

## **HOMEOSTASIS UNIT PLAN**

### **Key Idea: 5**

#### **Organisms maintain a dynamic equilibrium that sustains life.**

Life is dependent upon availability of an energy source and raw materials that are used in the basic enzyme-controlled biochemical processes of living organisms. Because organisms are continually exposed to changes in their external and internal environments, they must continually monitor and respond to these changes. The result of these responses is called homeostasis, a “dynamic equilibrium” or “steady state” which keeps the internal environment within certain limits. Control mechanisms detect deviations in systems and take corrective action to maintain favorable internal environments. Failure of these control mechanisms can result in disease or even death.

### **Essential Question**

**How do we survive?**

### **Desired Results**

#### **Enduring Understandings**

- Being able to respond to or accommodate to changes in the environment is critical so that living things can maintain an internal balance.
- Living things maintain balance on a chemical, cellular, and systemic level using a variety of response and regulatory mechanisms.
- A disturbance in the internal balance is what leads to illness.

### **Guiding Questions**

- Why is important for living things to have boundaries?
- How do things get into and out of cells?
- How do cells and body systems keep conditions just right for living?
- How does our body send signals?
- How do different parts of our body communicate with each other?
- What makes us sick and how do we get better?
- Can epidemics be prevented?

### **Knowledge and Skills**

- The difference between internal and external environments
- The necessity for living things to be able to respond to changes in environment.
- Dynamic equilibrium
- The structure and function of cell membranes in regulating movement of materials into and out of a cell.

- Diffusion/ osmosis/ active and passive transport
  - Structure, function and regulation of enzyme activity
  - Hormones
  - Negative feedback
  - Immune response
  - Bacteria and antibiotics, viruses and vaccines
  - Experimental design
  - Collection and analysis of data.

<b>Assessment Evidence</b>
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- Completed hospital triage charts
- Visual representation of body's response to hypothermia
- Egg lab design
- Egg lab report
- Lab notes and report on catalase activity
- Writing sample on the change in levels of insulin, glucagons and glucose
- Written response on red disease, and immune system
- Essay on epidemics

## UNIT SKETCH

**Key Idea: 5** Organisms maintain a dynamic equilibrium that sustains life.

Essential Question: How do we survive?

	<b>Lesson 1</b>	<b>Lesson 2</b>	<b>Lesson 3</b>	<b>Lesson 4</b>	<b>Lesson 5</b>
<b>Essential and Guiding Questions</b>	How do we survive?	Why is it important for living things to have boundaries?	Why is it important for living things to have boundaries?	Why is it important for living things to have boundaries?	How do things get into and out of cells?
<b>Learning Opportunities</b>	<ol style="list-style-type: none"> <li>1. Answer essential question using journal.</li> <li>2. Students read “a sweltering experience”</li> <li>3. Students respond in journal.</li> <li>4. Introduce concept of homeostasis</li> </ol>	<ol style="list-style-type: none"> <li>1. Lesson on vital signs.</li> <li>2. Hospital Triage Activity               <ol style="list-style-type: none"> <li>a. students assess each patient’s vital signs.</li> <li>b. based on given information, list disrupted systems for each patient.</li> <li>c. using triage guidelines, list treatments needed for each patient.</li> </ol> </li> </ol>	Hospital Triage (continued): <ol style="list-style-type: none"> <li>d. Get “new information” from teacher.</li> <li>e. As a group, use consensus to propose a treatment order for the patients from most critical to most stable. Also list the factors that have contributed to your decision for EACH patient in “treatment priority” column.</li> </ol>	Study of hypothermia- how does your body respond when balance is disturbed? <ol style="list-style-type: none"> <li>1. Read scenario about the Titanic.</li> <li>2. Students write response: “what caused the passengers to die?”</li> <li>3. go over and distinguish between body’s external and internal response (shivering vs. blood vessel constriction).</li> <li>4. Students create visual representation of body’s response to hypothermia</li> </ol>	Lab Activity: “Eggs-periment”  Vocabulary: diffusion, osmosis, concentration. <ol style="list-style-type: none"> <li>1. Students observe an egg and discuss the boundaries that protect the egg.</li> <li>2. Students hypothesize about the movement of liquids such as water, corn syrup, and vinegar into and out of the egg if the shell were removed.</li> <li>3. Students develop a written procedure with a means of measurement for testing hypothesis.</li> </ol>
<b>Assessments and Reflection</b>	Journal entries to EQ and reading	Completed Triage charts. Class discussion to summarize findings.	Analysis questions (to be completed individually)	Visual representation (diagram or picture of what you learned )	Lab design (written in groups of 3)
<b>Standard 1</b>		1.2a	1.2a		2.3a, 2.3b, 2.3c, 3.1a
<b>4</b>	5.2a, 5.3a	1.2b, 1.2c, 1.2d, 5.2a, 5.3a, 5.3b	1.2b, 1.2c, 1.2d, 5.2a, 5.3a, 5.3b	5.3a, 5.3b	1.2g

Essential Question: How do we survive?

	<b>Lesson 6</b>	<b>Lesson 7</b>	<b>Lesson 8</b>	<b>Lesson 9-10</b>	<b>Lesson 11-12</b>
<b>Essential and Guiding Questions</b>	How do things get into and out of cells?	How do living things get into and out of cells?	How do cells and body systems keep conditions “just right” for living?	How do cells and body systems keep conditions “just right” for living?	How does our body send signals? How do different parts of our body communicate with each other?
<b>Learning Opportunities</b>	Eggs-periment (continued) 1. Students carry out experiments in same groups. 2. Students record data of mass change. 3. Go over checklist for lab report	Elodea Leaf Observation 1. Define diffusion and osmosis. 2. Review how osmosis and diffusion were observed in the egg. 3. Students hypothesize about the movement of material into or out of Elodea leaf in different environments. 4. Review guidelines for drawing specimens 5. Students observe leaf in fresh water and salt water.	Modeling Enzyme Action  “Lock and Key” model of enzyme structure and function.	Ideal Conditions for the function of Catalase enzyme.- Lab activity  Pre lab q: How does the body get rid of wastes?  Lab report checklist includes: focus question, analysis questions, conclusion	Case Study of Insulin Shock
<b>Assessments and Reflection</b>	Lab report	Lab report answering questions on checklist. Extension questions.	In class reflection	Lab Notes and Report	Written Response: Conceptual application of Negative Feedback Loop to another body system
<b>Standards</b>	1.3a, 2.1, 2.3a, 2.3b, 2.3c, 3.1a, 3.4a	1.3a, 2.1, 2.3a, 2.3b, 2.3c		1.1a, 1.3a, 2.1, 3.1a	
	1.2g	1.2g	5.1f, 5.1g	5.1f, 5.1g	5.3b

Essential Question: How do we survive?

