cell. Place the gumball in this hole to represent the nucleus of the cell (Picture 3).



Picture 2

Picture 3

Using the spoon to make spaces and your diagram as a guide, place the other cell parts into the cell. Parts can be put into both the top and bottom half of the Jello/Knox cell (see pictures below).

Picture 4

Picture 5

Picture 6

When completed, one side of your cell should look something like the picture below.

Picture 7

Take the top part of the cell and carefully place it on the top. If the cell feels soft, you can put the parts back into the plastic cup, then turn it over onto the paper plate. Then carefully remove the plastic cup. Your finished cell should look something like the picture below.

Picture 8

After reviewing the parts one final time, those students who wish to can feast on their cell. Give the students clean spoons in case the ones they were working with fell on the floor or the table was not completely clean.

If you use this activity and have any suggestions or other feedback, please send email by clicking below. Thanks, we hope you and your students enjoyed this activity.

minersci@rand.nidlink.com

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Honors Biology Date _____

Mr. Hunter

Stem Cell Research

Enclosed you will find a primer concerning Stem Cell Research. It provides you with enough information to understand the potential impact that this research may have on our treatment of disease in the future. Not all individuals feel that stem cell research should be taking place. Consider the information provided in this primer and do any additional research you feel may be important to understand a differing point of view.

Your task in a 4 page typed paper is two fold;

describe what stem cells are and what potential they have

describe your feelings about stem cell research in general

support your feelings with data collected from your readings

Additional research will be necessary, so please include a bibliography at the end of your paper. You should use at least 4 sources. A possible starting site may be

http://stemcells.nih.gov/index.asp

You should consider this your first major grade of the marking period. It will have a value of 75 points. To gain full credit, you must complete all three of the above tasks in a well organized and fact filled paper. Support your views

with data. Be sure that your paper is typed and well organized. Run both grammar and spell checks from your computer.

This paper is due on _____. Grade deductions will be made for lateness, incomplete work, sloppiness, and not following directions.

Good Luck!!

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Understanding By Design Template

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Biology Curriculum guide

Grade: High School

UNIT III: CELL PROCESSES

Content Standard (s):

5.1.A.1. When making decisions, evaluate conclusions, weigh evidence, and recognize that arguments may not have equal merit.

5.1.A.2. Assess the risks and benefits associated with alternative solutions.

5.1.A.3. Engage in collaboration, peer review, and accurate reporting of findings.

5.1.B.1. Select and use appropriate instrumentation to design and conduct investigations.

5.1.B.2. Show that experimental results can lead to new questions and further investigations.

5.1.C.1. Understand, evaluate and practice safe procedures for conducting science investigations.

5.2.A.1. Recognize the role of the scientific community in responding to changing social and political conditions and how scientific and technological achievement effect historical events.

5.2.B.1. Examine the lives and contributions of important scientists who effected major breakthroughs in our understanding of the natural and designed world.

5.2.B.2. Discuss significant technological achievements in which science has played an important part as well as technological advances that have contributed directly to the advancement of scientific knowledge.

5.2.B.3. Describe the historical origin of important scientific developments such as atomic theory, genetics, plate tectonics, etc., showing how scientific theories develop, are tested, and can be replaced or modified in light of new information and improved investigative techniques.

5.3.A.1. Reinforce indicators from previous grade level.

5.3.B.1. When performing mathematical operations with measured quantities, express answers to reflect the degree of precision and accuracy of the input data.

5.3.C.1. Apply mathematical models that describe physical phenomena to predict real world events.

5.3.D.1. Construct and interpret graphs of data to represent inverse and non-linear relationships, and statistical distributions.

5.4.A.1. Know that scientific inquiry is driven by the desire to understand the natural world and seeks to answer questions that may or may not directly influence humans, while technology is driven by the need to meet human needs and solve human problems.

5.4.B.1. Assess the impacts of introducing a new technology in terms of alternative solutions, costs, tradeoffs, risks, benefits and environmental impact.

5.4.C.1. Plan, develop, and implement a proposal to solve an authentic, technological problem.

5.5.A.1. Relate the structure of molecules to their function in cellular structure and metabolism.

5.5.A.2. Explain how plants convert light energy to chemical energy.

5.5.A.3. Describe how plants produce substances high in energy content that become the primary source of energy for life.

5.5.A.4. Relate disease in humans and other organisms to infections or intrinsic failures of systems.

5.5.B.1. Explain that through evolution the Earth's present species developed from earlier distinctly different species.

5.5.B.2. Explain how natural selection accounts for extinction as well as an increase in the proportion of individuals with advantageous characteristics within a species.

5.5.C.1. Describe how information is encoded and transmitted in genetic material.

5.5.C.2. Explain how genetic material can be altered by natural and/or artificial means; mutations and new gene combinations may have positive, negative, or no effect on organisms or species.

5.5.C.3. Assess the impact of current and emerging technologies on our understanding of inherited human characteristics.

5.6.A.6. Know that many biological, chemical and physical phenomena can be explained by changes in the arrangement and motion of atoms and molecules.

5.6.A.7. Recognize that the properties of matter are related to the structure and arrangement of their molecules and atoms, such as in metallic and nonmetallic crystals and carbon compounds.

5.6.B.1. Explain that the rate of reactions among atoms and molecules depends on how often they encounter one another and that the rate is affected by nature of reactants, concentration, pressure, temperature, and the presence of a catalyst.

5.6.B.2. Show that some changes in chemical bonds require a net input or net release of energy.

5.8.C.3. Recognize that the evolution of life on Earth has changed the composition of Earth's atmosphere through

time.

5.10.A.1. Distinguish naturally occurring processes from those believed to have been modified by human interaction activity: climate change, ozone production, erosion and deposition, threatened and endangered species.

5.10.B.1. Assess the impact of human activities on the cycling of matter and the flow of energy through ecosystems.

5.10.B.2. Use scientific, economic, and other data to assess environmental risks and benefits associated with societal activity.

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STAGE 1: DESIRED RESULTS

Understandings

Students will understand that …

District:

(1) Science is an ongoing investigative process that demands a variety of safe methods, posing questions, explaining, and predicting outcomes about the universe. The methods chosen are based on honesty, the known and unknown, and the risks/benefits of the solution while communicating the results to others for their

(5) The survival of all organisms is dependent upon diversity of structure, function, and behavior due to genetic make up and/or environmental conditions.

(6) The relationship among the structure of matter, its organization and its chemical and physical properties can be used to predict and explain the universe.

Course:

(1) experiments must be appropriately designed and implemented in order to communicate conclusions which are supported by observations and analysis

(5) organisms are composed of complex biochemical systems that are designed to maintain homeostastis

(6) the structure of organic and inorganic matter predicts its chemical and physical properties which can be used to explain its behavior

Essential Question(s):

Why is it important for cells/organisms to maintain balance?

Once energy is used, is it gone forever?

Why is new life created?

