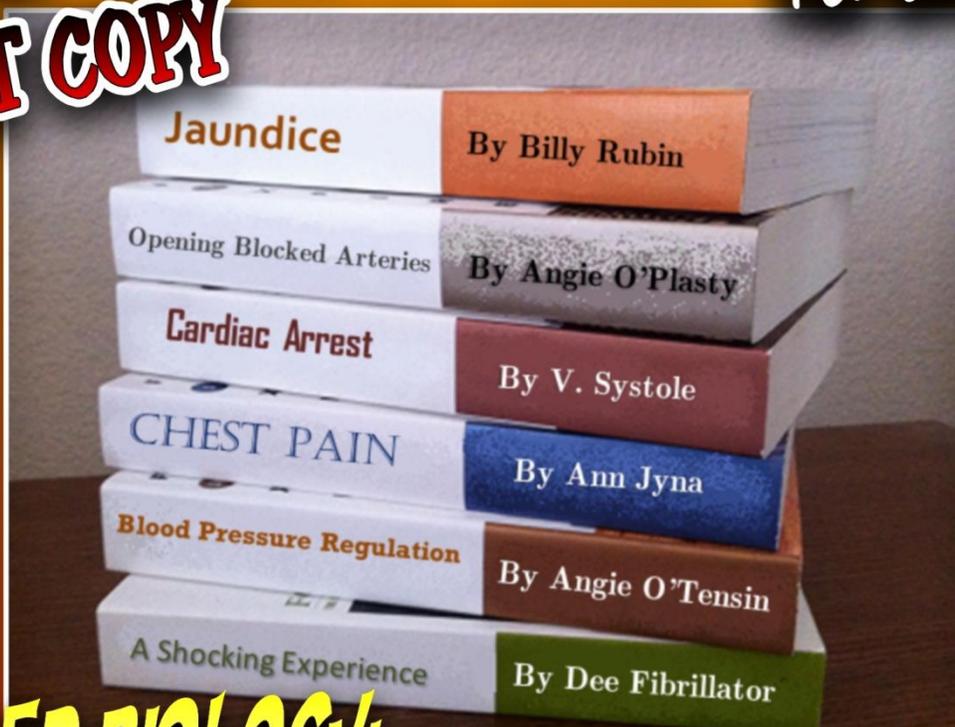


Classic Science

For the Family

PARENT COPY



ADVANCED BIOLOGY:

I FIND THIS HUMERUS...

ANATOMY and PHYSIOLOGY

The lab of
MR. Q

zzzz...



Scott McQuerry



*Thank you so much for purchasing this
copy of*
**Advanced Biology: Anatomy and
Physiology**

Hello there! Thank you so much for your willingness to bring this curriculum into your home. This curriculum is the embodiment of two years of research and study. I've jumped head-first into resources devoted to the concepts of Anatomy and Physiology to bring you the best for your family. Please keep in mind that I have built this curriculum as an introductory course into the basic concepts of anatomy and physiology. I am certain you will not be disappointed.

If you are new to the Classic Science series, the following information will give you an overview of the coming year. For seasoned veterans out there, I want you to know that the format of this new advanced series is comparable to the elementary and advanced curriculum you may have been using. In addition, you will find many of the activities involve the use of the kitchen, much like those found within the Advanced Chemistry book.

Before we begin, I want to thank each and every one of you who have helped guide me throughout the years. Your time and effort will not be forgotten. I could not have achieved so much without your help....

And now for something completely different...

The study of Anatomy and Physiology is a little different than some of the other scientific disciplines. First of all, this concept is LOADED with vocabulary. I would highly recommend purchasing a stack of notecards and begin generating flash cards for every vocabulary term that is provided. Throughout the year, many of these definitions are used over and over again. Write the word on one side and give yourself plenty of room on the other for notes. I'm really not kidding here ☺

Second, the weekly practice problems include an "Application Question" that should require a short essay by the child. This may prove to be a challenge for many students - and that is good! I would recommend allowing your child to utilize their notes in the answering of these practice questions. The answers to each of these problems have been provided for you within the parent edition of the textbook.

Weekly Timeline

This is a 36-week curriculum for children of ages 12-18. The weekly curriculum has been arranged into two-week units (which is different from the elementary curriculum!) Each week may be broken down into three separate days to make it easier for you to set up a schedule:

- 1) *The first day of each week contains a reading assignment and a series of practice problems for your child.*
- 2) *The second day can be spent reviewing the answers from the practice problems on the first day, to review the flash cards for the week, AND to preview the weekly lab activity which may require some preparation.*
- 3) *The third day is set aside for a lab activity that will reinforce the concepts being taught that week.*

Unit Quizzes, Quarterly Tests, and the dreaded Final Exam (gasp!)

Each two-week unit contains a quiz in similar format to the weekly practice problems. Students should study not only their vocabulary terms, but the labeled images throughout the textbook as well.

Four quarterly tests have been created to further assess your child's understanding of the chapter concepts in addition to the unit quizzes. Your child will need time to prepare for these tests as a full week has been provided for their administration:

Test #	Week	Chapters	Topics
1	8	1-7	Protection, Support, and Movement
2	16	8-14	Integration and Regulation
3	24	15-21	Fluid transportation
4	32	22-28	Absorption and Excretion
FINAL EXAM	36	1-31	All topics including Reproduction

In addition, a "**Conditions and Disorders**" chapter has been included in the weeks before a quarterly test. These include weeks 7, 15, 23, 31, and 35. The content for these chapters addresses the question, "What can go wrong?" Their purpose is to introduce the student to the common disorders and conditions involving the material within the previous units.

I would highly recommend setting up a regular schedule to prepare for the quarterly tests. Breaking down each testing week into three or more separate days will make it easier to digest (no pun intended) the large amount of vocabulary and its application to the human body. Here are my suggestions:

- 1) *The first or second days of each testing week should be spent reviewing the weekly practice problems and unit quizzes. Do not forget to study the labeled diagrams within each chapter as well.*
- 2) *One day should obviously be allowed for your child to complete the test.*
- 3) *An additional day needs to be set aside to evaluate the answers, correct any possible mistakes within the notecards, and for an overall review. This material overlaps many times throughout the year. The tests can be the most powerful learning tool throughout the year.*

A sample timeline can be seen below which contains the Unit Quiz and Quarterly Test schedule:

Weeks	Weekly Assignment	Assessment
Week 1	Unit 1: Chapter 1	
Week 2	Unit 1: Chapter 2	Unit Quiz
Week 3	Unit 2: Chapter 3	
Week 4	Unit 2: Chapter 4	Unit Quiz
Week 5	Unit 3: Chapter 5	
Week 6	Unit 3: Chapter 6	Unit Quiz
Week 7	Chapter 7: What can go wrong?	
Week 8		Quarterly Test

Unit 13 deals with the concept of the reproductive system and stands by itself. The unit quiz can be found at the end of Chapter 31 (Week 35) which is a little different from the previous unit quizzes; however, due to the small size of this unit, I felt it would be best to incorporate the last three chapters into this quiz.

The **final exam** is comprehensive assessment covering the entire year. You may choose to allow your child to complete this exam with or without notes; or, a single notecard can be provided for any selective notes over topics which may have proven difficult throughout the year. I would recommend a few days to prepare for this assessment.

Weekly Labs

I have attempted to place as many food-based labs into this book as possible. Please read the labs before you begin your studies as some require preparations that cannot be performed by the student. I promise you do not need an M.D. degree to prepare any of these activities!