	<b>Lesson 13</b>	<b>Lesson 14</b>	<b>Lesson 15</b>	<b>Lesson 16</b>	<b>Lesson 17</b>
<b>Essential and Guiding Questions</b>	What makes us sick?	What makes us sick and how do we get better?	How do we get better?	What makes us sick and how do we get better?	Can epidemics be prevented?
<b>Learning Opportunities</b>	Disease Simulation- using phenol red  Question: how are diseases transmitted? What can we do to stop the spread of disease?	Comparison of Viruses and Bacteria	“Self Defense!” Reading Jigsaw on immunity	Risk Assessment Jigsaw	Case Study of the AIDS epidemic in United States.  What steps can society take in order to prevent epidemics?
<b>Assessments and Reflection</b>	Students chart origin of the disease and write a reflection.	chart comparing viruses and Bacteria		Reflective Essay on the Jigsaw. Written Summary of ideas presented in small group.	Essay: Why did HIV become such a horrifying epidemic? (Students use a variety of sources to complete this piece.)
<b>Standard 1</b>					
<b>4</b>	5.2c	5.2b, 5.2e, 5.2f	5.2c, 5.2d	5.2g, 5.2h, 5.2i, 5.2j	5.2f

**Unit Topic/Essential Question: How do we survive?****Aim/Guiding Question**

Students are introduced to the essential question: How do we survive?

**Objectives**

*Students will be able to:*

- Explain that homeostasis is the condition of a stable internal environment in an organism.
- Explain that living things must be able to continually monitor and respond to changes in their internal and external environments in order to survive and maintain homeostasis.
- Explain that the body can work to maintain balance only within certain limits or conditions.

**New Terms:**

homeostasis

equilibrium/ balance/ steady state

internal environment

external environment

**Materials/Preparations:**

Class set of the story: “A Sweltering Experience” from BSCS Biology- A Human Approach (p. 113- First Edition)

Note: this story is about a father and daughter who go on hike into a desert canyon. Lack of water leads them to become dehydrated. The story ends when the father and daughter are taken to an emergency room. The story paints a dramatic picture of dehydration and imbalance in the body.

<b>Time (min)</b>	<b>Development</b>	<b>Instructional Strategies</b>
5	<i>Write on board:</i> Make a list of the different ways that humans put stress on their bodies.	(Do-now)
5	Teacher reads “A Sweltering Experience” to the whole class.	Read aloud (Motivation)
10	Students re-read story and answer questions. Then they share responses with partner. <i>Write the following questions on board:</i> 1. List details about the physical conditions of the hikers over the course of the day and at the time of rescue. 2. Explain in your own words, what factors led to the condition of each of the hikers.	Think-pair-share
15	As a whole class, share responses. • Teacher elicits the difference between <b>internal and external</b>	Discussion, Assessing prior

	<p><b>environments</b> of the hikers.</p> <ul style="list-style-type: none"> <li>• <i>Write these words on board.</i></li> <li>• <i>Write definitions for these terms on board based on student response.</i></li> <li>• Students copy into their notebooks</li> <li>• <i>Ask students- are the hikers in good shape or are they out of <b>balance</b>? Ask for justification. Go over balance.</i></li> <li>• <i>Define <b>homeostasis</b>: the state of balance in an organism. Write on board.</i></li> <li>• As a class, come up with synonyms for homeostasis such as balance, steady state, equilibrium.</li> <li>• <i>Write these synonyms on the board for students to copy.</i></li> <li>• Explain to class - homeostasis will be the focus of study for this unit.</li> </ul>	knowledge, Note-taking
5	<p>Individually, students respond the essential question “How do we survive?” <i>Teacher collects responses from students.</i></p>	Assessing prior knowledge, reflection

### **Suggested Homework:**

Read the essay, “Beyond the Limits” in BSCS Biology- A Human Approach (pE73, 1<sup>st</sup> Ed)

Answer the following questions:

1. What is a stressor? Define in your own words.
2. Make a list of different type of disruptions that affect the human body.
3. Why do some disruptions have a temporary effect while others are more serious with long term effects? Give 2 examples of each kind.
4. In your opinion, have the hikers gone “beyond the limits”? Explain.

### **References**

*BSCS Biology – A Human Approach (1st Edition): p. 112-113, E73*

### **Standards Addressed**

MST Standard 4- 5.2a, 5.3a

**Unit Topic/Essential Question: How do we survive?**

**Aim/Guiding Question:** Why is important for living things to have boundaries?

**Objectives**

*Students will be able to:*

- Define vital signs.
- Explain how vital signs are used to assess the general well being of a patient.
- Understand the connection between homeostasis and the vital signs of a patient.
- Explain that disruption in homeostasis leads to disruption in vital signs.
- Understand that homeostasis in the human body may be disrupted by internal and external factors.
- Understand that homeostasis can often be restored, but extreme disruption can result in death or serious illness.
- Understand that when homeostasis is disrupted, it affects many systems of the body, because body systems are connected.
- Analyze and evaluate given information.

**New Terms:**

vital signs

heart rate

prognosis

blood pressure

temperature

pulse

breathing eate

shock

hyperthermia

hypothermia

cardiopulmonary resuscitation (CPR)

body systems:

respiratory, circulatory

excretory, nervous

muscular, skeleton

digestive

**Materials/Preparations:**

Note: this lesson is adapted from BSCS Biology- A Human Approach. It is a dynamic lesson that allows students to play the role of doctors in an emergency room. They learn to take given information about vital signs in order to assess the general health of patients.

1. Students will work in groups of 4. You need one information packet per group. Each packet will contain one of the each of the following:  
“Patients’ Vital Signs- Preliminary Information”, “Glossary of Vital Signs”, “Range of Vital Signs”, “General Triage Guidelines”, Data Tables.
2. Guidelines and Instructions for Hospital Triage- day 1, written on newsprint (see attached).
3. “Tasks for Triage- Day 2” written on board before class begins on day 2. (see attached)
4. “Patients’ Vital Signs- New Information”- one copy for each group.
5. Optional: Segment of any hospital show such as ER or Chicago Hope. *or*  
A collection of different physiology textbooks, resources, and/or pictures describing the various systems of the human body as a reference for students to look at.



Lesson 2

Time (min)	Development	Instructional Strategies
3-5	<p>Do Now : <i>Write on board</i>            Write down all the things that doctors do in order to figure out that you are sick.            Students answer in their notebooks.            Optional: show a segment of ER and ask students to list what doctors are doing to the patient and why they might be doing it.</p>	Assessing prior knowledge (Motivation)
10	<p>Go over responses to the question.  <i>Define and write on board:</i>  <b>vital signs:</b> measurements of different body conditions that indicate the internal state of an individual. These include pulse, blood pressure, body temperature, rate of breathing.            Note: this information should be elicited from student responses.            Go over body systems as review for students.  <i>Write student responses on board</i> (not necessary for students to copy)            Put students into groups of four.</p>	Discussion and mini lesson
5	<p>Give instructions for Hospital Triage Activity  <i>Read to whole class:</i> the introductory paragraph to set the stage for the activity (see attached).  <i>Go over guidelines for activity.</i>  <i>(written on newsprint and posted in room- see attached)</i></p>	Cooperative group work
15	<p>Students work on Triage Activity  <i>Teacher monitors student work and gives assistance where necessary.</i></p>	Group work
2	<p>Students debrief their work as a group-</p> <ul style="list-style-type: none"> <li>•Discuss two things they did successfully as a group, one improvement they can make as a group.</li> <li>•Write these things down on back of the data table.</li> </ul> <p>Teacher collects data tables.</p>	De-brief
3	<p>Students individually respond to the following questions:            Which patient do you feel is most serious at this point and why?            If you could have more information about any of the patients and their conditions, what would you want to know?  <i>Teacher collects these responses.</i></p>	Individual assessment

**Suggested Homework (Lesson 2):**

Read “Coping With Disruptions: The Role of Medicine in Homeostasis” (pp. E75- 77, BSCS)  
 Make a list of five different types of technology which help to maintain homeostasis. Explain in your own words how EACH of these technologies is helpful, or how it is used.