Knowledge & Skill

Students will know …

substances move into/out of cells

the effects of solute concentration on cells the types and function of vascular transport tissue in plants the source of energy for all life energy is transformed from one form to another in living organisms all cells must divide/replace themselves organisms reproduce asexually and sexually
Students will be able to… describe the movement of molecules (E) compare the similarities and differences of diffusion, osmosis, active transport, facilitated diffusion and passive transport (E) identify diagrams of the above processes and explain what and/or why this is happening (E) explain how the cell membrane controls what enters and leaves cells (E) predict what would happen to cells placed in various solutions (E) describe the differences of plant and animal cells with respect to what happens in solutions of different solute concentrations (E) relate cell transport to the process of dialysis (renal) (E) describe how xylem and phloem tissue facilitate transport of materials in plants show the relationships between autotrophs, heterotrophs, carnivores and omnivores illustrate a food chain (E) use the analogy of a rechargeable battery to explain how ATP functions (E) describe the process of photosynthesis (E) distinguish between the light dependent and light independent reactions (E) write/identify the balanced equation for photosynthesis and tell where the products and reactants are produced/used (E) tell why photosynthesis is important for all life on earth (E) describe what happens during glycolysis (E) describe what happens during lactic acid fermentation, alcoholic fermentation, and cellular respiration (E) identify the balanced equations for all metabolic processes (E)

explain how and when humans use different pathways to break down glucose and the results of each (E)

describe the relationship between photosynthesis and respiration(E)

tell what would happen if all plants disappeared from Earth or if the sun no longer shined (E)

list reasons why cells divide & explain what would happen if they did not (E)

describe / identify the stages of mitosis including distinguishing cell parts (E)

list and describe processes that organisms use to reproduce asexually (E)

distinguish between sexual and asexual reproduction (E)

distinguish between haploid and diploid cells (E)

explain why meiosis is necessary for sexual reproduction (E)

describe/ identify the stages of meiosis including distinguishing cell parts (E)

describe the purpose of a karyotype (E)

distinguish between the processes and daughter cells of oogenesis and spermatogenesis

compare the stages and daughter cells of mitosis and meiosis (E)

explain how meiosis & sexual reproduction create genetic diversity in offspring (E)

STAGE 2: ASSESSMENT

Performance Task Summary:	Rubric Titles (Key Criteria)
Comparing Photosynthesis and Respiration Create a visual that illustrates the relationship between photosynthesis And respiration	5 pts: Inverse relationship illustrated Balanced equations shown Energy cycle illustrated Oxygen/CO2 cycle illustrated Visual is neat and colorful Points lost successively for each criteria point that is not met.
Comparing Meiosis & Mitosis Create a paper and pencil or yarn model illustrating the movement of chromosomes in each of the phases of cell division. Explain the differences in the daughter cells.	5 pts: All Phases correctly labeled Chromosome movement correctly illustrated Centromeres/spindles/cell plate Illustrated and labeled Comparison of daughter cells (# of and ploidy of) Project is neat and colorful Points lost successively for each criteria point that is not met.
Photosystems Comparison Project Create a skit with props that accurately and completely demonstrates the interaction of the 2 photosystems (see Unit III resources) * Individual project may be modified or substituted as appropriate for course intensity level while maintaining minimum requirement of one project per unit.	

	5 pts: Pigments properly employed All team members used effectively in the skit Energy molecules properly cycled All parts of both photosystems included Props are appropriate; colorful, easy to read, and timely Points lost successively for each criteria point that is not met.
Self-Assessments	Other Evidence, Summarized
Student interactive notebook (Avid strategy) Science lab journal (Avid strategy) How do cells control what enters and leaves? Three item summary (Avid strategy	Periodic quizzes Unit tests: Cell transport Cell metabolism Cell division Various inquiries found in the student workbook associated with the textbook In class cooperative (group) work

STAGE 3: LEARNING ACTIVITIES

Learning Activities:

Inquiry: Tea Bag Diffusion (see Unit III resources)

Lab: Anacharis Plant Cell Transport (see Unit III resources)

Lab: Photosynthesis (affect of light wavelength/intensity) Lab Manual A, pg 91

Lab: Paper Chromatography (see Unit III resources)

Lab: Fermentation Inquiry (see Unit III resources)

Labs: Fermentation (see Unit III resources)

Inquiry

Yogurt production

Alcoholic fermentation

Lab: Plant Respiration and Photosynthesis (see Unit III resources)

Lab: Onion Root tip mitosis (see Unit III resources)

Lab: Comparing Mitosis and Meiosis Paper Lab (see Unit III resources)

Lab: Mitosis in Prepared Slides (see Unit III resources)

Lab: Potato Core Diffusion (see Unit III resources)

United Streaming Videos on Science Network Drive (R):

Active Transport

Cell Division

Energy and the Chemistry of Life

Energy From the Sun

Haploid Diploid Cells

Haploid Cells and Fertilization

Maintaining Equilibrium

Mitosis

Mitosis: Cell Reproduction

Mitosis and Cell Reproduction

Passive Transport

Producers Capture Solar Energy

* Suggested labs may be modified or substituted depending on the intensity level of the course

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UNIT III RESOURCES

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Grade: High School

NAME:

PERIOD:

TEA BAG DIFFUSION

Objective:

How does temperature affect the rate of diffusion?

Materials:

2 beakers	cold water	tea bags
room temperature water	white paper background	timer (clock/watch)

Procedure:

Add a tea bag to each of the two beakers of water.

Sketch your observations of each beaker after ONE minute.

Sketch your observations of each beaker after FIVE minutes.

Sketch your observations of each beaker after TEN minutes.

Data:

	After ONE minute	After FIVE minutes	After TEN minutes
Beaker with COLD water			

Beaker with ROOM TEMPERATURE Water			

Analysis:

1. Describe any differences in the appearance of the beakers after observing them for one minute.

2. Describe any differences in the appearance of the beakers after five minutes.

3. Describe any differences in the appearance of the beakers after ten minutes.

4. What substances are diffusing in this lab and in which directions are they moving?

5. How could you get the tea to approach “dynamic equilibrium” at a faster rate? EXPLAIN

6. What would be the quickest way to make “iced tea” using tea bags instead of an instant mix? EXPLAIN

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Name: Period:

ANACHARIS PLANT CELL TRANSPORT

Objectives:

How does cell transport explain what happens to plants that do not get enough water?

Materials:

Glass slides and cover slips	concentrated salt solution
Elodea leaflets	compound light microscope

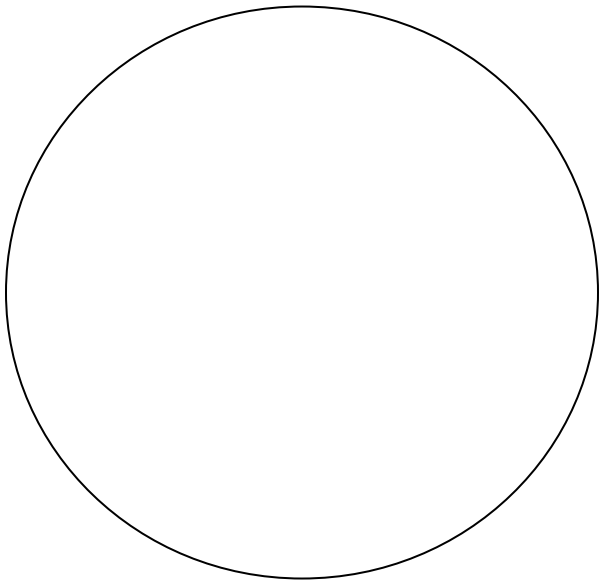
Procedure:

1. Observe an elodea leaflet that is in water. Draw what you see and label all visible structures.

Make sure that your field of view is labeled with the total magnification and specimen being observed.

2. Repeat step one using an elodea leaflet placed in concentrated salt solution.

Data:



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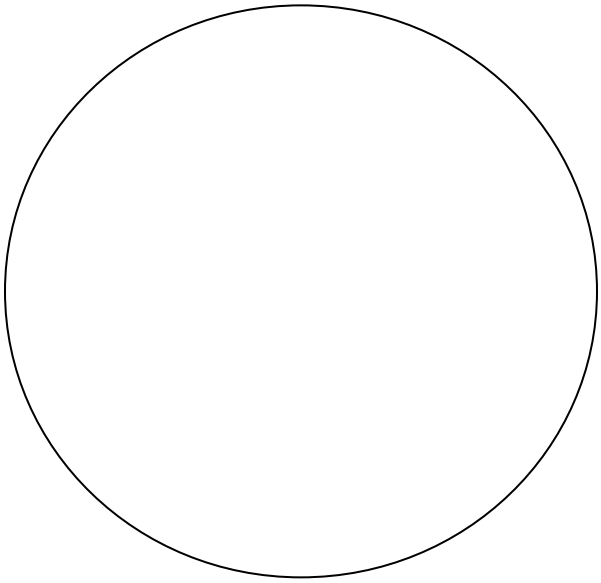

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Analysis:

1. Describe the arrangement of the chloroplasts inside the elodea cell in fish tank water.

2. Describe the “tonicity” of fish tank water compared to the “tonicity” of the inside of an elodea cell.

3. Describe the arrangement of the chloroplasts inside the elodea cell in salty water.

4. Describe the “tonicity” of salty water compared to the “tonicity” of the inside of an elodea cell.

5. Explain why the appearance of the elodea cell changed when it was placed into salty water.

6. Predict what would happen to the salty elodea cell if it were placed into fish tank water again.

EXPLAIN your prediction.