To be perfectly honest, there is nothing more valuable than your health. The knowledge gained from this curriculum added to the daily routine of preparing a meal can have amazing educational opportunities for your child and your family. These labs have been designed to help a student understand their own bodies and how it is affected through good nutrition and exercise. It makes sense to incorporate

Future projects

Oh yes... there will be more books in the Advanced series! The best way to keep up-to-date on this development is to sign up for my monthly LabNotes at www.eequalsmcq.com. I'm certain you'll love the free activities I provide each month for you and your family!

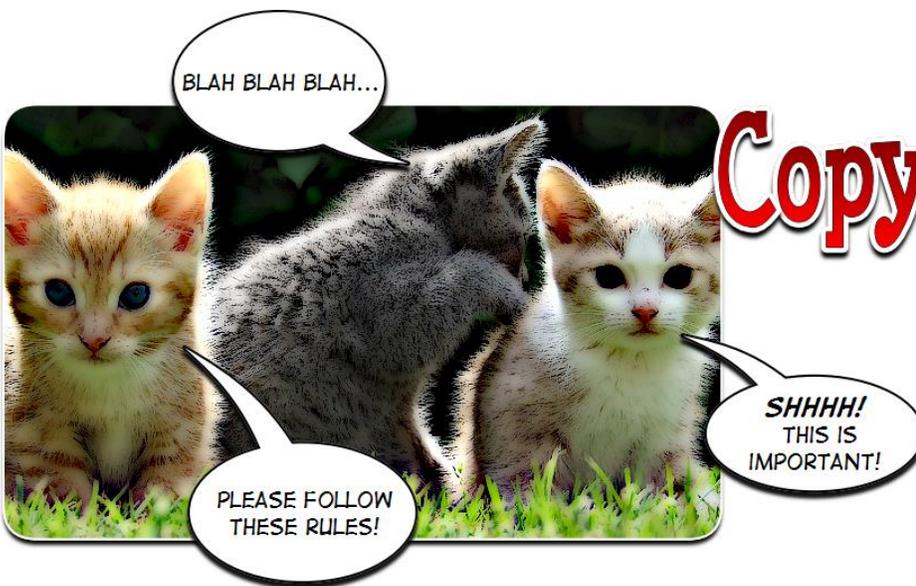
Once again, thank you all so much for your continual support and advice. I have read all of your emails and have taken all of them to heart. I honestly could not have done this without your help. Thank you. Thank you. Thank you.

And thank you for your tireless efforts to guide your children through the concepts of science. Your hard work will not be forgotten in the young lives you are molding right now.

As I've said before - above all else, keep asking questions and keep searching for the answers! And if you get stuck, I'm only a click away mrq@eequalsmcq.com

Take care,

Scott McQuerry



Copyright Stuff

First of all thank you very much for choosing to use this book with your family. You will not be disappointed! I have been asked by several families the same question, “**Who** are you and **why** are you doing this?” Without going into great detail, E=McQ is owned, operated and stressed over by me. Yep... little o’ me. I am an educator by profession and began working with homeschool families several years ago while offering free programs to area families to explore various concepts in science. I guess I can’t stop doing what I love!

This product is the fruit of my 15-year labor in science education. Having worked with homeschool families over these years I have gained an appreciation for your needs, struggles and wants. I could not make this curriculum any simpler for your child to master the concepts of science. It is easy to follow, relatively cheap (I tried to keep it under the cost of a tank of gas), and adaptable to various needs at home and as fun as humanly possible.

Like I said, I am an “army of one.” I have no problem with you using this one copy for your entire family. However, if you give or loan this book out to another family you are putting a lot of pressure on me. If this happens too often, I may not be able to continue producing this curriculum. I am not telling you to keep this curriculum a secret, but I have provided some options for you should another family wish to use this curriculum:

- If your friends are asking to borrow your copy to use throughout the year, please ask them to read this copyright page and go to my website: www.eequalsmcq.com so that they may purchase their own book!
- If you are reselling this curriculum please be aware that its value will diminish if many people are selling it for a lower amount of money. This, too, puts pressure on little o’ me. If this is the path you choose, I hope you (or the buyer) will consider providing a small contribution to support my continued work. I know it is impossible to regulate this, but I am certain you will do the right thing!
- If you are part of a CO-OP or other similar group of homeschool families, you may purchase licensing/copying rights for use in your classrooms at a reduced rate. Please contact me at mrq@eequalsmcq.com for details.

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Master Materials List

Chapter 1: The Autopsy of a Dill Pickle

Four large whole dill pickles	Several toothpicks
2-3 foam meat trays or styrofoam plates	Sharp paring knife
Several straight pins	Paper clip
	Wire cutters

Chapter 2: Uncovering the Hidden Layers of an Egg

3-4 eggs (a couple for practice)	Sewing needle or similar item
White vinegar	Soap and water
Drinking glass	Baby powder
Plastic wrap	Baby aspirator, syringe, or bicycle pump (optional)
2-3 eggs	

Chapter 3: Plasticized Fingerprints

Two cotton balls	Gloves
Baking soda (sodium bicarbonate)	Safety goggles
Distilled water	Crumpled piece of paper towel (approximately the size of a fist)
Spoon	Gallon freezer bag (clear)
Clear drinking glass	
Superglue	
Small piece of foil	

Chapter 4: How Flexible is a Chicken?

Three chicken leg bones (or smaller bones if possible)	Cookie sheet and foil
Vinegar	Small drinking glass
Oven	Small cooking pan

Chapter 5: The Dissection of Dinner

Protective gloves and goggles

Scissors

Sharp knife

Paper towels

Tweezers or a toothpick

Uncooked whole chicken wing (not "party wings" or wing sections)

Chapter 6: Gummy Chicken Tissue

Materials for roasting the chicken:

1 roasting chicken (~4lbs or 1.8kg); a

good quality bird is a must!

1 tablespoon table salt

$\frac{1}{4}$ teaspoon pepper

1 tablespoon olive oil

$\frac{1}{2}$ cup chopped onion

$\frac{1}{4}$ cup chopped celery

6 garlic cloves

1 bay leaf

1 large pinch of rosemary

2-3 tablespoons apple cider or white vinegar

Additional materials:

Dutch oven or large stock pot with a lid

Large spoon

Fine-wire strainer

Container with lid for drippings

Foil

Baking dish or carving board for chicken

Large knife

Meat thermometer

Chapter 7: Putting your life on the "clothes" line

One clothespin (a tennis ball can also be used)

Large bowl of ice water

Timer or clock with second hand

Chapter 8: You've got some nerve!

Materials:

One large plastic baggie

One small plastic baggie

33 black beans*

31 red beans*

26 pinto beans*

20 lima beans*

*Any small objects may be used in place of beans as long as they are uniform in appearance.