Lesson 3

Time (min)	Development	Instructional Strategies
5	Do Now: <i>Teacher returns information packets and individual reflections.</i> Students get into the groups they worked with on the day before. Students share the questions they wrote at the end of class yesterday with their group.	review (motivation)
5	<i>Give feedback</i> to class on work from the day before. Explain the tasks for Day 2 (written on board- see attached)	direct instruction
20	Students work on Triage activity <i>Teacher monitors student work and provides assistance when needed.</i> <i>Hand out “New Information” only after students have completed the “treatment needed” and “priority” section on Data Table 1.</i>	group jigsaw
10	Class Discussion Each group (if possible) shares with whole class the order that they came up with and also explains their rationale. <ul style="list-style-type: none"> <li><i>Teacher should point out that no order is necessarily “right”. The point is that we are able to make informed decisions with the information given to us.</i></li> </ul> <i>Teacher collects Data Table 1 and 2</i>	informal assessment group work  wrap up.

**Suggested Homework (Lesson 3):**

Students answer analysis questions (see attached hand-out) based on the Hospital Triage Activity:

**References**

*BSCS Biology – A Human Approach (1<sup>st</sup> Edition): pp. 112-119; E75-77, copymaster 6.1*

**Standards Addressed**

MST Standard 4- 1.2b, 1.2c, 1.2d, 5.2a, 5.3a, 5.3b

## **Guidelines for Hospital Triage Activity**

### *Day 1*

1. Each person should take one of the written pieces from the packet.
2. You must work with your group and share the information that you have in order to determine a treatment order for the patients that have just entered the emergency room.
3. Person with the “Glossary of Vital Signs” is also the note-taker.

Your job today:

1. assess the vital signs of each patient using “normal, serious, critical” classification,
2. list the disrupted systems for each patient.

*Fill in this information in the first three columns of Data table #1 in your information packet.*

## **Tasks for Hospital Triage**

### *Day 2*

1. Complete Data Table 1 with your group. For the “Priority” column, use +, ++, or +++  
Use your information packet and the reference texts in the classroom to help you.
2. Get the “New Information” from your teacher. Look over with your group and add any additional information to data table 1.
3. Discuss an order for your patients and as you come up with reasons for the order, write them down in the priority part of your table.
4. Write the order for triage (from most serious to least serious) on Data Table 2 and complete all the other sections of the table. Consider Data Table 2 to be like the final draft of Data Table 1.
  1. It should be very neat and easy to follow.

## **Analysis Questions**

### **Hospital Triage**

1. Why are vital signs so valuable in assessing a patient's condition?
2. Explain how a head injury like Albert's could have affected so many systems in his body?
3. Nelson died because his body could not restore its homeostatic balance. Which other patients have a balance that is highly disrupted? Justify your answer.
4. What factors did you consider in ranking your patients?
5. Compare and contrast an illness or injury that the body can recover from on its own with an illness or injury that requires medical intervention. (for example, falling and scraping your knee compared to being in a car accident and having a lot of blood loss) Explain how your body responds to each situation. Explain why you absolutely need a doctor in the second situation.
6. What role did you play in your group? Do you feel you were successful at completing the task? Why or why not?



# Hospital Triage

Data Table #2

<b>Patient Name</b> (list in order of priority)	<b>Disrupted Systems</b>	<b>Summary of Important Information</b> (include reasons for ranking)	<b>Prognosis</b>

**Unit Topic/Essential Question: How do we survive?****Aim/Guiding Question:**

Why is important for living things to have boundaries?  
How does the body respond when balance is disturbed?

**Objectives**

*Students will be able to:*

- The body must be able to detect and respond to changes in the environment in order to maintain homeostasis.
- Thermoregulation is an example of how the body maintains homeostasis.
- Negative and positive feedback control or maintain homeostasis.
- Thermoregulation is an example of negative feedback.

**New Terms:**

hypothermia

negative feedback

external

thermoregulation

constriction

internal

hypothalamus

**Materials/Preparations:**

1. Class set of: “Commentary- Falling Overboard and the Odds for Survival” adapted from Starr and Taggart’s Biology
2. Class set of “Maintaining Homeostasis- Thermoregulation” (pp.204-208, Amsco- The Living Environment). This reading goes over the idea of mechanism of thermoregulation and then defines and goes over the mechanism of negative feedback.
3. Drawing paper and markers or colored pencils.
4. Optional: portion of the movie Titanic- when the ship is sinking and people are dying in the ocean.

<b>Time (min)</b>	<b>Development</b>	<b>Instructional Strategies</b>
10	Do Now: (Optional: <i>Teacher shows segment of Titanic where the passengers are drowning in the ocean.</i> ) <i>Teacher reads to the whole class: “Commentary- Falling Overboard and the Odds for Survival”. Read only up to the phrase “None had drowned.”</i>	(motivation)
5	Students respond individually to the question: What caused the passengers to die? How is the fate of the passengers similar to and different from Monique and Nelson’s condition?	reflection compare and contrast
15	<i>Teacher explains:</i> <ul style="list-style-type: none"> <li>• the passengers in the Titanic were in conditions that were so cold that their bodies could not have responded fast enough to save them. But on a daily basis, we must be able to deal with temperature changes in the</li> </ul>	Lecture reading assessment

	<p>environment. Our bodies do not change temperature whenever there is a change on the outside. This is an example of maintaining homeostasis.</p> <ul style="list-style-type: none"> <li>• <i>Draw</i> a picture of a person and <i>distinguish</i> difference between <b>external and internal</b>. Establish the difference in conditions. Explain that when something happens on the outside, it has an effect on the inside and the body has to do something to maintain balance.</li> <li>• <i>Ask:</i> What do you do when your body is cold? What does your body do (without your help) when you are cold? <i>elicit</i> shivering response, extremities becoming cold, shock</li> </ul> <p><i>Hand out</i> “Maintaining Homeostasis- Thermoregulation” <i>Teacher reads</i> first paragraph to the whole class. <i>Define</i> <b>hypothalamus and thermoregulation</b>. Students continue to read on their own and create a visual representation of how the body responds to change in temperature. <i>Teacher collects these drawings.</i></p>	
10	<p><i>Review</i> the internal responses of the body to changes in temperature with class based on reading. Make and use student drawings as an aid. <i>Define</i> <b>negative feedback</b> using thermoregulation as an example. <i>Explain</i> demonstration- The water in this beaker has been heated to a certain temperature. I have a thermos with hot water and a beaker of ice. As a class we have to see if we can maintain this temperature for 5 minutes.</p> <ul style="list-style-type: none"> <li>• Have one student come to the front and take initial temperature, two assistants to add either hot water or ice and one student as data keeper who reads the temperature every 30 seconds and records on the board.</li> </ul> <p>As the demonstration is taking place <i>elicit</i> from the class how this process is similar to negative feedback.</p>	Demonstration Reinforcement

### **Suggested Homework**

Read in BSCS Biology- A Human Approach: pp. E50-52 “Compartments”

Answer the following questions:

1. What are some of the ways that internal environments differ from external environments?
2. Give at least three examples of boundaries in living things.
3. Why is it beneficial for living things to have more compartments?
4. Describe how the girl in the picture on E50 is similar to the thermos that she is holding.

### **Resources**

Amsco, The Living Environment, 2000, pp. 204-208.

BSCS, Biology- A Human Approach, 1997, ppE50-E52.