7. Predict what would happen to a cheek cell placed into salty water. EXPLAIN

8. Predict what would happen to a cheek cell placed into pure water. EXPLAIN

Conclusion:

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PAPER CHROMATOGRAPHY

Background Information

Solutes can be separated from other solutes and identified by various chemical and physical means or a combination of both. A Russian scientist, Tswett, developed a technique to separate compounds from a solution. This is called chromatography. He worked with plant pigments. A mixture of pigments in a leaf may be separated into bands of color by a process called paper chromatography. This means “color writing”. Pigments are separated on the paper and show up as colored streaks. This paper is then called a chromatogram.

You have observed that fall leaves possess a variety of colors; bright green, yellow-green, yellow, orange, brown, red, etc. These colors are sometimes masked by the pigments chlorophyll a and b. Some of the pigments present might be chlorophyll a (bright green) chlorophyll b (yellow-green), xanthophyll (yellow), anthocyanin (red), and carotenes(faint yellow, browns, and oranges). See the table within this lab.

Vocabulary: pigment, accessory pigment, chromatogram, chromatography, solvent, solute, Rf value, wavelength, visible spectrum, autotroph, photosystems, solubility, cohesion, adhesion, reflection, absorption, pigment

Objectives;

What pigments are present in autotrophs and what part do they play in photosynthesis? Be

specific.

Additional Research Questions:

2. How does the technique called paper chromatography separate pigments in autotroph cells? Be specific.(Research)

3. Why do leaves turn color in the fall? Be as complete as possible with your answer. (Research)

4. How can trees and plants, like the Japanese Maple that have red leaves all year round, carry on photosynthesis?

**5. Which wavelengths of visible light do plants require most in photosynthesis?

Design a step-by-step experiment to prove this. Make sure you include a control.

Procedure ;

Part I

1. One person in your team should cut a length (strip) of chromatography paper so that it just fits in side a 250ml flask. Cut a point at one end (bottom). Use a ruler and draw a faint pencil line as shown in the picture on page 3. This line is called the BASE line. Use a pin to poke a hole at the top of the paper so that a toothpick can be pushed through and the paper can hang freely down into the flask. (Teacher demo.)

2. Obtain a small sample of the “pigment extract” from your instructor. Now repeatedly dip a tooth- pick into the pigment and apply a spot at the middle of the line on the chromatography paper. Allow each spot to dry before applying the next. This will concentrate the pigment.

NOTE; You must let each streak dry after each application from the marker. The drying keeps the pigment from spreading out.

3 The other member of the team should pour enough water (chromatography solvent) into the flask to cover the tip of the hanging paper. Once the chromatography paper is ready, hang it in the TT. Adjust the height of the paper so that just the point touches the solvent.

NOTE: DO NOT let the paper drop down so that the pigment base line drops into the solvent.

4. Watch the solvent rise up the paper, carrying and separating the pigments as it goes. Allow the solvent to travel up the paper until it reaches the top or until your instructor tells you to stop. Remove the paper. Observe the bands of pigment. Use a pencil to circle each color “spot”. Draw a picture of the paper showing where each color is located. One member must include the actual chromatogram stapled into the lab write-up.

5. These color spots of leaf pigment each has an Rf value. This is an identifying characteristic of each pigment. It is calculated by dividing the distance which the pigment traveled by the distance the solvent traveled.

$$Rf = \frac{\text{Distance moved by pigment (mm)}}{\text{Distance moved by solvent (mm)}} = \text{decimal value (.XX)}$$

6. Measure the distance in mm from the base line to the middle point of each pigment spot. Then measure the entire distance traveled by the solvent. Create 2 tables that show the information below. Label one Table as the Experimental Data and the other as the Practice Data

Pigment Color

Distance Pigment moved

Distance Solvent moved

Rf value for each color

Identity of pigment

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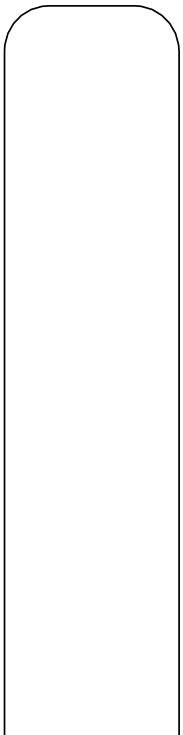
Part II

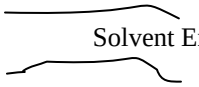
7. Below is a table that identifies the approximate Rf values for the more commonly found pigments in green plants. It is important to note that these are approximate and can show some variation due to numerous conditions.

Pigment	Visible Color	Rf
Carotene	Yellow	0.98
Xanthophyll	Yellow	0.86
Xanthophyll	Red	0.8
Phaeophytin a	Dark grey	0.67
Phaeophytin b	Light grey	0.6
Xanthophyll	Yellow	0.5
Chlorophyll a1	Light blue-green	0.48
Chlorophyll a	Dark blue-green	0.46
Chlorophyll b1	Light yellow-green	0.30
Chlorophyll b	Dark yellow-green	0.25
Xanthophyll	yellow	0.15

Pigment	Visible Color	Rf
Alpha Carotene	Yellow-orange	0.97
Beta Carotene	Yellow-orange	0.94
Lycopene	Yellow-orange-red	0.81
Leutein	Yellow-brown	0.75
Violaxathin	Yellow-brown	0.66
Neoxathin	Yellow-brown	0.28



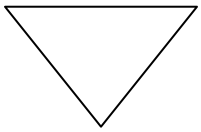
Now use the practice chromatogram provided here to determine the identity of each pigment. Put your data into the Practice Data Chart.



Part III

Your next task is to examine your real Chromatogram and determine which pigments most closely resemble the separated pigments you found. You must show all your measurements in the Experimental Data Chart. Include your calculations in a neat and orderly way. Remember to measure distance in mm units.

Base Line



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FERMENTATION INQUIRY

Objectives:

1. What is the effect of sugar and yeast on the rate of fermentation?

Additional Questions:

2. What evidence do you have that fermentation has occurred?

3. What is the control you used in your experiment?

4. How will you know what gas is released in your experiment?

5. What is the purpose of the flask connected to Bromothymol Blue?

Background Information:

Yeast is a naturally occurring organism found on fruit. As you know, yeast will feed on sugars and do anaerobic alcoholic fermentation to gain energy for its metabolism. In this investigation, you and your team are to design an experiment to determine how the amount of sugar OR the amount of yeast will effect fermentation. You will share your results with another team who has chosen the other variable. You must come up with a step by step process that can measure the rate of fermentation given the varying conditions. Don't forget to include a control. A flask with water, yeast and sugar will be stoppered and a rubber tube run into a beaker of bromothymol blue. You should draw a start and end picture to show any color change.

Procedure:

o You and your group are to design a procedure that will determine the answer to the above objective question.

o The materials you have to work with will be listed by your instructor.

o Remember that you must produce a step by step set of instructions with only one variable.

o You must make a hypothesis to be tested

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YOGURT FERMENTATION

WITH LACTOBACILLUS CULTURES

Objectives

To demonstrate the use of microorganisms in food processing by using yogurt as an example.

Introduction

Actually this experiment has already been performed. One may have noticed in Experiment No. 1 that mushy substance formed during the prolonged precuring process in cheese manufacturing in which the natural action of lactose fermenting culture originally resident in butter milk was utilized to acidify milk. Of course, this custard-textured substance was none other than yogurt, sometimes spelled yoghurt or yoghourt.