Chapter 9: Retrain Your Brain

Diagram sheets (attached)	Thick piece of cardboard
Pencil	Scissors
Small mirror	Timer/Watch with second hand
Book	Tape
Safety goggles with a flat face plate	
Plastic or glass prism approximately 2in (5cm) in length	
Basketball and hoop/Tennis ball or Crumpled paper and trash can - anything that can be tossed (safely) inside or outside	

Chapter 10: Scrambling the PNS and the CNS

Sugar	Saltine crackers
One lemon	Tonic water with quinine
Spoon	Four drinking glasses
Glass of water	

Chapter 11: Mapping the Location of your Taste Buds

Blue food coloring	One sheet of 3-hole punched notebook paper
Magnifying glass	One sheet of blank white paper
Paper cup	Scissors
2 cotton swabs	2-paper towels or napkins
Flashlight	Digital camera (optional)

Chapter 12: Clarifying Proteins

2 sticks (225g) unsalted butter, cut into pieces	Glass measuring cup (Pyrex)
Small saucepan	Plastic wrap
	Spoon

Chapter 13: The Hidden Rhythms of our Body

Oral thermometer (a digital thermometer will likely work best that can provide information to at least 0.1 degree accuracy)

Computer with Internet access

Paper and pencil

Chapter 14: Measuring your blind spot

One 3 X 5 inch (8 x 13 cm) card or other stiff paper

Black and red markers

Pen

Meterstick

Chapter 15: Centrifuging the Components of Blood

Bicycle

Tape

1% milk

Vegetable oil

Red food coloring

Blue Food Coloring

Mixing container and spoon

Metric ruler

Three small clear plastic bottles with caps

Chapter 16: The Hidden Reactions of Typing Blood

Twenty 3oz (89mL) paper cups

8 toothpicks

Marker

One cup (250mL) skim milk

Water

Red and green food coloring

1/2 cup (100mL) vinegar

12 eye droppers

Measuring cup

Chapter 17: Welcome to the Lub Dub Club!

Scotch tape or Sellotape (UK)

Old water/soda bottle with lid

Scissors

Bowl or tub of water

Drill with 0.4in (1cm) bit (optional)

Chapter 18: The Mysterious Shrinking Veins

Stopwatch or clock with a second hand
Camera (optional)

Chapter 19: Simulating the most frightening form of defense imaginable

1 plastic shopping bag
1 pair of scissors
15 cm of string, large rubber band, or tape
4 pieces of wrapped candy, peanuts, raisins, or other item

Chapter 20: Homemade Yogurt

1.75 cups (~91 grams) powdered whole milk	Five (5) one-cup containers with lids
4 cups (946mL) warm water (between 43-51 °C or 110-125 °F)	Mixing bowl and whisk
1/3 cup (80 grams) of plain yogurt with active and live cultures	Small cooler or insulated lunch container
	Fresh fruit
	Spoons

Chapter 21: Stowaways on our Phalanges

4 packages (4oz/113g) plain gelatin	Ten sealable sandwich bags
Four cups (946mL) cold water	Sauce pan and stove
Eight teaspoons (33.6g) sugar	Aluminum foil
Four beef bouillon cubes	Measuring spoons
*Ten foil muffin cups	Permanent marker
*Muffin pans	

*If muffin cups are not available, you can use disposable plastic cups

Chapter 22: Breathing Acid and Scuba Diving 101

Distilled water	Drinking glass
Red cabbage	Drinking straw
Knife	Small empty water bottle
Large pot	Baking soda
Fine mesh strainer or coffee filter	
Large syringe (10-60mL) *the largest syringes can be found at pharmacies, automotive stores (for bleeding fluids from a car), or BBQ retailers (for injecting marinades)	

Chapter 23: Homemade Spirometer

Three-liter soda bottle with cap
 ~2 foot (61cm) length of plastic tubing
 Measuring cup
 Bucket/pan with a 3+ liter volume

Chapter 24: Anti-gravity beverages

Two small kitchen funnels	Water
Plastic tubing	Stopwatch or clock with second hand
Tape (optional)	Ruler
Drinking glass	Two volunteers of varying heights

Chapter 25: Encapsulating the Digestive System

1/4 cup (60mL) flour	1 clear plastic cup
1/8 cup (30mL) corn starch	1 cup (240mL) clear diet soda
1/4 cup (60mL) sugar	1 small plastic spoon
1/8 cup (30mL) vegetable oil	2 pieces of color-coated candy (Runts or Skittles work well)
1 paper plate	Timer
4 small paper or plastic bowls or cups	

Chapter 26: Neutralizing an Acid

16oz (473mL) baking soda	3 clear drinking glasses
8oz (236mL) white vinegar	One can of clear soda (7-up, Sprite, etc.)
One gallon (3.8L) of distilled water	
1 eyedropper	

Chapter 27: Modeling the Nephron

Cornstarch

Two sealable baggies

Iodine

*Do not use any of your good bowls for this lab!

Two drinking straws

Large clear disposable glass/plastic bowl

Chapter 28: Homemade Greek Yogurt

Strainer

Large bowl

Several paper towels

Four cups plain regular yogurt

Plastic wrap

One full can of fruit, vegetables, etc.

Cocoa (optional)

Chapter 29: Licorice Meiosis

One white sheet of paper

Four sealable baggies

Pencil

String

Scissors

Scotch tape

Two red and black pieces of licorice

Chapter 30: The Genetics of Mr. and Mrs. Peep

1 bag of large white marshmallows

1 bag of small colored marshmallows

1 container of push pins (red and blue)

1 container of thumb tacks

5+ pipe cleaners (cut in half)

1 box of toothpicks

Chapter 31: Adherence rates and HIV

Twenty (20) individual servings of any powdered drink (Kool-Aid, Crystal light, etc. are all acceptable)

One box each of TicTacs in the following flavors: Spearmint, Cinnamon, Citrus, and Wintergreen; and two boxes of orange TicTacs*

Drinking glasses/spoons

Two reliable assistants

*Any substitution would be acceptable for the candies

Chapter One

Body sections and Homeostasis



Day One:

Today, your child should complete their reading and practice problems for the week.

Below are the supplies for this week's lab:

Four large whole dill pickles
2-3 foam meat trays or styrofoam plates
Several straight pins
Several toothpicks
Sharp paring knife
Paper clip
Wire cutters

National Science Education Standards covered this week:

12CLS6.2 Organisms have behavioral responses to internal changes and to external stimuli. Responses to external stimuli can result from interactions with the organism's own species and others, as well as environmental changes; these responses either can be innate or learned.

Definitions

anatomy	the study of the body's physical structures
anterior (ventral)	directional term meaning "toward the front"
coronal (frontal) plane	plane of reference which divides the body into anterior and posterior portions
distal	away from the trunk of the body
external (superficial)	toward the surface of the body
homeostasis	the property which regulates our internal environment to create a stable and constant set of properties
inferior (caudal)	directional term meaning "toward the bottom"
interior	away from the surface of the body
lateral	away from the midline of the body
medial	toward the midline of the body
negative feedback	occurs when the response to a stimulus (feedback) results in a reversal of the direction of change
physiology	the study of the body's functions
planes of reference	a set of three planes (imaginary flat surfaces) passing through the body used to identify specific locations in, on, and around the body
positive feedback	occurs when the feedback results in an increase of the change
posterior (dorsal)	directional term meaning "toward the back"
proximal	toward the trunk of the body
sagittal plane	plane of reference which divides the body into right and left sides
superior	directional term meaning "toward the top"
transverse plane	plane of reference which divides the body into inferior and superior portions

Sample questions to ask your child after completing the weekly reading.

What is the difference between anatomy and physiology?

Anatomy is the study of the body's physical structures. Physiology is the study of the body's functions.

How is negative feedback important for the human body?

Negative feedback allows the body to go through homeostasis by reversing an action taking place within the body.

Which is more prevalent within the human body - negative or positive feedback?

Negative feedback is more prevalent within the human body.

Are the feet superior or inferior to the chest?

The feet are inferior to the chest.

Which plane of reference which divides the body into inferior and superior portions?