Holt, Rhinehart, Winston, Biology- Principles and Explorations, 2001, p. 988.

Starr and Taggart, Biology, p. 475.

### **Page References**

Amsco, The Living Environment: pp. 204-208

BSCS Biology – A Human Approach: pp. E50-E52



**Standards Addressed**

MST Standard 4- 5.3a, 5.3b

## **Falling Overboard and the Odds of Survival**

(adapted from Starr and Taggart)

In 1912, the ocean liner Titanic set out from Europe on her maiden voyage to America. In the same year, a huge chunk of a glacier from Greenland broke off and began floating out to sea. On April 14, late at night, off the coast of Newfoundland, the iceberg and the Titanic met for a devastating moment. Lifeboats and survival drills had been neglected, and only about a fourth of the 2000 people on board manage to scramble into lifeboats. What happened to the rest of the passengers? Within two hours, rescue ships were on the scene, yet 1,513 bodies were recovered from a calm sea. All were wearing life jackets. None had drowned.

**Unit Topic/Essential Question: How do we survive?**

**Aim/Guiding Question:** How do things get into or out of cells?

**Objectives**

*Students will be able to:*

- Explain the role that cell boundaries play in separating the external environment from the internal cellular environment.
- Give examples of how external environments can cause change to internal environments of living systems.
- Formulate a hypothesis, design and carry out a controlled experiment to test their hypothesis.

**Materials/Preparations:**

For a class of 32- teams of 4:

24 500 ml beakers or jars, 8 balances, plastic wrap, coffee filters, paper towels, 2.5 L corn syrup solution (50%), 2.5 L water, 5 L vinegar, 24 shell-less eggs (3 eggs per 1 L beaker), 1 egg with shell intact.

1. Soak the eggs at least 5 days in advance in vinegar. Put 3 eggs in 1 liter beaker. Fill to the top with vinegar and cover with plastic wrap. On the third day, pour out vinegar and replenish with fresh vinegar. The vinegar will dissolve the egg shells and produce carbon dioxide bubbles so put holes in the plastic wrap. The set up can be left at room temperature.
2. Prepare a Class Data Table like the one attached. You may want to put it on an overhead transparency or on newsprint paper.

Lesson 5

Time (min)	Development	Instructional Strategies
20	<p>Do Now: <i>hold up a raw egg and ask:</i>            Where's the inside of the egg? Where's the outside of this egg?            Show students the set up of eggs in vinegar and explain that the shells have been dissolved and the egg is now only protected from the outside by a thin membrane. (Most students are familiar with this membrane from having cracked eggs at home).</p> <ul style="list-style-type: none"> <li>• <i>Elicit</i> that membrane and shell form a boundary between the contents of the egg and the outside.</li> <li>• <i>Remind</i> students that eggs are a special type of cell and we are studying how things get in and out of cells.</li> <li>• <i>Divide students into groups of four.</i></li> </ul> <p><i>Ask aloud:</i></p> <ol style="list-style-type: none"> <li>1. Do you think that the egg is more protected or less protected than when it had the hard shell?</li> </ol>	(motivation)

	<p>2. What are some of the conditions that the egg is protected from because of the shell? (Students should say things like temperature liquids, chemicals).</p> <ul style="list-style-type: none"> <li>• <i>Draw</i> a picture of the egg in a beaker. <i>Label</i> inside, outside.</li> <li>• <i>Ask</i> students to consider: if the shell- less egg were placed in different solutions such as vinegar, water or corn syrup, how might it interact with it's external environment? Students write responses in "if- then" form- (for example- if the egg was placed in vinegar, then...)</li> </ul> <p>As students write their hypotheses, monitor work and guide them to think about the MOVEMENT OF MATERIAL into or out of the cell. Ask them to think about the reasons behind their proposals.</p>	
20	<p>In groups, have students create a controlled experiment to test their hypothesis using the materials listed on the board. Remind students that:</p> <ul style="list-style-type: none"> <li>• Their design must have a quantifiable way of assessing change. For example, if the hypothesis is "the egg will get bigger in water- ask students how they will measure or know if their hypothesis is correct.</li> <li>• Be sure to clarify the use of balances for accurate measurement of change. If students have another way of measuring, it is fine to encourage them to use alternative methods- such as displacement or string to measure diameter of egg.</li> <li>• They must have control in order for their design to be complete.</li> <li>• Although they will be carrying out experiment in groups, each student is responsible for writing their own design.</li> </ul> <p><i>Teacher monitors student work for detail and clarity.</i>  <i>Students revise their designs based on teacher feedback.</i>  <i>Teacher collects experimental designs.</i></p>	Assessment

**Suggested Homework (Lesson 5)**

Create a data table to use for your experiment.

## Lesson 6

Time (min)	Development	Instructional Strategies
5	Do Now: Students get into groups from yesterday. Share data tables and decide as a group which data table you will use as a group.	Review (motivation)
5	Teacher goes over basic protocol and safety guidelines for the experiment. <ul style="list-style-type: none"> <li>• If possible, students should take measurements of the egg weight at two time intervals (for example at 20 minutes and 40 minutes). It works best if you have a double period class. If not, have students measure the weight of the egg at one time interval. Best results are seen when the egg least 30 minutes in solution.</li> <li>• Be sure to clarify that the control egg sits in vinegar or in air. Clarify the terms control and variable.</li> <li>• Answer any questions.</li> </ul>	
20	Students carry out experiments. Students record their data. As students are waiting to take measurements go over lab report format and checklist (see attached)	
10	Students share data with class on table that on the board. Students copy data table. Students clean up.	

### **Suggested Homework (Lesson 6)**

Write a Lab Report based on the activities of the past two days.

### **Resources**

BSCS, *Biology- A Human Approach*, 1997. Kendall Hunt, pp. 80-82.

### **Page References**

*BSCS Biology – A Human Approach: pp. 80-82.*

### **Standards Addressed**

MST Standard 1- 2.3a, 2.3b, 2.3c, 3.1a

MST Standard 4- 1.2g

## LAB REPORT FORMAT AND CHECKLIST

### “Eggs-periment”

1. Introduction: answer in a paragraph
  - a. Based on class work and readings, explain why it is important for living things to have boundaries.
  - b. Give a general description of what we are doing with the egg in the lab today.
  - c. How might this experiment give you an opportunity to answer the question “ How do things get into and out of cells?”
2. Hypothesis: State your hypothesis
3. Materials and Procedure: List the materials that you used and summarize what you did in a step by step format.
4. Data and Observations:
  - a. Include any drawings or notes that you think might be helpful in explaining your experiment.
  - b. Include your group’s data table.
  - c. Include the class data table. Be sure to calculate averages for each condition.
  - d. Tables should be neatly made and make sure units are included in all measurements.
5. Conclusions: answer in a paragraph
  - a. Was your hypothesis proven correct? Explain.
  - b. Why was it useful to combine class data?
  - c. What does the data tell you about the relationship between the internal contents of a shell-less egg and its external surroundings? \*\*\*
  - d. How would you account for any differences that you noticed in the behavior of the three eggs under the different external conditions?
  - e. What were the controls in your experimental design? How were they useful to you in making conclusions about your data?



## Lesson # 7

### **Unit Topic/Essential Question: How do we survive?**

**Aim/Guiding Question:** How do things get into or out of cells?

### **Objectives**

*Students will be able to:*

- Understand that plant cells have two boundaries which separate them from their external environment.
- Understand that these boundaries control which molecules enter and leave the cell.
- Understand that the process of diffusion is the random movement of molecules from areas of higher concentration to lesser concentration.
- Understand that diffusion is the major means by which materials leave and enter a cell.
- Understand that osmosis is the diffusion of water.
- Explain how the observation of an Elodea leaf is related to the process of diffusion and osmosis.