Other than cheese, buttermilk, and yogurt, lactic starter cultures are also used to help prepare or manufacture a wide variety of food products such as sour dough bread, pickles, and sausages. As implied by the name "lactic cultures," they belong to a category of microorganisms that can digest the milk sugar lactose and convert it into lactic acid. For the cells to utilize lactose, deriving carbon and energy from it, they must also possess the enzymes needed to break lactose into two components sugars: glucose and galactose. Some representative strains are Streptococcus lactis, S. cremoris, thermophilus, Lactobacillus bulgaricus, L. acidophilus, and L. plantarum. These cultures can be purchased directly from local health food and drug stores in tablet form. These tablets, taken orally during the intake of dairy products, help those people who have digestive tract disorder and cannot tolerate lactose. The major steps involved in a large scale production of lactic starter cultures are the following: media preparation (constitution, mixing, straining, sterilization), inoculum preparation, fermentation, cell concentration by centrifugation, liquid nitrogen freezing, and packaging.

In summary, commercial yogurt production is composed of the following steps: pretreatment of milk (standardization, fortification, lactose hydrolysis), homogenization, heat treatment, cooling to incubation temperature, inoculation with starter, fermentation, cooling, post-fermentation treatment (flavoring, fruit addition, pasteurization), refrigeration/freezing, and packaging. For set yogurt, the packaging into individual containers is carried out before fermentation. In addition to the above steps, the starter culture is propagated in parallel. Although a batch process is followed in this illustrative experiment, the commercial production of yogurt is carried out in an automated continuous fermentation process. A good strain of starter culture not only affects the flavor and aroma, it can also speed up the process and thus reduces the effective equipment cost.

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List of Reagents and Instruments

A. Equipment

Beakers

Heat source

Incubator, 43ºC

Thermometer

B. Reagents

Milk

Starter culture or plain yogurt from local stores

Procedures

Heat 1 liter (approximately 1 quart) of milk in a beaker slowly to 85 ºC and maintain at that temperature for 2 minutes. This step kills undesirable contaminant microorganisms. It also denaturizes inhibitory enzymes that retard the subsequent yogurt fermentation. If you are attempting this procedure at home with a sauce pan, use caution so as not to allow the milk to boil over and make a mess on your kitchen stove. See Note 1.

Cool milk in a cold water bath to 42-44 ºC. The cooling process should take about 15 minutes.

Add 5 g of starter culture to the cooled milk and mix with a glass rod. See Note 2.

Cover the container to minimize the possibility of contamination. Incubate at 42ºC for 3 to 6 hours undisturbed until the desired custard consistency is reached. Yogurt is set when the mixture stops flowing as the container is tipped slowly. Fluid yogurt results if the mixture is stirred as the coagulum is being formed. See Note 3.

The fresh made yogurt is ready for consumption when it is set. However, you may want to refrigerate it first if you are not accustomed to warm yogurt. Refrigeration also stops the growth of the lactic acid culture, which is thermophilic. (Thermophilic cultures grow best at high temperatures.) See Note 4.

Use of Lactobacillus acidophilus: Grind 4 yogurt tablets (about 1 g) into fine powder. Repeat Steps 3-5.

For entrepreneurs or simply hungry/thrifty students: You can recycle a small part of the finished product as the starter culture for the next batch. Theoretically, you can multiply or maintain your supply of yogurt indefinitely. However, in actuality, extended recycling is not recommended because the composition of the mixed culture will gradually deviate from the ideal one, and hence the flavor.

Notes

Any type of milk may be used. Use nonfat or lowfat milk you are watching your fat intake. For example, one cup of nonfat dry milk powder dissolved in one liter of hot water may be convenient. The consistency and the flavor of the final product depend on the type of milk used. You may experiment at home to find your favorite recipe.

The yogurt in a local market usually contains an active culture. Thus, if a starter culture is not readily available, it can be easily derived from plain store-bought yogurt. In this case, a few teaspoonfuls of the store-bought yogurt will adequately act as as the starter culture. (Make sure the label on the package indicates that it indeed contains an active culture.) The culture in fresh yogurt is healthier and more active than that in an outdated one. A stale one is also more likely to be contaminated with undesirable microorganisms, so check the expiration date. If possible, choose the "All-Natural" variety, because stabilizers and additives, included to suppress microbial activities, are generally harmful to the culture. If one is making yogurt at home, it is more convenient to pour the mixture into smaller containers before incubation; drinking glasses are just about the right serving size. Seal the glasses with a lid or plastic food wrap. Place all the glasses in a baking pan for easy handling.

At home, a household electric or gas oven is an ideal substitute for the incubator. The middle shelf, slightly away from the direct heat, usually gives the most even temperature. The temperature can be controlled better if a pan of warm water is placed on the bottom rack.

You may add your favorite fruits, fruit preserves, puree, jam, or sweeteners to enhance the taste, or you may add equal part of water to make a yogurt drink. Many types of yogurt differ mainly in the post-incubation processing. For example, the yogurt may be frozen, spray-dried or freeze-dried, carbonated, or concentrated.

Discussions

Yogurt originated in the Balkans and the Middle East; it is now quite popular in Europe and America, as well. The microorganisms used in the production of yogurt accomplish two tasks: production of lactic acid and flavor components. The secret to tasty yogurt is in the proper control of the temperature at various stages. If the temperature is too low, the culture grows too slowly to adequately acidify milk and to achieve a good texture. The commercial starter is a mixed culture of thermophilus and L. bulgaricus. The culture is killed if the temperature is too high. In addition, there is a subtle difference in the taste because the formation and secretion of metabolites which contribute to the overall taste are dependent on the growth rate. The window of proper fermentation is quite small, i.e. from 42 ºC to 44 ºC. In general, as the temperature is raised up to 44 ºC, the rate of culture metabolism is higher, and the yogurt is sweeter. Faster growth also prompts the yogurt to set faster. When the desired acidity is reached, yogurt is quickly cooled to halt further fermentation and metabolic activity. This cooling step is quite critical in industrial yogurt production; it must be done quickly to control tightly the acidity of the yogurt, which has a profound effect on the taste.

Questions

Compare the texture and taste of yogurt made from different sources of starter cultures. Also compare your "homemade" yogurt to commercial brands.

What was the cost of "homemade" yogurt? Compare this to the market price of a comparable item. Did you make a profit?

The yogurt starter culture is a mixed population of S. thermophilus and L. bulgaricus, both competing for the common substrate lactose. How does the principle of competitive exclusion apply here?

Can the human intestinal tract be infested with lactic acid cultures? If yes, why has this method not been employed to to treat lactose-intolerant consumers who cannot intake dairy products without the usual gastro-intestinal discomfort? If no, what make these strains different from, for example, Escherichia coli, normal flora of digestive tract?

Why is the shelf life for unpasteurized yogurt longer than that for pasteurized milk?

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	MAKING ROOT BEER	

Fermentation has been used by mankind for thousands of years for raising bread, fermenting wine and brewing beer. The products of the fermentation of sugar by baker's yeast Saccharomyces cerevisiae (a fungus) are ethyl alcohol and carbon dioxide. Carbon dioxide causes bread to rise and gives effervescent drinks their bubbles. This action of yeast on sugar is used to 'carbonate' beverages, as in the addition of bubbles to champagne). [Note: In response to many questions I have received, here is a discussion of the small amount of ethyl alcohol which results in this root beer .]

We will set up a fermentation in a closed system and capture the generated carbon dioxide to carbonate root beer. You may of course adjust the quantities of sugar and/or extract to taste. (Zatarain's or Hire's have both been available at my local Kroger's, but I prefer the taste of Zatarain's, a product of New Orleans .)
[SUGAR SUBSTITUTES? Many people have emailed me asking about substituting artificial sweeteners for the sugar in this recipe. The short answer is no. Sugar is required for yeast to generate carbon dioxide which carbonates the beverage. No sugar, no carbonation. You might experiment with less sugar, and add a substitute to make up for the lower sweetness, but I do not know how little sugar you can add and still get adequate carbonization.]