The transverse plane divides the body into upper and lower halves of the body.

Day Two:

Your child should check their work on the practice worksheets today with the answer key on the next page.

In addition, your child should read the lab activity and start collecting all of the necessary materials!

Answer Key for Practice Problems

Vocabulary Review

- | | |
|------------------------|-----------------------------|
| 1) planes of reference | 11) coronal (frontal) plane |
| 2) lateral | 12) transverse plane |
| 3) interior | 13) sagittal plane |
| 4) distal | 14) homeostasis |
| 5) positive feedback | 15) anatomy |
| 6) negative feedback | 16) physiology |
| 7) posterior (dorsal) | 17) medial |
| 8) inferior (caudal) | 18) external (superficial) |
| 9) anterior (ventral) | 19) proximal |
| 10) superior | |

Multiple Choice

- | | |
|------|------|
| 1) A | 4) A |
| 2) C | 5) D |
| 3) E | 6) D |

Application Questions

- Inferior (caudal)
- Anterior (ventral) and external (superficial)
- Proximal and superior
- Medial and anterior

Day Three: Lab Activity

Your child should have already read through this lab and has been reviewing all of this week's vocabulary words.

Collect your supplies for the lab:

- Four large whole dill pickles
- 2-3 foam meat trays or styrofoam plates
- Several straight pins
- Several toothpicks
- Sharp paring knife
- Paper clip
- Wire cutters

PARENTS! Be certain to check out the Pre-lab preparation for this week's activity. This lab requires a little planning!

The Autopsy of a Dill Pickle

“The sight was horrible. Relish everywhere....”

The dissection of a pickle will be used to review planes of reference and directional terms for the human body.

Materials:

Four large whole dill pickles	Several straight pins	Paper clip
2-3 foam meat trays or styrofoam plates	Several toothpicks	Wire cutters
	Sharp paring knife	

Pre-lab preparation (for parents):

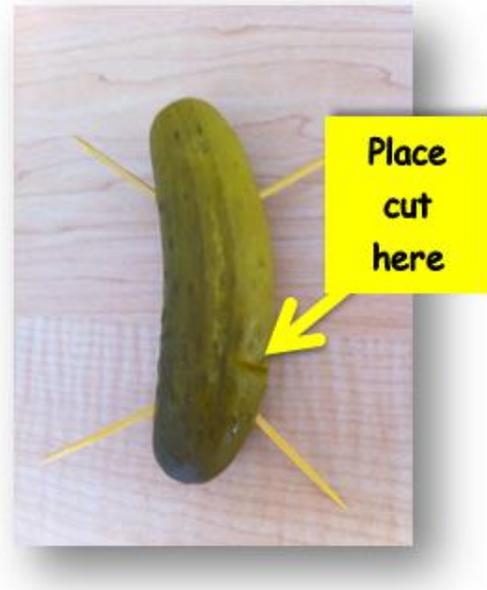
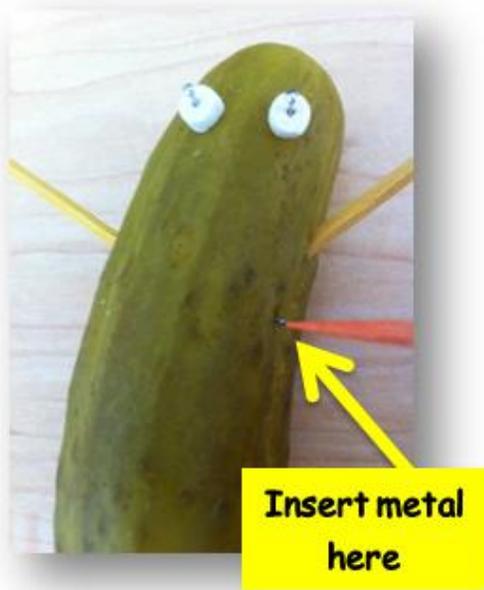
Each of the four pickles will represent an individual undergoing an autopsy. Insert four toothpicks into each pickle to represent the arms and legs of the individual and attach two beads for eyes using pins. In addition, cut three small pieces of metal from a paper clip (0.2 inches or 5mm in length). You will use one of these pieces in Pickle #1 and the others with Pickle #4.

Feel free to venture beyond the following instructions to be as creative as you wish; however, the following images, descriptions, and answer keys will provide you an easy way to assess your child's understanding of the planes of reference and directional terms for the human body. You may prepare the “bodies” in the following manner:

Pickle #1

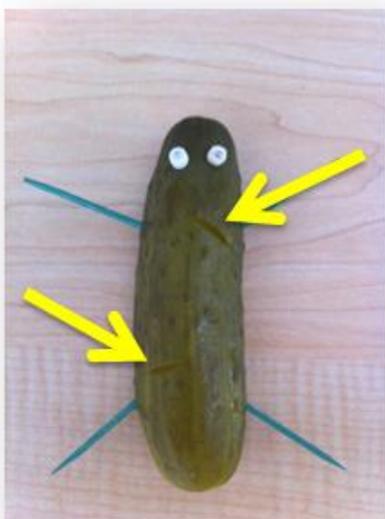
Insert one of the small pieces of metal within the upper left portion of pickle #1. This should be placed on the front side of the pickle. Do not bury this piece much below the surface. It may be beneficial to make the opening much larger in order to be visible during the autopsy.

In addition, make a large (noticeable) cut through the lower right section of the pickle on its back side.

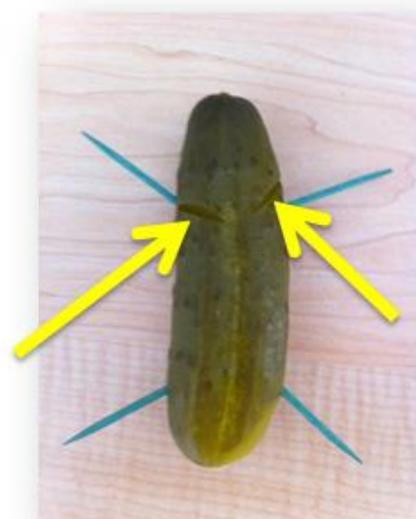


Pickle #2

Make one large cut in the lower right section on the front side of the pickle; one cut within both the right and left sides of the upper back side; and, another cut in the upper left area on the front side of the pickle.

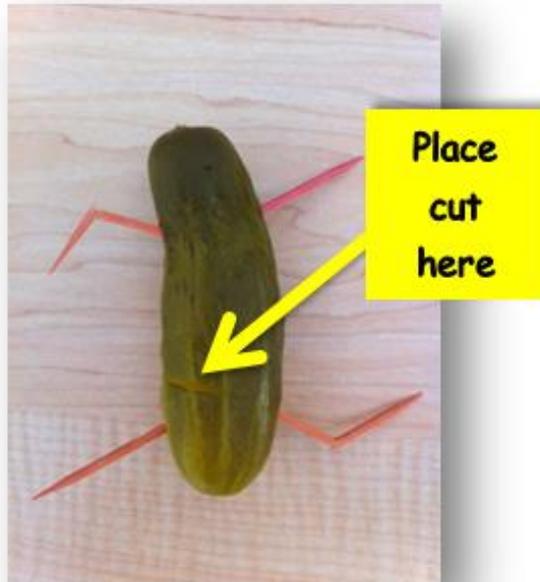
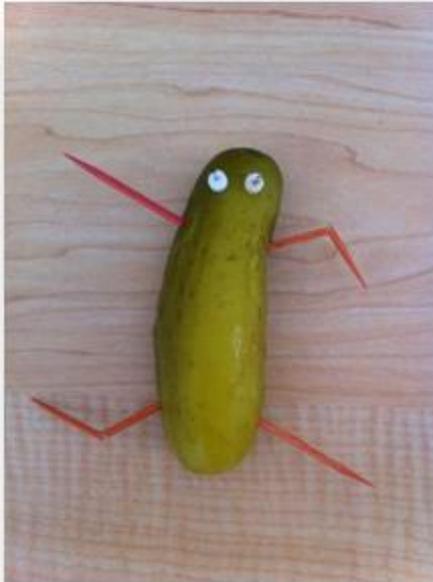