### **New Terms**

diffusion	active transport
osmosis	passive transport
concentration	
cell membrane	

### **Materials/Preparations:**

6 1 Liter Beakers of fresh water to spread around the class or 1 5 Liter beaker with water.

Potassium Permanganate crystals

Per pair of students:

Microscope, microscope slide, cover slip, paper towels

Guidelines for Observations on newsprint.

Elodea plants- one or two stems will be plenty. They are inexpensive and easily purchased at pet stores which have living aquarium plants (such as Petco).

Tweezers

Dropper Bottles with water

Dropper Bottles with 10% salt solution.

Class set of readings and worksheets (see attached)

Class set of lab report checklist.

\*\*NOTE: this lesson assumes students are comfortable with microscope use.





	<p>fresh and salt water for students to refer to.</p> <ul style="list-style-type: none"> <li>• Have two students who finish early make their drawings on the board or on a transparency.</li> </ul>	
5	<p><i>Bring whole class back together.</i></p> <p>Elicit what they observed was that water left the leaflet because the concentration of water was higher in the cell than outside of the cell. It is also possible that some salt moved into the cell since the concentration of salt is higher in the external environment.</p> <p>Explain that the result of this that the cell looks like it was “shrinking”. It is like taking some of the contents out of a tightly packed box with a plastic liner inside. Now you have less volume in the box or the cell. The cell wall is like the box. It is rigid and does not really change.</p> <p><i>Ask students:</i> What might not be able to pass through the cell membrane? Size and charge of the molecule affect movement of material.</p> <p><i>Ask students:</i> What if something wanted to go from lower to higher concentration? This would be like moving something uphill- active transport.</p>	Reteach Assessment

### **Suggested Homework**

Have students read about the processes of diffusion and osmosis from your textbok.  
and

Write a lab report (see attached guidelines)

### **Page References**

**BSCS Biology – A Human Approach:** pp. 83-84, E53-E56

### **Standards Addressed**

MST Standard 1- 2.3a, 2.3b, 2.3c

MST Standard 4- 1.2g

### **Guidelines for Observation**

- Make your first wet mount using fresh water.
- Be sure to focus under low power first.
- Look clearly and be able to describe the distribution of the chloroplasts and the location of the cell membrane and cell wall. In your drawing label all of these structures.
- Do the same thing with salt water.

### **Guidelines for Lab Report**

1. *Introduction:*

- a. Describe the lab activity in general.
- b. Write a definition of osmosis and diffusion in your own words.

2. *Materials and Procedure:*

Make a list of materials used and describe in detail what you did.

3. *Hypothesis:*

State your hypothesis

4. *Results:*

- a. Include two drawings one in fresh water, one in salt water.
- b. Label the cell wall, cell membrane and chloroplasts.
- c. Include a written description of what you observed as well.

5. *Conclusion:*

- a. Explain what happened to the distribution of the chloroplasts in salt water.
- b. Explain how your observations are related to osmosis and diffusion.
- c. Explain what might happen if we were to put the leaf back in fresh water.
- d. Was your hypothesis correct? Explain.

**Unit Topic/Essential Question: How do we survive?**

**Aim/Guiding Question:** How do cells and body systems keep conditions just right for living?

**Objectives**

*Students will be able to:*

- Describe and model how enzymes work to help chemical reactions take place in living systems.
- Observe and explain that enzymes are specific (they can only work with one molecule called the substrate).
- Conduct an investigation about conditions that affect the function of an enzyme.
- Gather, record, and interpret data.
- Observe and describe how different factors affect the reaction rate of the enzyme, catalase.
- Relate the results of their investigation to the way that enzymes function under a narrow range of internal conditions.

**New Terms**

enzyme  
substrate  
catalyst  
reaction rate

**Materials/Preparations:**

Lesson 8- for a class of 32

28 Shapes with dotted lines (seven of each kind- 4 different kinds)

4 Enzyme pieces: corresponding piece to fit with the shape

1 pair of scissors

Lesson 9-10

At least 1 Liter of Hydrogen peroxide

4 Potatoes cut in quarters.

16 Heavy duty plastic knives (or precut the potato into 1 cm squares)

50- 100 mL Hydrochloric Acid

10% Starch Solution

Hot water bath or potato that has been cooked before class

Thermometer

48 to 64 Test tubes

16 Test tube racks

16 Centimeter rulers

Optional: 16 stop watches

Wax pencil (to mark test tubes) or you can use a piece of masking tape.

Note: this is a lab activity than can be easily implemented in the classroom.

Lesson 8

Time (min)	Development	Instructional Strategies
5	<p>Do Now:</p> <p>Ask:</p> <p style="padding-left: 40px;">Why do substances have to be broken down by the body? What are some examples of substances that have to broken down by the body?</p> <p>Students write a response to these questions.</p> <p><i>Teacher explains</i> that the class will be modeling <b>how</b> reactions take place in the body and in our cells. The type of reactions being modeled is a breakdown reaction. Imagine that the whole classroom is a cell.</p>	<p>Assessing prior knowledge (motivation)</p>
10	<p><i>Teacher gives out</i> one shape to each student.</p> <p><i>Explain</i> that some of these “molecules” are the ones that need to broken down. They have dotted lines through them.</p> <p>The others are needed to help these “molecules” to break down.</p> <ul style="list-style-type: none"> <li>• It might be helpful based on prior discussion to have students label the substances to be broken down (for example- starch, protein, and waste product).</li> <li>• When the shapes find one another they should raise their hands and then their molecule will be broken down).</li> </ul> <p>Students walk around the room and interact to find the piece that fits with each other.</p> <p><i>Teacher approaches them and cuts the molecule with scissors</i> as they raise their hands. The enzyme is then free to go and interact with other substrate molecules.</p>	<p>Modeling</p>
15	<p>Lesson on enzymes, substrates, catalysts and reaction rate.</p> <p><i>Ask students:</i></p> <p style="padding-left: 40px;">What happened? Why might the substances need a helper? What happened to the helper after it helped the reaction to take place? Could any helper molecule help the substances to be broken down? What could have made the reactions go faster?</p> <p><i>Explain</i></p> <ol style="list-style-type: none"> <li>1. The helper molecules are called <b>enzymes</b>.</li> <li>2. Enzymes are needed to speed up reactions without changing the environment of the cell. They are called <b>catalysts</b>.</li> <li>3. Enzymes are proteins with very specific shapes and only fit with one specific molecule- called a <b>substrate</b>. (LOCK AND KEY MODEL)</li> <li>4. <b>Reaction rate</b> is how much work an enzyme does (how much product is made) in a certain amount of time.</li> </ol> <p>**Be prepared to answer questions about the concentration of enzymes to substrate (for example- why doesn't the cell have more helper molecules?)</p>	<p>Direct Instruction</p>

10	Students write down vocabulary words for today and give examples of how this was demonstrated in the activity.	Assessment, Reflection
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*Suggested Homework*

Reading on enzyme function and questions.