	EQUIPMENT	SUPPLIES
	clean 2 liter plastic soft drink bottle with cap funnel 1 cup measuring cup 1/4 tsp measuring spoon 1 Tbl measuring spoon	cane (table) sugar [sucrose] (1 cup) Zatarains's Root Beer Extract (1 tablespoon) (When I could not find it locally, I ordered a case of 12 bottles for $18 from Zatarain's, New Orleans, LA 70114. Previously, I had used Hires extract.) powdered baker's yeast (1/4 teaspoon) (Yeast for brewing would certainly work at least as well as baking yeast.) cold fresh water

INSTRUCTIONS:

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	1) Assemble the necessary equipment and supplies
	2) With a dry funnel, add in sequence: 1 level cup of table sugar (cane sugar) (You can adjust the amount to achieve the desired sweetness.)
	3) Add: 1/4 teaspoon powdered baker's yeast (fresh and active) (Fleischmann's or other brand)
	4) You can see the yeast granules on top of the sugar.

	5) Shake to distribute the yeast grains into the sugar.
	6) Swirl the sugar/yeast mixture in the bottom to make it concave (to catch the extract).
	7) Add with funnel: 1 Tbl of root beer extract (I prefer Zatarain's, but Hires, etc. will work.) on top of the dry sugar
	8) The extract sticks to the sugar which will help dissolve the extract in the next steps.

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	9) Half fill the bottle with fresh cool tap water (the less chlorine, the better). Rinse in the extract which sticks to the tablespoon and funnel. Swirl to dissolve the ingredients.
	10) Q.s. [fill up] to the neck of the bottle with fresh cool tap water, leaving about an inch of head space, securely screw cap down to seal. Invert repeatedly to thoroughly dissolve.

If you leave it in a warm temperature longer than two weeks, you risk an explosion...

	11) Place at room temperature (RT)about three to four days until the bottle feels hard to a forceful squeeze. Move to a cool place (below 65 F). refrigerate overnight to thoroughly chill before serving. Crack the lid of the thoroughly chilled root beer just a little to release the pressure slowly. NOTE: Do not leave the finished root beer in a warm place once the bottle feels hard. After a couple weeks or so at room temperature, especially in the summer when the temperature is high, enough pressure may build up to explode the bottle! There is no danger of this if the finished root beer is refrigerated.
	12) Move to a refrigerator overnight before opening.

NOTE: There will be a sediment of yeast at the bottom of the bottle, so that the last bit of root beer will be turbid. Decant carefully if you wish to avoid this sediment.

A WORD ABOUT THE ALCOHOL IN HOME MADE ROOT BEER (OR GINGER ALE): I have received numerous inquiries about whether there might be alcohol in this home made soft drink. The answer is yes, but... We have tested in our lab the alcoholic content which results from the fermentation of this root beer and found it to be between 0.35 and 0.5 %. Comparing this to the 6% in many beers, it would require a person to drink about a gallon and a half of this root beer to be equivalent to one 12 ounce beer. I would call this amount of alcohol negligible, but for persons with metabolic problems who cannot metabolize alcohol properly, or religious

prohibition against any alcohol, consumption should be limited or avoided. However, there are many high school biology labs who have made this beverage without any problems. If you are one of these, I am interested to hear about your conclusions.

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Name: Period:

PLANT PHOTOSYNTHESIS AND RESPIRATION

Objectives:

Do plants perform both photosynthesis and respiration?

Materials:

4 test tubes in a beaker	2 sprigs of elodea
bromothymol (aka bromthymol) blue solution (BTB)	parafilm
straw	aluminum foil
light source	beaker of water

Background:

In water, carbon dioxide dissolves to form a weak acid.

$CO2 + H2O \rightarrow H2CO3 \rightarrow H+ + HCO3-$

Bromthymol blue is an acid-base indicator that turns green to yellow in the presence of acid.

Procedure:

Fill four test tubes ¾ full with bromthymol blue solution

Using the straw, blow into the BTB solution in three of the test tubes until it turns green.

Add a sprig of elodea to two of the green test tubes.

Cover all of the test tubes with parafilm.

Cover one of the elodea test tubes with aluminum foil.

Place all four test tubes in front of a light source with a beaker of water between the light source and the test tubes.

After 24 hours, remove the foil and record the observations of all the test tubes.

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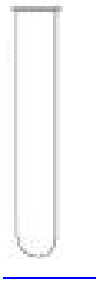
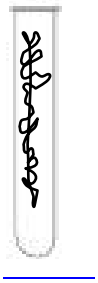
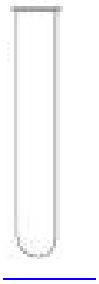
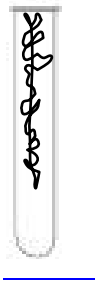
Data:

pH of blue BTB: _____ pH of green BTB: _____

	After 24 hours Color		After 24 hours Color
Test Tube #1: No elodea/blue		Test Tube #3 Elodea/green/in light	
Test Tube #2: No elodea/green		Test Tube #4 Elodea/green/in dark	

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Analysis Questions:

1. What is the job of Bromthymol blue (BTB)?

2. How does BTB work?

3. What substance was added to the test tubes when the teacher blew into the BTB?

4. Which metabolic process produced that substance that was added into the BTB?

5. Why did the BTB change color after the teacher blew into the test tubes?

6. Which metabolic process uses the substance that was added to the BTB?

7. What would happen to green BTB if respiration occurred in the test tubes? EXPLAIN

8. What would happen to green BTB if photosynthesis occurred in the test tubes? EXPLAIN

9. In which test tube(s), if any, did you observe photosynthesis?

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How did you know?

10. In which test tube(s), if any, did you observe respiration?

How did you know?

Conclusion:

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ONION ROOT TIP MITOSIS

Name_____

Date_____

Mitosis is considered nuclear division, since its main stages deal strictly with the nucleus and its contents (DNA). Mitosis consists of 4 major stages: Prophase, Metaphase, Anaphase, and Telophase. Mitosis is part of a larger process called the cell cycle. When a living organism needs new cells to repair damage, grow, or just maintain its condition, cells undergo the cell cycle. In this lab you are going to determine the approximate time it takes for a cell to pass through each of the four stages of mitosis. You may use your textbook and class notes to help you identify the stages of mitosis as seen under the microscope.

Materials:

Microscope or magnifying glass

Prepared slide (Onion root tip)

Lab Paper

Procedure:

1. Set up a compound light microscope and turn on the light (if microscope not available use pictures below).

2. Place a slide containing a stained preparation of the onion root tip.

3. Locate the meristematic zone, which is just above the root cap at the very end of the tip.

4. Focus in on low power and then switch to medium or high power. Below find micrographs of the four stages of mitosis. Use them to help you identify the stages on the microscope slide.

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Prophase

Metaphase

Anaphase

Telophase

5. Now count the number of cells found in each stage of mitosis and place the data in the chart below.

6. Determine the percentage of time each cell will spend in each stage of mitosis. Divide the number of each cell by the total number of cells and multiply by 100 to determine the percentage. Place these values in the chart below.