Place cuts in these four locations



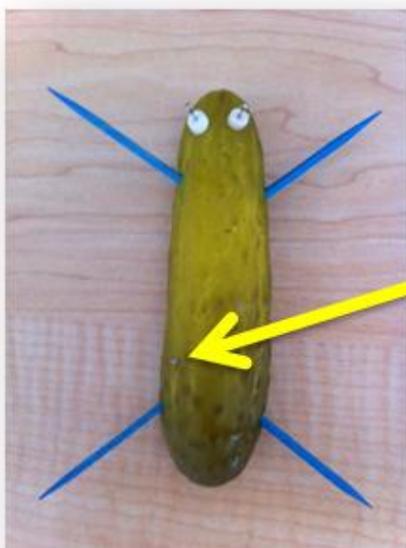
Pickle #3

Break the lower right and upper left toothpicks in half. Make one large cut in the lower left area on the back side of the pickle.

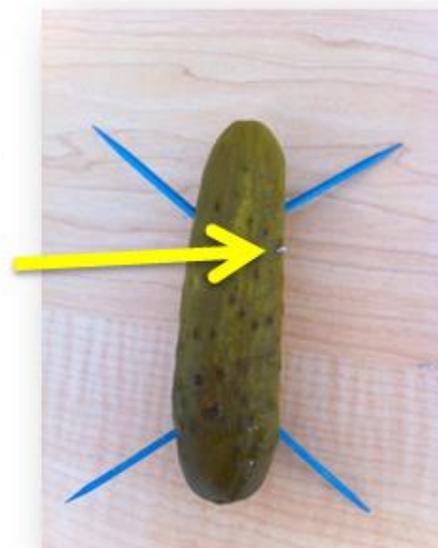


Pickle #4

Insert one of the remaining pieces of paper clip within the upper right portion of the pickle on its back side. The last piece of metal is to be placed in the front side of the pickle on its lower right side.



Insert metal
in these two
locations



Procedure (for students):

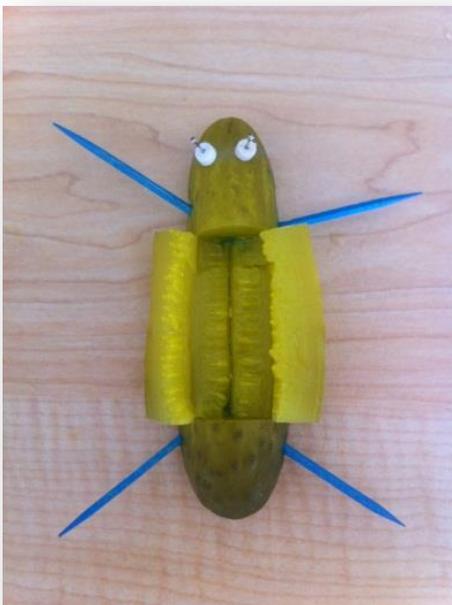
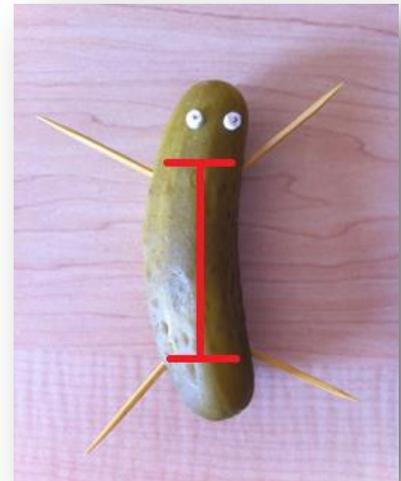
In this activity, you will assume the role of a medical examiner with the responsibility of performing an autopsy on four individual patients. Each of these patients has perished by different means. It is up to you to examine and record all of your findings within the Autopsy Report.

Examine both the posterior (dorsal) and anterior (ventral) surfaces of your patient for distinguishing marks such as wounds or scars from injuries or surgeries. Draw and label your findings in the External Observations section of your Autopsy Report.

Rotate your patient so that its anterior side is up. Fasten your patient to the plates by inserting a pin into the upper superior and lower inferior sections of the body.

Use the paring knife to open the ventral "body cavity" of the patient by making a deep I-shaped incision as shown in the picture on the right:

The incision should allow you to open this cavity much like hinged doors. You may need to pin down the sides in order to keep the cavity open.



Draw and label your patient at this time within the Internal Observations section of your Autopsy Report. Note any foreign objects and their location. The following will provide you with a sample report - "A metal object was found in anterior section of the patient in the left superior area, medial to the shoulder."

Your report must include locations using the following terms: superior or inferior, anterior or posterior, and left or right sides.

Explanation:

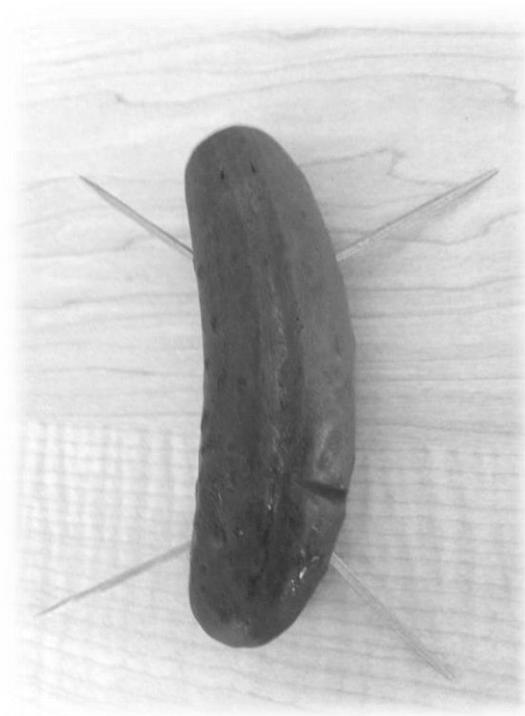
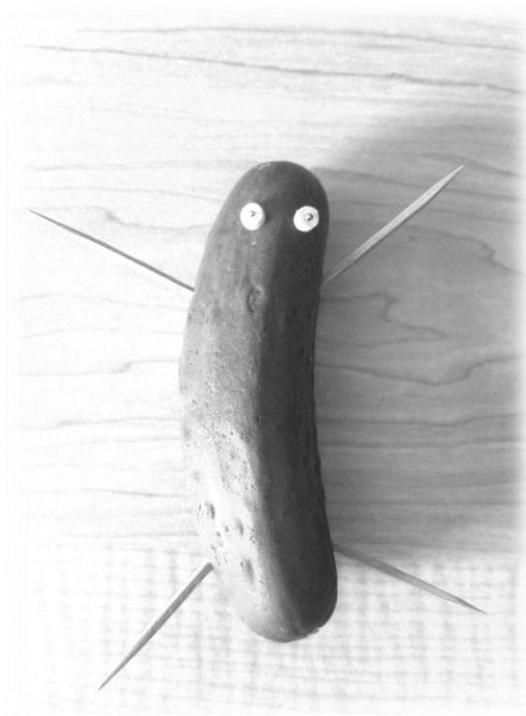
A real autopsy would include a more thorough examination of the height and weight of the individual as well as the cause of death, presence of drug use, or the identification of any congenital defects. This activity is designed to identify the basic directional terms for the locations of the human body. These directional terms are based upon the directional terms for the human body:

Term	Definition
Superior	Toward the head; toward the top
Inferior (caudal)	Away from the head; toward the bottom
Anterior (ventral)	Toward the front
Posterior (dorsal)	Toward the back
Medial	Toward the midline of the body
Lateral	Away from the midline of the body
Internal (Interior)	Away from the surface of the body
External (superficial)	Toward the surface of the body
Proximal	Towards or near to the trunk of the body
Distal	Away from the trunk of the body

Autopsy Report

Locate and draw the following planes of reference within each drawing:
Sagittal plane, Coronal plane, and Transverse plane

In addition, label the following pictures with the following directional terms:
Anterior, Posterior, Superior, Inferior



External examination:

Pickle #1

Dorsal View

Ventral View

--	--

Pickle #2

Dorsal View

Ventral View

--	--

Pickle #3

Dorsal View

Ventral View

--	--

Pickle #4

Dorsal View

Ventral View

--	--

Internal examination:

Pickle #1

Pickle #2

Pickle #3

Pickle #4

Answer key:

Pickle #1

Small piece of metal found within the left superior (upper half) and anterior section (front side) of the body. Large cut found in the right inferior (lower half) and posterior (back side) of the body.

Pickle #2

One large cut found in the right inferior (lower right) and anterior (front side).
One large cut found in the right superior (upper right) and posterior (back side).
One large cut found in the left superior (upper left) and posterior (back side).
One large cut found in the left superior (upper left) and anterior (front side).

Pickle #3

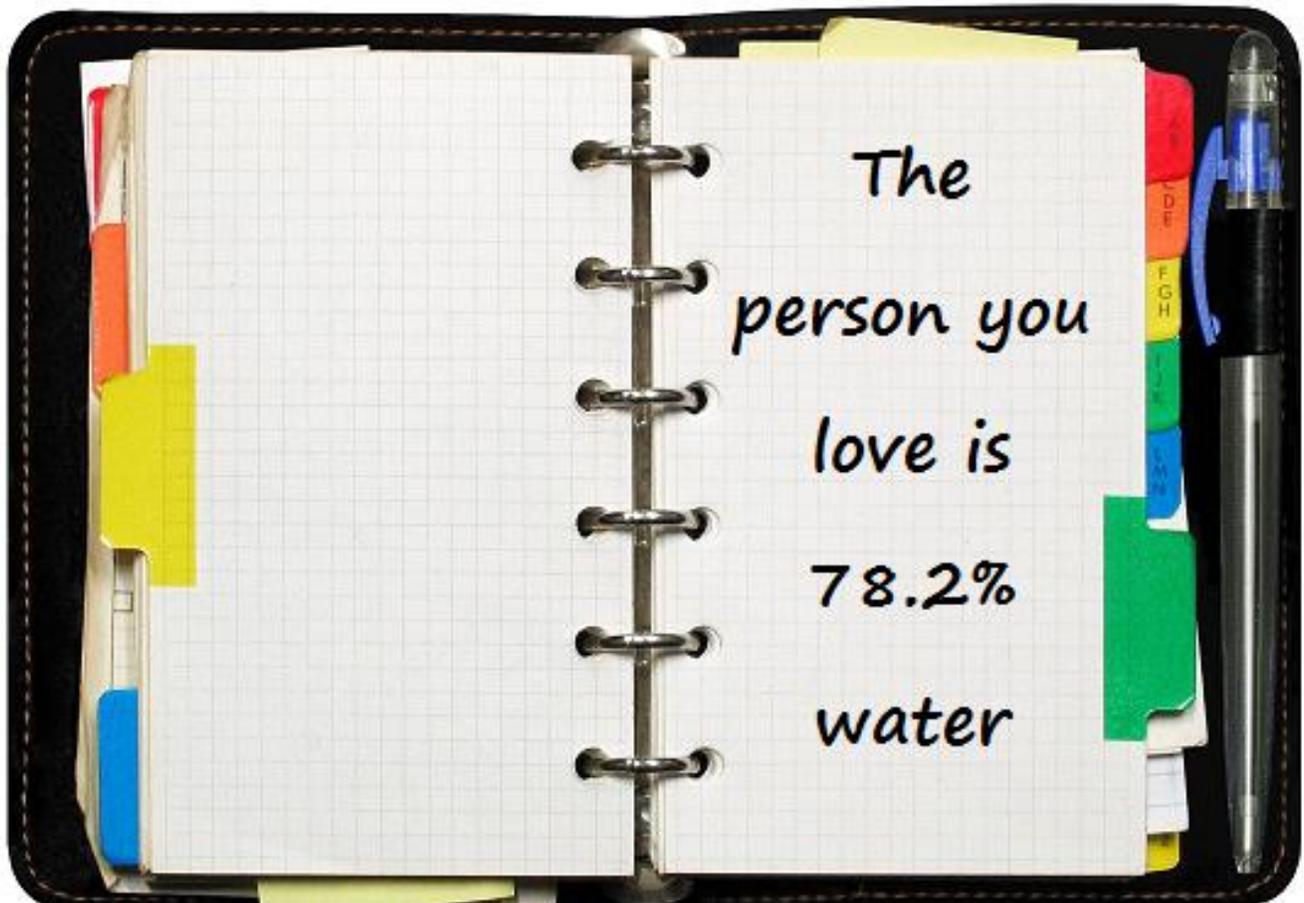
The right leg and left arm are broken. One large cut found in the left inferior (lower left) and posterior (back side) of the pickle.

Pickle #4

Small piece of metal found within the right superior (upper half) and posterior section (back side) of the body. Another small piece of metal was found within the right inferior (lower half) and anterior (front side) of the pickle.

Chapter Two

Cells and Tissues



Day One:

Today, your child should complete their reading and practice problems for the week.

Below are the supplies for this week's lab:

3-4 eggs (a couple for practice)

White vinegar

Drinking glass

Plastic wrap

2-3 eggs

Sewing needle or similar item

Soap and water

Baby powder

Baby aspirator, syringe, or bicycle pump (optional)

National Science Education Standards covered this week:

12CLS1.1 Cells have particular structures that underlie their functions. Every cell is surrounded by a membrane that separates it from the outside world. Inside the cell is a concentrated mixture of thousands of different molecules which form a variety of specialized structures that carry out such cell functions as energy production, transport of molecules, waste disposal, synthesis of new molecules, and the storage of genetic material.