Lesson 9

Time (min)	Development	Instructional Strategies
5	<p>Do Now:            Students write response to the question:            “How does the body get rid of wastes?”            Students share responses with the class.</p>	<p>Reflection            Assessing prior knowledge (motivation)</p>
15	<p>Review enzymes, substrates, catalysts and reaction rate.  <i>Ask:</i> What factors might affect how fast an enzyme works?            Students should be able to remember the amount of enzyme affects the reaction rate. Also elicit that temperature and other chemical conditions like pH can affect how efficiently an enzyme can work. (Students may think things like “temperature will make the reaction go faster because things move faster when temperature is increased).  <i>Introduce lab:</i></p> <ul style="list-style-type: none"> <li>• Explain that students will be testing the effect of different factors on enzyme activity. The enzyme they are studying is called catalase and is found naturally in potato (among other things, like liver). Catalase breaks down hydrogen peroxide and forms water and oxygen gas. Write the reaction on the board.</li> <li>• The oxygen gas can be seen in the form of bubbles. More bubbles mean the reaction is happening faster. Bubbles are the way <b>reaction rate</b> will be measured in this investigation. Students will be able to measure the amount of bubbles using a centimeter ruler.</li> <li>• Identify the variables in the experiment- pH, temperature, size of molecule and type of substrate.</li> <li>• Make a point of NOT mentioning possible sources of error (such as cutting all the potato to the same size or measuring time accurately). It will be interesting to come back to this during the analysis of results.</li> </ul>	<p>Direct instruction</p>
10	<p>Students read through lab procedure.            Students set up data tables in lab notebooks.  <i>Teacher informally checks their summaries</i>  <i>Put students in pairs.</i></p>	<p>Assessment</p>
10	<p>Students complete step 1 of the lab activity. This serves as the “control data”</p>	<p>Lab work</p>

**Suggested Homework:**

Complete the introduction, materials and procedure parts of lab report (See checklist)

## Lesson 10

Time (min)	Development	Instructional Strategies
5	Do Now: Students sit in pairs. Answer the following questions: Write on board: What is the substrate in this lab activity? What is the enzyme? What are the products?	review (motivation)
20	Students complete the lab activity. <i>Teacher monitors student work and gives feedback.</i>	Lab work Group work
10	Class Discussion of Data Go over guidelines for lab report.	Discussion Informal Assessment
5	Reflection: Students write: Why are enzymes important in maintaining homeostasis? If you were given a group of substances like: potato, radish, apple, pear, carrot, white meat and red meat, how might you determine which one of these has the most amount of catalase in it?	Assessment

### **Suggested Homework**

Write a lab report based on this activity.

Include:

Introduction (explain what you were testing and studying about. Define enzyme and substrate)

Procedure- a summary of what you did in the lab.

Results- a table showing the different reaction rates in cm of bubbles.

Discussion- explain your results.

### **Resources**

Morholt, Brandwein, and Joseph, A Sourcebook for the Biological Sciences 2<sup>nd</sup> Edition, 1966. Harcourt, Brace Jovanovich.

Haskel and Sygoda, Biology Investigations. 1973. Amsco

### **Standards Addressed**

MST Standard 1- 1.3a, 1.3b, 2.4, 3.1a

MST Standard 4- 1.2c, 1.2h, 5.1f, 5.1g

Note: Lab handout and guidelines need to be revised. A draft has been included here.



**Unit Topic/Essential Question: How do we survive?**

**Aim/Guiding Question:**

How does our body send signals?

How do different parts of our body communicate with one another?

**Objectives**

*Students will be able to:*

- Explain that dynamic equilibrium results from a detection of and response to stimuli.
- Explain that organisms detect and respond to change in a variety of ways both at the cellular level and at the organismal level.
- Learn about and explain different feedback mechanisms have evolved to maintain homeostasis.

**New Terms**

negative feedback

hormones

endocrine system

**Materials/Preparations:**

Readings for each jigsaw on:

Control of body temperature

Control of electrolytes and water balance

Control of blood glucose

Control of blood calcium

Readings that address these scenarios are easily found in most biology textbooks.

Lesson 11

Time (min)	Development	Instructional Strategies
10	<p>Do Now:</p> <ul style="list-style-type: none"> <li>• Ask students to explain (in writing) as best as they can how a thermostat works to maintain the temperature of a room.</li> <li>• Students pair up and work with another student to refine their explanation.</li> </ul>	(Motivation) Think-Pair-Share
5	<p>Students share responses aloud.</p> <p><i>Teacher asks:</i></p> <p style="padding-left: 40px;">What would happen if the thermostat in this room were broken?</p> <p style="padding-left: 40px;">What is the temperature of your body’s “thermostat”?</p> <p><i>Put students into groups</i></p> <p><i>Explain that they will be exploring different ways that the body maintains balance.</i></p>	Assessing prior knowledge
15	Student groups investigate the body’s physiological response to the following:	Jigsaw

	<p>high temperature, low temperature, increased water intake, increased salt intake.</p> <p>Students answer the following:</p> <ul style="list-style-type: none"> <li>• What is homeostasis?</li> <li>• Why is it important?</li> <li>• How is the physiological response you read about related to homeostasis?</li> <li>• What would happen if the homeostatic mechanism you read about broke down?</li> </ul>	<p>Developing New Understanding</p>
<p>10</p>	<p>Students share what they learned in their groups and answer the following: How is the body's response in all of these examples similar? Can you make a generalization about HOW the body deals with changes in order to maintain stability? <i>Teacher collects the group responses.</i></p>	<p>Assessment</p>

## Lesson 12

Time (min)	Development	Instructional Strategies
10	<p>Show students a model of how a toilet works. (Some students may be familiar with how they work) Elicit that when you flush the toilet, the water drains out of the tank and then fills up until it reaches a certain level. Then a chain releases and the water stops filling into the tank. <i>Ask:</i> What happens if the toilet is “broken”? <i>Define</i> <b>negative feedback.</b> <i>Connect</i> the idea of toilet feedback to negative feedback. Explain that one way of sending messages is using a chemical messenger: called <b>hormones.</b></p>	<p>(motivation)</p> <p>Direct Instruction</p>
15	<ul style="list-style-type: none"> <li>• <i>Discuss</i> the normal feedback control of blood glucose</li> <li>• <i>Define:</i> pancreas, insulin, glucagon.</li> <li>• <i>Explain</i> that without insulin, cells could not get the glucose in.</li> <li>• <i>Explain</i> that glycogen is stored form of glucose.</li> </ul>	<p>Discussion/ Direct Instruction</p>
15	<p>Students work in the same groups as the day before. Imagine you have just eaten a meal- describe what happens to: The level of glucose, insulin, and glucagon in your blood</p> <ol style="list-style-type: none"> <li>Immediately after the meal.</li> <li>An hour after you’ve eaten.</li> <li>Four hours after you’ve eaten.</li> </ol> <p>Students may wish to use a flow diagram to help them answer this question. (note- The New York City Standards book has an activity that is similar to this). Students read about diabetes and as a group answer the following questions: What are the symptoms of diabetes? How do patients with the condition cope with the illness? What happens as a result of the lack of insulin in the body? Teacher collects these responses.</p>	<p>Group Work</p> <p>Assessment</p>

### Suggested Homework

Students read about control of blood calcium and create a chart comparing how it is similar and different from the control of blood glucose

### Resources

BSCS Biology- A Molecular Approach, pp. 514-516

Holt, Visualizing Life, pp. 673, 681

Teaching and Learning Plan 5.3b- pp. 111-113

### Standards Addressed

MST Standard 4- 1.2c, 5.3a, 5.3b

**Unit Topic/Essential Question: How do we survive?****Guiding Question:** What makes us sick?**Objectives***Students will be able to:*

- Model the spread of the disease.
- Hypothesize about the route of transmission of the disease.
- Convey their understanding of how diseases spread (modes of transmission).