Stage of Mitosis	Number of Cells	Percent of time in each stage
Prophase	_____	_____%
Metaphase	_____	_____%
Anaphase	_____	_____%
Telophase	_____	_____%
Total number of Cells	_____	100%

7. Line graph the data you have just collected and then answer the questions that follow.

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Title: ____

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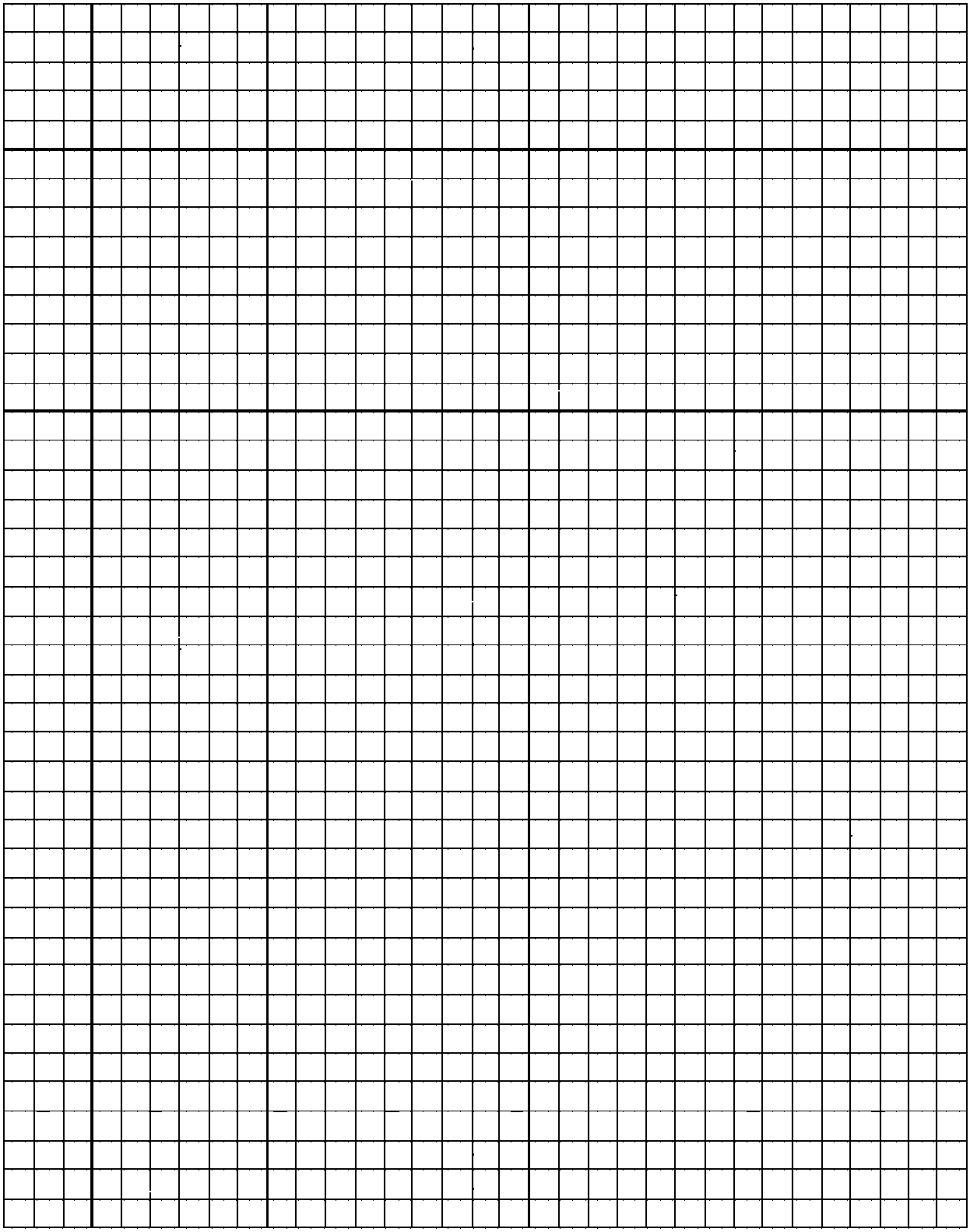

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Legend: ____

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1. Of the four stages of mitosis, which one takes the most time to complete? _____

2. Which is the shortest stage in duration? _____.

3. What would happen if the process of mitosis skipped metaphase? _____

_____

_____.

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Name: Period:

COMPARING MITOSIS AND MEIOSIS

Objectives:

How are mitosis and meiosis similar?

How are mitosis and meiosis different?

Explain how meiosis creates genetic diversity.

Materials:

Colored pencils

Procedure:

Create a parent cell in interphase (with visible chromosomes!) that has 6 chromosomes (three pair of homologs). Use THREE different colors and to indicate homologs, press hard to indicate those from one parent and press light to indicate those from the other parent)

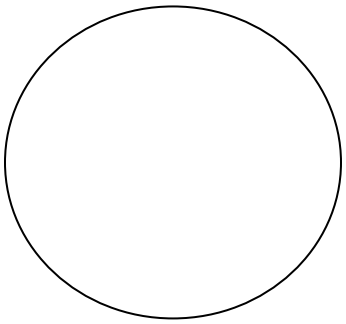
Show how the chromosomes would move during each of the phases of cell division and LABEL each

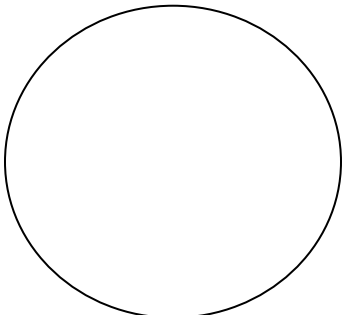
Phase.

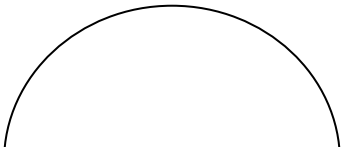
Data:

MITOSIS

Parent cell







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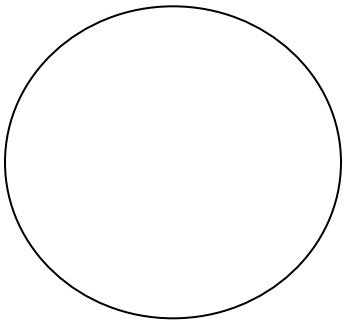
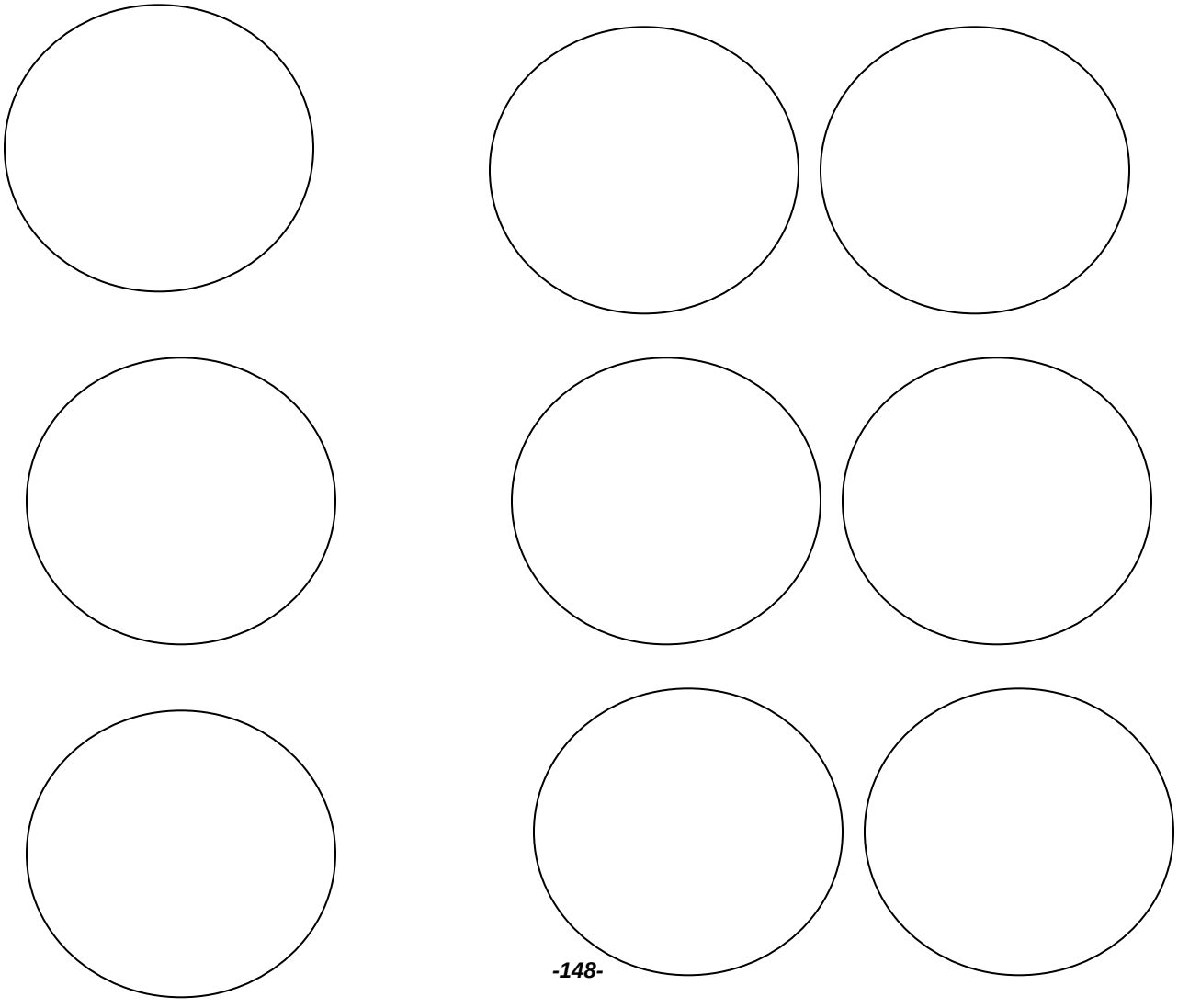
Parent Cell