Definitions

active transport	a pump which drives particles in and out of the cell against the normal flow of diffusion
body cavity	any space in the body between the skin and the outermost tissues of the internal organs
cardiac muscle	an involuntary tissue making up most of the heart's mass which is primarily responsible for pumping blood
cartilage	type of connective tissue responsible for protection of bones and flexibility of joints; not as rigid as bone tissue but less flexible than muscle tissue
cell membrane	protective covering which surrounds a cell
collagen	group of proteins making up ~30% of all connective tissues; easily and widely converted into gelatin for industrial uses
columnar	skin cells which are much taller than they are wide
connective tissue	most widespread tissue; acts as "cellular glue" forming the framework and support structures for all body tissues and organs
connective tissue proper	type of connective tissue which includes tendons, ligaments and fat tissue; strong and flexible tissue which allows the body to hold onto fluids, absorb waste material, and stores fat
contracts	to shorten
cuboidal	cube-shaped skin cell
cytoplasm	fluid within a cell which acts as a storage area for gases, food, wastes, etc.
diffusion	the movement of any substance from an area of high concentration to an area of low concentration
epithelial	tissue which covers the outside of the body, outer surfaces of organs, body cavities, and various glands
esophagus	the muscular tube which carries your food to the stomach

facilitated diffusion	"gates" or "revolving doors" within cell membranes which allow certain types of particles to pass through
gelatin	compound formed from processed collagen; used for a variety of industrial products
glands	organs responsible for creating and releasing specific chemicals throughout the body
involuntary	actions which are not controlled by the brain
keratin	protein produced and used by the epidermis of the skin which provides a protective barrier against infection
lipid	fat
lumen	the inside spaces of a tubular structures such as the esophagus
matrix	a combination of fluid and fibers of various strengths which makes up connective tissue
muscle fibers	very long and threadlike cells which make up skeletal muscle
muscle tissues	a collection of elongated cells which contract (shorten) to enable locomotion of the organism or movement of the internal organs
myelin	a lipid which covers parts of the neurons and is vital for the promotion of nerve impulses
nerve impulse	a wave-like signal that moves through the body by an electric current
nervous tissue	responsible for creating and sending nerve impulses throughout the body
neuroglia	supporting cells: help to support the neurons throughout the body
neurons (nerve cells)	responsible for sending the nerve impulses throughout the body
organelles	specialized structures within a cell
osmosis	a special type of diffusion in which only water is being transported through the membrane
phosphate	a chemical made of one atom of phosphorus and four oxygen atoms

phospholipids	large molecule made up of a phosphate and two long "tails" of lipids; found in doubled layers as the main component of cell membranes
plasma	fluid portion of blood
proteins	large organic molecules each possessing a unique function)
semipermeable	property of the cell membrane which regulates the substances allowed in and out of the cell
simple epithelial tissue	epithelial tissue made of a single layer
skeletal muscle	voluntary tissue which is responsible for movement
smooth muscle	responsible for slow, involuntary movements of the internal organs
squamous	a thin, flat skin cell
stratified epithelial tissue	epithelial tissue made of several layers
striated tissue	tissues which contain visual stripes on its surface when viewed under a microscope

Sample questions to ask your child after completing the weekly reading.

What are the four different types of tissues within the human body?

Epithelial, Connective, Muscle, and Nervous

How is osmosis a special form of diffusion?

Diffusion is the movement of any substance from a high concentration to a low concentration. Osmosis is the movement of water through a semipermeable membrane from areas with low concentrations of dissolved substances into areas which contain high concentrations of dissolved substances.

What is the most abundant protein in the human body?

Collagen

How is blood considered a tissue?

Blood is a form of connective tissue as it is a combination of various types of cells, cell parts, and a fluid called plasma. By its definition, connective tissue is also a combination of fluid and fibers of various strengths, and a few cells.

Which two muscle types are involuntary and what does this term mean?

Cardiac and smooth muscles are involuntary. This means they will perform their functions without any conscious control by the individual.

Day Two:

Your child should check their work on the practice worksheets today with the answer key on the next page.

In addition, your child should read the lab activity and start collecting all of the necessary materials!

Answer Key for Practice Problems

Vocabulary Review

- | | | |
|--------------------------|----------------------------------|------------------------------|
| 1) skeletal muscle | 16) simple epithelial tissue | 30) neurons (nerve cells) |
| 2) facilitated transport | 17) stratified epithelial tissue | 31) smooth muscle |
| 3) phosphate | 18) lipid | 32) columnar |
| 4) myelin | 19) plasma | 33) organelles |
| 5) muscle tissues | 20) cytoplasm | 34) neuroglia |
| 6) matrix | 21) collagen | 35) lumen |
| 7) active transport | 22) phospholipids | 36) diffusion |
| 8) osmosis | 23) proteins | 37) esophagus |
| 9) squamous | 24) connective tissue | 38) epithelial |
| 10) nerve impulse | 25) glands | 39) striated tissue |
| 11) involuntary | 26) semipermeable | 40) contracts |
| 12) cardiac muscle | 27) cell membrane | 41) cartilage |
| 13) body cavity | 28) keratin | 42) connective tissue proper |
| 14) gelatin | 29) nervous tissue | 43) muscle fibers |

Multiple Choice and True/False

- | | |
|------|------|
| 1) B | 5) F |
| 2) E | 6) F |
| 3) C | 7) F |
| 4) A | 8) T |

Application Questions

Epithelium that functions to resist abrasion is stratified squamous epithelium. The moist stratified squamous epithelium lining the mouth and the keratinized stratified squamous epithelium of the skin are examples. The cells at the surface are flattened, and when scraped away due to abrasion they are replaced by the cells beneath them. In contrast epithelial cells that carry out absorption are either simple cuboidal or simple columnar. Because they are one layer thick, they are more susceptible to damage and are not resistant to abrasion. In addition, these cells are large in volume, which allows them to contain the organelles involved in transport, such as mitochondria to produce ATP in the case of active transport. The surfaces of the cells that absorb are likely to contain microvilli, which increases the surface area for absorption. The flat cells that resist abrasion have no microvilli.

Day Three: Lab Activity

Your child should have already read through this lab and has been reviewing all of this week's vocabulary words.

Collect your supplies for the lab:

3-4 eggs (a couple for practice)

White vinegar

Drinking glass

Plastic wrap

2-3 eggs

Sewing needle or similar item

Soap and water

Baby powder

Baby aspirator, syringe, or bicycle pump (optional)

Uncovering the Hidden Layers of an Egg

How do you like your eggs? Scrambled, fried, or folded?

The pliable and toughness of the protein keratin will be demonstrated.

Materials:

3-4 eggs (a couple for practice)

White vinegar

Drinking glass

Plastic wrap

2-3 eggs

Sewing needle or similar item

Soap and water

Baby powder

Baby aspirator, syringe, or bicycle pump (optional)

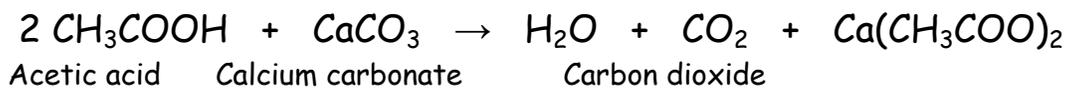
Procedure:

- 1) Place a small amount of soap onto the surface of the eggs and wash them thoroughly.
- 2) Carefully use the sewing needle to poke a small in both ends of a raw egg. This can be accomplished with constant pressure along with a twisting motion of the needle to avoid breaking the egg.
- 3) With both holes in a vertical position, insert the needle or other device into the hole to scramble the yolk. Needless to say, it would be best to do this over the sink. Be careful not to damage the egg shell during this process.
- 4) The contents of the egg must be removed at this time. This can be accomplished by blowing into one of the holes, thereby pushing the contents of the egg out of the second hole. Understandably, the placing of one's mouth onto the surface of an (already cleaned) egg can be a little discomfoting. If this is true, you may use a syringe, baby aspirator, or bicycle pump to force the contents of the egg out of one of the holes.
- 5) Fill a drinking glass with vinegar and submerge the egg shell until it is filled with vinegar. Cover the drinking glass with plastic wrap and allow it to sit undisturbed for 7-10 days. I know it takes a long time, but it is worth it!
- 6) After 7-10 days have passed, the white eggshell will be dissolved leaving behind the translucent double-membrane inside the egg. It will not be out of place to see large parts of the eggshell floating in the container at this time.