**New Terms:**

None

**Materials/Preparations:**

2 Test Tubes per student

Test Tube racks

Acidic Solution

Basic Solution

Phenol Red Indicator

Note: phenol red turns yellow in the presence of acid and remains red in the presence of base. Each student should get about 5 mL of basic solution in their test tube except for one student who will receive a acidic solution. This person is the carrier of the disease. Prepare the test tubes before class. Students will not know who has the infected test tube at this point since all of the solutions are clear.

This lesson is easily implemented in the classroom.

Time (min)	Development	Instructional Strategies
3	Do Now: Ask students to write a response to the following: How do we get sick?	(Motivation ) Assessing Prior Knowledge
5	Class shares responses. Expect students to share what they know about common illnesses like the flu, AIDS, other sexually transmitted diseases. They may also talk about allergic reactions and chronic conditions like asthma. Use this an opportunity to see what your class already knows and where their misconceptions lie. Try not to build a lot of vocabulary and new thinking on this day.	Informal Assessment
15	“The Red Disease”- <i>Explain</i> to students that the class will be simulating the spread of a disease in this classroom. Give each student two test tubes. One test tube contains	Simulation

	liquid, the other is empty. Students should pour about half of their liquid into the empty test tube. <b>THE OTHER TEST TUBE IS RESERVE LIQUID.</b> Ask them to think about what the liquid in the test tube might represent. They will say things like semen, mucus, blood, etc. Try to elicit as many as possible. Inform students that they will be interacting with <b>THREE</b> different people in the class. An interaction includes pouring all of the liquid from one test tube into another, and then pouring back half into the partner's test tube. Students should write down the name of each person they interacted with.	
5	<i>Explain</i> that as the health official you have bad news. One person in the class is carrying a deadly disease (make up some deadly symptoms). You are here are to test each individual in the room. <i>Teacher goes around the room and drops phenol red into each test tube. Infected students are asked to stand up.</i>	(Motivation)
10	Students fill in chart. Ask students to work in groups and see if they can figure out who started the epidemic in the classroom. They should be able to come up with two possible culprits using process of elimination. Then teacher can drop phenol red into the <b>RESERVE LIQUID</b> of these two students to solve the mystery.	Group Problem Solving

**Suggested Homework:**

Students answer the following:

1. Come up with strategies for fighting the red disease.
2. How can you figure out how this disease was transmitted?
3. How will you prevent the spread of the disease?
4. How is the class activity related to epidemics that have happened in your lifetime?

**Resources**

Holt, Visualizing Life, Teacher's Resource Book- Laboratory Experiments  
Chapter 32- Investigation 32-1 (p. 778)

**References**

***BSCS Biology – A Human Approach (1st Edition): p. 112-113, E73***

**Standards Addressed**

MST Standard 1- 1.2a, 1.2b, 1.3a, 1.3b  
MST Standard 4- 5.2a, 5.2b

**Unit Topic/ Essential Question: How do we survive?**

**Aim/ Guiding Question:** What makes us sick and how do we get better?

**Objectives**

*Students will be able to:*

- Explain that viruses and bacteria are examples of pathogens that can disrupt homeostasis.
- Distinguish between the characteristics of viruses and bacteria.
- Understand the difference between antibiotics and vaccines.
- Apply new ideas in order to solve a problem.

**New Terms**

virus	vaccine
bacteria	antibiotic
pathogen	immunity

**Materials/ Preparations**

Test Subject cards  
Scenario card

Note: these cards can be obtained through the BSCS Biology – A Human Approach

<b>Time (min)</b>	<b>Development</b>	<b>Instructional Strategies</b>
3	Do Now: Make a list of different diseases that you know.	(Motivation) Prior Knowledge
10	<p>Go over class responses</p> <p>Teacher should list the different diseases on the board in three columns: Bacterial, viral, and other. Do not label the columns yet.</p> <p><b>Define pathogen as any microscopic substance that can make you sick.</b></p> <p>Ask students how the diseases in column 1 might be treated (these are the bacterial ones).</p> <p>Ask how diseases in column 2 might be treated (these are the viral ones).</p> <p>Elicit similarities and differences in the two columns.</p> <p>Explain that diseases in column 1 are caused by bacteria, while diseases in column 2 are caused by viruses.</p> <p>Explain differences between viruses and bacteria</p> <ul style="list-style-type: none"> <li>• Viruses are non-living, bacteria are living.</li> <li>• Viruses need a host in order to reproduce themselves.</li> <li>• Viruses can't be treated with antibiotics, while bacteria can.</li> </ul>	Sharing  Direct Instruction

	<ul style="list-style-type: none"> <li>• Vaccines are a way of preventing the attack of a virus.</li> </ul>	
25	<p><b>Diagnosis Puzzle:</b></p> <p>Part A: Give each student a test subject card and ask them to predict the prognosis of this patient based on the information given if the subject was exposed to the flu virus.</p> <p>Part B: Give each student a scenario card and a list of clues and tell them that their test subject has been exposed to either the streptococcus bacteria, the cold virus or the rubella virus. Using their knowledge and the information that they have been given they must solve the puzzle.</p>	<p>Application of New Ideas</p> <p>Group Work</p> <p>Assessment</p>

Note: The resources needed for this lesson are found in BSCS Biology- a Human Approach. Test subject cards, scenario cards and clues are found in the teacher's resource book (Copymasters, Chapter Six) and the lesson is developed in detail in the teacher's guide (Unit Two, Chapter Six). Student notes are found in the textbook (pp.121-122)

### **Suggested Homework**

Students read about antibiotic resistant bacteria (such as tuberculosis- try US News and World Report, 1998) and submit a written report.

OR

Students read about bacteria and viruses from textbook and write on findings.

### **Resources**

See above

### **Standards Addressed**

MST Standard 4: 5.2b, 5.2c, 5.2e

**Unit Topic/Essential Question: How do we survive?**

**Aim/Guiding Question:** How do we get better?

**Objectives**

*Students will be able to:*

- Explain the difference between the non-specific and specific barriers that the human body has in order to fight off pathogens.
- Explain the major steps of the cell mediated response-
  - a. white blood cells (macrophages) engulf invaders to the body.
  - b. Macrophages start off a chain reaction in which other cells (t-cells) kill and learn who the invader is so that they can fight off the same invader again.
- Explain that allergies are a response of the immune system to harmless substances.
- Explain that cancer results from uncontrolled cell division

**New Terms:**

non specific barrier  
 specific barrier  
 immune system  
 antigen  
 antibody  
 macrophage  
 t-cells

**Materials/Preparations:**

Class set of “Avoiding Disruptions: The Immune System” *BSCS BIOLOGY – HUMAN APPROACH* (pp. E78-E81)

Note: you may wish to use a different reading on the same topic depending on the reading level of your class. This reading is about how the immune system works.

Index cards representing: macrophage, antigen, antibody, t-cells.