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Name _____ Date _____

Honors Biology Period _____

Reference 148-151

Mitosis in Prepared Slides

Objectives:

1. What are stages of a cell's life cycle and what are the events that take place in each of these stages?

2. What are the reasons that cells undergo Mitosis?

Vocabulary:

sister (chromatids) diploid homologous chromosomes

binary fission cell cycle cell plate

cleavage furrow cytokinesis spindle fiber

kinetochore fiber polar fiber centromere

daughter cells parent cell chromatin

nucleus nuclear membrane nucleolus

cytosol centrioles aster

centrosome centriole replicated

Procedure:

1. You and your lab partners should use the prepared slides to find and examine cells in the 5 major stages of Cell Division.

2. Draw cells in each of the stages.

3. After you find and draw a well labeled diagram of each stage, get your instructor's initials. Also include approximate size of each cell in each drawing/

4. Complete the questions associated with each of the cell stages. You should answer most of the questions associated with the stage at the time you find and draw it. Some of the questions may require you to use reference material.

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Interphase:

1. Describe the contents of the cell during interphase.

2. Are the nucleolus and nuclear membrane present in the cell?

3. Are distinct rod shaped chromosomes easily visible this time?

Answer 4-6 from notes and text

4. Are the chromosomes present in cells during interphase?

5. What term is used to apply to the nuclear contents during interphase?

6. List all the important events that occur in interphase:

Prophase:

7. Are chromosomes now visible during prophase?

8. What changes occurred to the nucleolus and the nuclear membrane?

Answer question 9 from your text and notes

9. Explain why chromosome are now visible but were not visible during interphase.

Metaphase:

10. Where are the chromosomes now located in the cell?

11. Can evidence of chromosome replication now be seen?

Answer questions 12-13 from your notes and text

12. What are the fibers called that become visible during this stage?

13. What term is used to describe the structure at which each fiber attaches to a chromosome?

Anaphase:

14. What occurs to each chromosome pair during anaphase?

15. Toward what area of the cell are the chromosomes being directed?

Answer question 16 from your notes and text

16. Why is it necessary for the sister chromatids to move during anaphase?

Telophase:

17. What cellular parts begin to reappear during telophase?

18. How many daughter cells have been formed from the original mother cell?

19. Compare the number of chromosomes and the amount and type of DNA in the mother cell and the resulting daughter cells:

Answer Sheet

Interphase:

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

Prophase:

7. _____

8. _____

9. _____

Metaphase:

10. _____

11. _____

12. _____

13. _____

Anaphase:

14. _____

15. _____

16. _____

Telophase:

17. _____

18. _____

19. _____

Piscatway Township Schools

Grade: High School

Name _____ Date _____

Biology Period _____

POTATO CORE DIFFUSION

Objective:

What are the effects of placing potato cores into various sugar solutions?

Procedure:

Using a potato core borer, cut three cores from a potato. Trim each core so that its length is at least 30 mm. Make all cores as nearly the same length as possible. Keep these cores separated and identify them as core A, core B, core C.

Measure the length and diameter of each core to the nearest mm and record the measurements on a data chart.

Measure the volume of each core using the following method; pour water into the graduated cylinder until it is about half full. Put the cylinder on a flat surface and lean down so that your eyes are level with the water line. Read the line on the same level as the lower part of the curved surface of the water. (meniscus) Using a chart, record this precise amount of water. Holding the core with a dissecting needle, sink it under the water level and record the new water level in your chart. Now subtract the start height from the final height and record this as the volume of the core. Repeat this procedure for all 3 potato cores.

Find the mass of a piece of weighing paper using a balance. Next, place core A onto the paper and find the combined mass of the paper and core. The difference between these two masses is the actual mass of the core. Repeat this procedure for core B and C. Record all data into your chart.

Record the qualitative observations concerning the color, smell, and texture etc. of each core.

Place each core into a separate Test Tube and label the tube with core A as tube A, the tube with core B as tube B, and the tube with core C as tube C. Pour distilled water into tube A until it covers the core. Add a 10% sugar solution to tube B until core B is covered. Add a 20% sugar solution to tube C until core C is covered. Cover all test tubes with Parafilm and store them in a test tube rack until tomorrow.

After 24 hours, remove the cores from their tubes and repeat steps 2, 3, 4, and 5. Record your data in the chart.

Plot a graph that shows the relationship between the changes in mass of the 3 potato cores and the water concentration. Plot Water Concentration (%) on the “X” axis and Change in Mass (g) on the “Y” axis.

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Sample Chart

	Core A (100% water)			Core B (90% water)			Core C (80% water)		
Measurements	Start	End	Change (+ or -)	Start	End	Change (+ or -)	Start	End	Change (+ or -)
Length (mm)									
Diameter (mm)									
Volume (mm)									
Mass (g)									

Discussion Questions:

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What changes took place besides the quantitative changes shown in your chart?

Is there any correlation between the change in volume of the cores and the change in their mass? Explain.

Predict the water concentration at which a potato core would not change mass. What is the significance of this concentration?

Describe where there might have been errors made in this experiment.

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Understanding By Design Template

Piscataway Township Schools

Biology Curriculum guide

Grade: High School

UNIT IV: GENETICS

Content Standard (s):

5.1.A.1. When making decisions, evaluate conclusions, weigh evidence, and recognize that arguments may not have equal merit.

5.1.A.2. Assess the risks and benefits associated with alternative solutions.

5.1.A.3. Engage in collaboration, peer review, and accurate reporting of findings.

5.1.B.1. Select and use appropriate instrumentation to design and conduct investigations.

5.1.B.2. Show that experimental results can lead to new questions and further investigations.

5.1.C.1. Understand, evaluate and practice safe procedures for conducting science investigations.

5.2.A.1. Recognize the role of the scientific community in responding to changing social and political conditions and how scientific and technological achievement effect historical events.

5.2.B.1. Examine the lives and contributions of important scientists who effected major breakthroughs in our understanding of the natural and designed world.

5.2.B.2. Discuss significant technological achievements in which science has played an important part as well as technological advances that have contributed directly to the advancement of scientific knowledge.

5.2.B.3. Describe the historical origin of important scientific developments such as atomic theory, genetics, plate tectonics, etc., showing how scientific theories develop, are tested, and can be replaced or modified in light of new information and improved investigative techniques.

5.3.A.1. Reinforce indicators from previous grade level.

5.3.B.1. When performing mathematical operations with measured quantities, express answers to reflect the degree of precision and accuracy of the input data.

5.3.C.1. Apply mathematical models that describe physical phenomena to predict real world events.

5.3.D.1. Construct and interpret graphs of data to represent inverse and non-linear relationships, and statistical distributions.

5.4.A.1. Know that scientific inquiry is driven by the desire to understand the natural world and seeks to answer questions that may or may not directly influence humans, while technology is driven by the need to meet human needs and solve human problems.