- 7) Once the egg shell has been completely dissolved gently squeeze out the vinegar left inside it. Dry it carefully and coat it with baby powder. Insert some of the powder into the egg as well. This will dry out the interior of the egg and prevent it from sticking to itself.
- 8) At this time you can carefully fold the eggshell into a small ball. To "reinflate" the shell, gently toss the egg into the air back and forth between your hands. The egg will inflate back into its original shape.

Explanation:

Much like an animal cell, the solid outer egg shell is covered with thousands of tiny pores which allow air and moisture to pass through. This hardened semipermeable membrane is made almost completely of calcium carbonate and is easily dissolved by the acetic acid within the vinegar. As the calcium carbonate reacts with the acetic acid, bubbles of carbon dioxide gas are created from the chemical displacement of the calcium from the carbonate molecule:



Under this hardened shell are two membranes made of the protein keratin. This double membrane of keratin is pliable enough to allow itself to be deflated and reinflated much like a balloon. The elastic nature and relative toughness of this protein makes it suited as the protective covering for our skin, hair, and nails.

Unit Quiz (Weeks 1-2)

Choose the correct answer in the following questions:

- 1) Your body's "thermostat" is located in a part of the brain called the hypothalamus. Which of the following elements does this area in the brain represent:
 - a) stimulus
 - b) receiver
 - c) effector
 - d) control center

- 2) The system that chemically controls and coordinates the body is the:
 - a) digestive system
 - b) nervous system
 - c) endocrine system
 - d) skeletal system
 - e) integumentary system

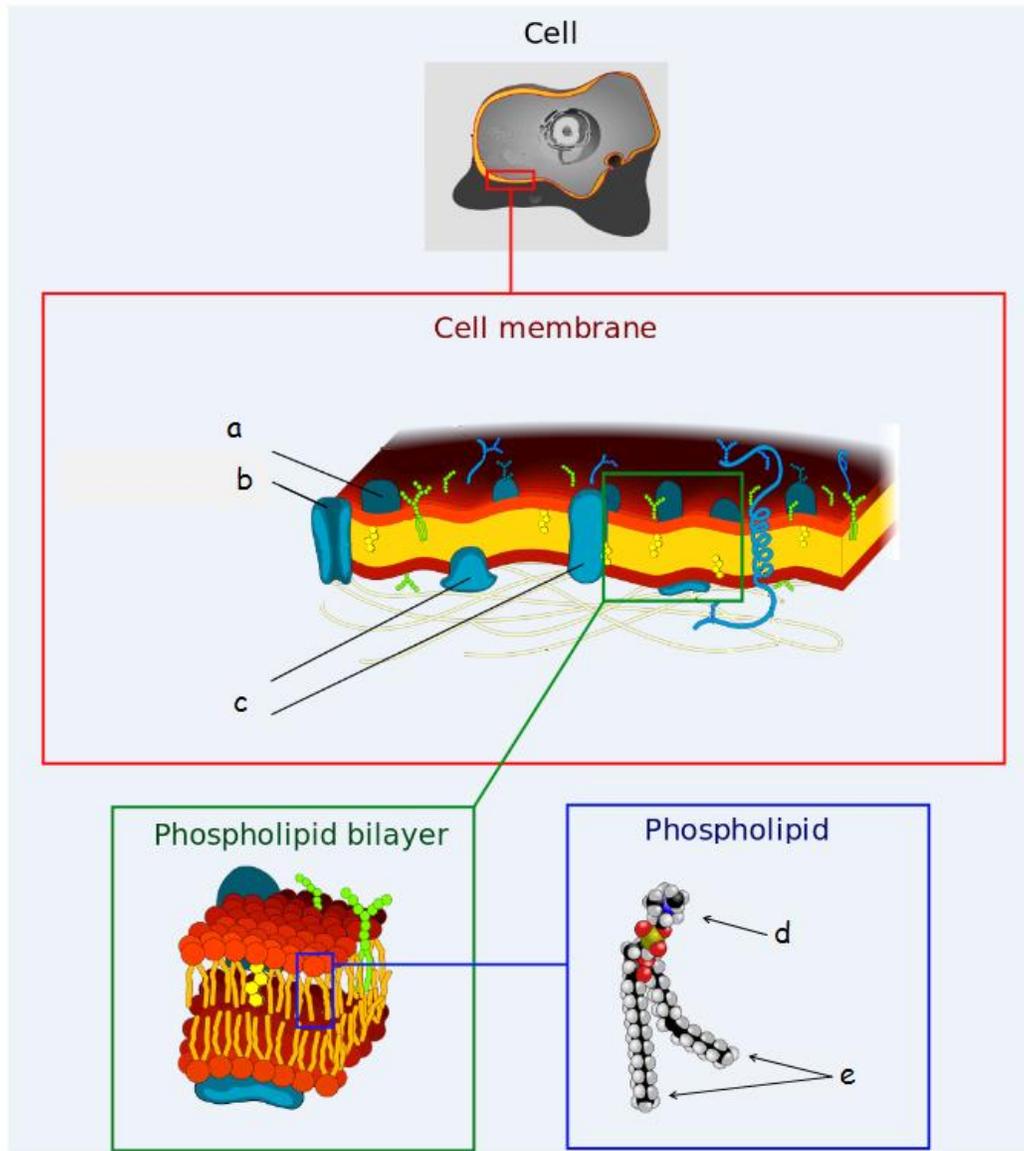
- 3) Positive feedback systems...
 - a) act to increase the level of change (stimulus) that is being received
 - b) act to reduce the level of change (stimulus) that is being received
 - c) act to turn off the level of change (stimulus) that is being received

- 4) Which type of epithelial tissue is found within the lining of kidney tubules:
 - a) simple columnar
 - b) simple cuboidal
 - c) simple squamous
 - d) pseudostratified columnar
 - e) stratified squamous

- 5) The type of muscle found in the lumen of hollow structures within the body is:**
- a) both smooth muscle and skeletal muscle
 - b) smooth muscle
 - c) skeletal muscle
 - d) cardiac muscle
 - e) both cardiac muscle and skeletal muscle
- 6) Which of the following do not involve the movement of substances from an area of high concentration areas of low concentration?**
- a) diffusion
 - b) facilitated diffusion
 - c) active transport
 - d) osmosis
 - e) filtration
- 7) Provide the correct directional term for the following statement. Defend why you believe this is correct.**

When a boy is standing on his head, his nose is _____ to his mouth.

8) Correctly identify the following structures within the following image. Use the words from the word bank below:



WORD BANK: protein channel, protein, lipids, phosphate, proteins

- a)
- b)
- c)

- d)
- e)

Unit Quiz Answer Key

1) d

2) c

3) a

4) b

5) b

6) e

7) When a boy is standing on his head, his nose is superior to his mouth. Remember that directional terms refer to a person are universal and are not connected with his/her current position.

8) Word match from picture:

a) protein

b) protein channel

c) proteins

d) phosphate

e) lipids