Time (min)	Development	Instructional Strategies
5	Do Now: Free write: How might the people that are infected with the red disease get better? What might the body do in order to heal itself? Why does the body need a way to recognize “invaders”?	motivation
20	<i>Give out</i> reading. (If you are using a different reading, divide the reading in the same way I have done here). Read <u>the first paragraph</u> out loud. Skip to the last paragraph on E78 and continue to read together up to the second paragraph on p. E79.	Direct Instruction



	Go over vocabulary words. Students read independently (to the end of p. E79) Make an outline of the cell mediated response as generally as possible. Create concept map as a class as you go over the reading.	Vocabulary
15	Teacher directs a play on the cell mediated response. Give each student an index card with a “part” that they will play. See if you can students to direct the steps of what happens when a pathogen enters the body. This serves as a review and reinforcement of some complex ideas.	Group work/ Discussion

**Suggested Homework:**

1. Create an outline of the different kinds of non specific barriers that the human body has in order to fight off pathogens that enter the body.
2. Explain what allergies are. Give two examples of allergies.
3. How is cancer related to homeostasis?

**Resources**

BSCS Biology- A Human Approach

**References**

*BSCS Biology – A Human Approach: pp. 120-121; pp.E78-E81*

**Standards Addressed**

MST Standard 4: 5.2c, 5.2d, 5.2g, 5.2i

**Unit Topic/Essential Question: How do we survive?****Aim/Guiding Question:** What makes us sick and how do we get better?**Objectives***Students will be able to:*

- Gain an overview of different health risks faced by society today.
- Evaluate how their choices affect their overall health.
- Identify ways in which health risks are a result of controllable or uncontrollable factors.
- Propose solutions to reduce some risks that humans face.
- Analyze the information they are studying.
- Share their findings with other students.

**New Terms:**

risk

controllable vs. uncontrollable

**Materials/Preparations:**Class set of reading: “Avoiding Disruptions: Behavior, Choices and Risk” *BSCS BIOLOGY –A HUMAN APPROACH* (pp. E84-E85)

Risk Assessment Data Packet (1 per group)

The Risk Assessment Data is long list of statistics on how people are affected by various health concerns today (like alcoholism, STD’s, cancer, etc). It is available in the teacher’s resource guide of BSCS Biology- A Human Approach.

Note: you may want to divide the data packet into four sections before handing them out to students so that they don’t spend their time doing this. Also the packet can be divided by themes like Drugs and Alcohol, Cancer, Sexually Transmitted Diseases, etc.

<b>Time (min)</b>	<b>Development</b>	<b>Instructional Strategies</b>
5	Do Now: Answer the following questions: 1. In your own words, define risk 2. Develop a list of at least 10 risks faced by humans.	Assessing prior knowledge (motivation)
5	Teacher puts students in groups of four. Teacher hands out one “RISK ASSESSMENT DATA” packet per group.  Teacher goes over instructions: <ul style="list-style-type: none"> <li>• After reading each statement label it with a “T” if it is a serious risk faced by mostly by teenagers, and label it with a “G” if it is a risk faced by the general population.</li> <li>• Mark an asterisk next to the most shocking or surprising statistic in each of your categories.</li> </ul>	Direct instruction

	<ul style="list-style-type: none"> <li>Using all the categories that you studied, write a paragraph explaining the risks and summarizing what you learned about the risks. Also propose one or two behaviors that might help to reduce the risk that you read about. You will present this paragraph to your group.</li> </ul>	
15	Students work independently on completing the task.	Reading, writing
10	<p>Students present their work to one another and as a group answer the following questions in writing:</p> <ul style="list-style-type: none"> <li>Make a list of three risks in our society that would be reduced if people would change their behavior.</li> <li>Make a list of three risks in our society that could probably not be reduced by a change in people's behavior.</li> <li>What kinds of behaviors do you think people might be unwilling to change?</li> </ul>	Group Work, Oral Presentation Assessment

**Suggested Homework:**

1. Complete the "Taking Risks: A Self-Evaluation" (found in BSCS teacher's resource guide)
2. Read "Avoiding Disruptions: Behavior, Choices, and Risk" (pp. E84-E85)
3. Explain the difference between controllable and uncontrollable factors.
4. What role do our choices play in determining our overall health or homeostasis?

**Resources**

**BSCS Biology- A Human Approach- pp. 128-130**

BSCS Biology- A Human Approach- Teacher's Resource Guide- Copymaster 6.5 (pp.78-84)

**References**

BSCS Biology – A Human Approach: pp. 128-130; pp. E84-E85.

**Standards Addressed**

MST Standard 4: 5.2h, 5.2i, 5.2j

**Unit Topic/Essential Question: How do we survive?****Aim/Guiding Question:** Can epidemics be prevented?**Objectives***Students will be able to:*

- Explain what an epidemic is.
- Provide an explanation for major causes of the AIDS epidemic in the United States.

**New Terms:**

epidemic

**Materials/Preparations:****Option 1**Video: And the Band Played On (produced by HBO, 1993)

(You will want to watch this film before hand so that you can preview the most important segments to show to the class- the movie is almost three hours long- so you may want to extend this lesson over two days to watch more of the film. Also, the film deals with issues of homophobia and the teacher should be comfortable dealing with this. Also you may wish to substitute with another video.)

**Option 2**Information Packets on AIDS statistics and history (a good web-site is [www.avert.org](http://www.avert.org))

(If you have access to the internet, you may want to log on this web-site and have your students search on the internet)

**Option 1**

<b>Time (min)</b>	<b>Development</b>	<b>Instructional Strategies</b>
5	Do Now: Free Write: Write down everything you know about AIDS.	Assessing Prior Knowledge (motivation)
5	<i>Go over</i> Do Now. <b>Define epidemic.</b> <i>Go over</i> different epidemics that have affected the world (cholera, flu, plague) <i>Explain</i> the focus question: “What steps can society take in order to prevent epidemics?”  <i>Go over task:</i> Introduce the film. As you watch the film, 1. Keep track of what you feel are important historical events that occurred in the early history of this epidemic. 2. Write down examples of things that the public did in order to deal/ not deal with this disease when it first appeared.	Direct Instruction
25	Watch film- take notes.	
5	Go over essay check list and homework assignment.	Direct Instruction

Option 2

Time (min)	Development	Instructional Strategies
5	Do Now: Free Write: Write down everything you know about AIDS.	Assessing Prior Knowledge (motivation)
5	<p><i>Go over</i> Do Now.  <b>Define epidemic.</b>  <i>Go over</i> different epidemics that have affected the world (cholera, flu, plague)  <i>Explain</i> the focus question: “What steps can society take in order to prevent epidemics?”</p> <p><i>Go over task:</i> Students will be working in groups with data packets (or on the internet) to gather important historical information about the public response to the AIDS epidemic. Students should use the historical timeline to highlight 5-6 major events in the early years of the epidemic that could have changed the course of events.</p>	Direct Instruction
25	Students work in groups of 3 to gather information.	Group work
5	Go over essay check list and homework assignment.	Direct Instruction

**Suggested Homework:**

Using the information that you have obtained today and the essay checklist, write an essay answering the following question:

What steps can society take in order to prevent epidemics?

**Standards Addressed**

MST Standard 4: 5.2f, 5.2j

## ESSAY CHECK LIST

1. Introduction: Briefly explain what HIV/ AIDS is. Go over some interesting statistics about people affected by this disease. Introduce the major topic of your essay.
2. Body: Use two to three paragraphs to outline some of the events/ decisions that people made in the early history of this epidemic in order to deal with this disease. What could have been done differently in order to stop the spread of the disease?
3. Conclusion: In your opinion, why is HIV/ AIDS such a big epidemic? What steps can society take in order to prevent epidemics?