5.4.B.1. Assess the impacts of introducing a new technology in terms of alternative solutions, costs, tradeoffs, risks, benefits and environmental impact.

5.4.C.1. Plan, develop, and implement a proposal to solve an authentic, technological problem.

5.5.A.1. Relate the structure of molecules to their function in cellular structure and metabolism.

5.5.A.4. Relate disease in humans and other organisms to infections or intrinsic failures of systems.

5.5.B.1. Explain that through evolution the Earth’s present species developed from earlier distinctly different species.

5.5.C.1. Describe how information is encoded and transmitted in genetic material.

5.5.C.2. Explain how genetic material can be altered by natural and/or artificial means; mutations and new gene

combinations may have positive, negative, or no effect on organisms or species.

5.5.C.3. Assess the impact of current and emerging technologies on our understanding of inherited human characteristics.

5.6.A.6. Know that many biological, chemical and physical phenomena can be explained by changes in the arrangement and motion of atoms and molecules.

5.6.A.7. Recognize that the properties of matter are related to the structure and arrangement of their molecules and atoms, such as in metallic and nonmetallic crystals and carbon compounds.

5.10.A.1. Distinguish naturally occurring processes from those believed to have been modified by human interaction activity: climate change, ozone production, erosion and deposition, threatened and endangered species.

5.10.B.1. Assess the impact of human activities on the cycling of matter and the flow of energy through ecosystems.

5.10.B.2. Use scientific, economic, and other data to assess environmental risks and benefits associated with societal activity.

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Grade: High School

STAGE 1: DESIRED RESULTS

Understandings

Students will understand that …

District:

(1) Science is an ongoing investigative process that demands a variety of safe methods, posing questions, explaining, and predicting outcomes about the universe. The methods chosen are based on honesty, the known and unknown, and the risks/benefits of the solution while communicating the results to others for their

(5) The survival of all organisms is dependent upon diversity of structure, function, and behavior due to genetic make up and/or environmental conditions.

(6) The relationship among the structure of matter, its organization and its chemical and physical properties can be used to predict and explain the universe.

Course:

(1) Science is an ongoing investigative process that demands a variety of safe methods, posing questions, explaining, and predicting outcomes about the universe. The methods chosen are based on honesty, the known and unknown, and the risks/benefits of the solution while communicating the results to others for their

(5) Organisms evolve towards increasing complexity and this evolution is driven by genetic recombination, mutation, and environmental conditions.

(6) The structure of matter can be used to predict and explain its behavior in organisms

Essential Question(s):

Why are organisms so diverse?

Can an organism live forever?

Is it possible for traits to not be passed to offspring?

Can scientists engineer a perfect life?

Knowledge & Skill

Students will know …

the origin of genetics as a science

traits are passed from one generation to the next

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Grade: High School

Mendel's Laws of inheritance the usage of Punnett squares meiosis, mutations, and heredity are responsible for genetic diversity. there are many different genetic interactions controlling inheritance mutations are the results of changes to DNA and can be helpful or harmful genetic abnormalities can be diagnosed/predicted the history of DNA research the structure of DNA & RNA DNA replicates prior to cell division the code in DNA determines protein structure the history of genetic engineering DNA can be edited genetic engineering has changed our world
Students will be able to… describe the work of Gregor Mendel (E) distinguish between genotypes and phenotypes (E) identify genotypes as heterozygous or homozygous and the resultant phenotypes (E) identify Mendel's laws of inheritance and explain how they relate to meiosis (E) calculate the probability of various events (E) tell why probability is important to genetics (E) use a Punnett square to predict the offspring of various sets of monohybrid crosses (E) and dihybrid crosses use a backward Punnett to determine the genotypes and phenotypes of the parents, given the offspring, (E) simulate how meiosis creates genetic diversity (E) define and distinguish between incomplete dominance, co-dominance, multiple alleles, polygenic inheritance and sex-linked traits (E) describe sex-influenced traits give examples of human characteristics determined by all inheritance interactions (E)

solve word problems involving the inheritance modes of incomplete dominance, co-dominance, multiple alleles, and sex-linked traits (E)

explain the historical significance of hemophilia to royalty (E)

describe how nondisjunction, inversion, duplication, deletion, inversion, and translocation happen and the results of each (E)

predict which type of mutation is most/least harmful and why (E)

list ways that genetic abnormalities/birth defects can be detected, how they work, types of disorders that can be detected with each technique, risks of each technique (E)

use and make a pedigree (diagram) (E)

create and analyze a karyotype (E)

describe the series of experiments that led to the discovery of the structure of DNA

make a model of DNA and label the parts (E)

describe the replication process and simulate base pairing (E)

compare the structure and function of DNA and RNA (E)

describe the transcription and translation processes and simulate/practice it on paper (E)

use a gene model to determine genotypes/phenotypes/amino acid sequences in a laboratory activity (E)

describe the early uses of genetic engineering/selective breeding (E)

describe the steps involved in editing/creating recombinant DNA

describe how and why cloning, gene therapy, DNA fingerprinting, transgenic organisms, stem cell research, and the human genome project are done

list and describe ways in which genetic engineering is helpful and could be harmful (E)

(E) = Essential Minimum Requirements For Basic Understanding Of Biology

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[redacted]	
Performance Task Summary:	Rubric Titles (Key Criteria)
DNA (Transcription/Translation) Model Create a paper & pencil (3-D) model of DNA/ transcription / translation	3 points: -neat & colorful -accurate -components labeled Points lost successively for each criteria point that is not met.
Genetic Disorder Research/Project/Presentation Research a genetic disorder, determine mode of inheritance, chromosome involved, how common is the disorder, characteristics of, treatment for, chances of passing to offspring Present the information in either a Brochure/poster/power point presentation * Individual project may be modified or substituted as appropriate for course intensity level while maintaining minimum requirement of one project per	5 points: -mode of inheritance/chromosome involved/frequency -characteristics of disorder/treatment -chances of passing to offspring (Punnett/pedigree) -neat colorful presentation -sources cited, grammar, spelling

unit.	Points lost successively for each criteria point that is not met.
Self-Assessments	Other Evidence, Summarized
Student interactive notebook (Avid strategy) Science lab journal (Avid strategy) How has the discovery of DNA and the study of genetics changed your world? Three item summary (Avid strategy)	Periodic quizzes Unit tests Genetics DNA/RNA/Protein synthesis Various inquiries found in the student workbook associated with the textbook In class cooperative (group) work

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STAGE 3: LEARNING ACTIVITIES

Learning Activities:

Inquiry Lab: Discovering DNA Structure (see Unit IV resources)

Practice Problem Worksheets (monohybrid, dihybrid, incomplete dominance, codominance, multiple alleles, sex-linked) (see Unit IV resources)

Practice Problem Worksheet: Oompa Loompa (see Unit IV resources)

Practice Problem Worksheet: SpongeBob Square Pants (see Unit IV resources)

Lab: Monster Baby/Human Inheritance (see Unit IV resources or Laboratory Manual A)

Lab: Dragon Genetics (see Unit IV resources)

Lab: DNA and RNA Relationships CHNOPS (see Unit IV resources)

Lab: Investigation Human Traits (Lab Manual A & B Chapter 14 Lab)

Lab: Probability (see Unit IV resources)

Lab: Karyotype (boxed activity found in Biology prep room)

Lab: Pedigrees (Prentice Hall Biology, Green book)

Lab: DNA fingerprinting (see Unit IV resources and kit)

GATTACA Video (Biology prep room)

United Streaming Videos on Science Network Drive (R):

DNA Genetic Engineering and Forensics

Genetics: Alternate Patterns of Heredity

Genetics: Epistasis & Pleiotrophy

Genetics: Mendel

Genetics: Power of Genes Twins

Genetics and Monohybrid Crosses

Genetics: Understanding the Power of Genes

Genetics: Incomplete Dominance

Genetics: The Age of Clones

Genetics: The Human Genome Project

Genetics: Human Genome Project 50min

Genetics: Dihybrid Crosses

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RESOURCES UNIT IV

name _____ date _____