Integrating Science and Technology
and
Catholic Curriculum Maps

Grade 8

Understanding Life Systems Strand

Cells

Catholic Curriculum Corporation
Central and Western Region

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Understanding Life Systems Strand
Grade 8

Unit At-A-Glance

Catholic Social Teaching:	Solidarity
Essential Question:	How are we Church in the world?
OCSGE:	A reflective, creative and holistic thinker who examines, evaluates and applies knowledge of interdependent systems (physical, political, ethical, socio-economic and ecological) for the development of a just and compassionate society (3f) A responsible citizen who acts morally and legally as a person formed in Catholic traditions (7a) and who witnesses Catholic social teaching by promoting equality, democracy, and solidarity for a just, peaceful and compassionate society (7e)
Topic:	Cells: Students will continue to develop their knowledge of organisms by focusing on the structure and function of cells in plants and animals
Unit Guiding Question:	As members of God's interdependent creation, how are we called to assess the impact of cell biology on individuals, society, and the environment?

Unit Culminating Task:

Create a presentation on a chosen disease to "apply" for a Medical Research Grant that will benefit society in dealing with the specific disease. They are to research and present how the disease originates, how it affects every organ system in the body, how it affects other individuals, the availability of medicine to all people in different societies, and the impact on the environment this disease could have. In doing this presentation, students will:

- Develop an awareness of the Catholic view of social justice and their responsibility in society
- Assess the impact of cell biology on individuals, society, and the environment
- Investigate functions and processes of plants and animal cells
- Demonstrate an understanding of the basic structure and function of plant and animal cells and cell processes
- Identify the personal qualities that are needed to practice social justice and how we are called as Catholics to develop an awareness of human rights

Essential Understandings

Catholic Curriculum Map: ***Essential Question(s) & Links***	How are we called to a Christian life? • Identify the Catholic view of social justice and its need in the world • Develop an awareness of how the human person is a reflection of God • Develop an awareness of acceptance and respect towards their bodies • Develop an understanding of their responsibility to participate in building a loving and just society • Develop an understanding of human rights • Identify the social justice issue of respect for life • Identify the personal qualities and skills that are needed to practice social justice: hope, empathy, critical thinking skills and creativity
Science and Technology: ***Fundamental Concept(s)***	Sustainability and Stewardship Systems and Interactions, Structure and Function
Science and Technology: ***Big Ideas and Overall Expectations***	• Cells are the basis of life (OE 2,3) • Cells organize into tissues, tissues into organs, organs into organ systems and organ systems into organisms (OE 2,3) • Healthy cells contribute to healthy organisms (OE 1,2) • Systems are interdependent (OE 1,3)

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Science and Technology: ***Scientific Inquiry Skill***	Experiment
Science and Technology: ***Expectation Tags, Guiding Questions & Specific Expectations***	Relating Science and Technology to Society and the Environment • What are some disadvantages of using electron microscope technology that might affect its availability or effectiveness? (SE 1.1) • How might the understanding of cells and cell processes help in treating disease? (SE 1.1) • Using our Catholic view of social justice, what are the potential benefits and harmful effects on human health and the environment that cell processes may have? (SE 1.2) Developing Investigation and Communication Skills • How might what you have learned about osmosis and diffusion be useful in daily life? (SE 2.4) Understanding Basic Concepts • What are the structure and functions of plant and animal cells? (SE 3.3)
Language Expectations:	Oral Communication • Use speaking skills and strategies appropriately to communicate with different audiences for a variety of purposes (OE 2) Reading • Read and demonstrate an understanding of a variety of literary, graphical, and informational texts, using a range of strategies to construct meaning (OE 1) Writing • Generate, gather, and organize ideas and information to write for an intended purpose and audience (OE 1)
Mathematics Expectations:	Data Management and Probability • Apply a variety of data management tools and strategies to make convincing arguments about data (OE 2) • Use probability models to make predictions about real-life events (OE 3)

Unit Overview

NOTE: Teachers will want to adjust the suggestions to address the learning needs of their students.

Subtask	Lesson / Time	Essential Understandings	Assessment	Resources
1	Introduction to the Unit 1.1 Introduction to Cells (40 minutes)	Develop an awareness of how the human person is a reflection of God Develop an awareness of acceptance and respect towards their bodies Investigate functions and processes of plant and animal cells (OE 2) SE 3.1, 3.2, 3.3	Observation, students' notes from lesson, students' diagrams	Examples of living things, diagrams on structures of cells, chart paper

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2	Using a Microscope 2.1 Microscopes (40 minutes) 2.2 Plant versus Animal Cells (40 minutes)	Identify the social justice issue of respect for life Investigate functions and processes of plant and animal cells (OE 2) SE 2.1, 2.2, 2.3, 2.6, 1.1	Students' diagrams, observation, models of cells, science procedures, safety methods, class discussion	Microscopes, labeling diagrams of microscopes, chart paper, slides, various objects needed to build model of organelles, labeling diagrams of plant and animal cells, wet and dry mount slides
3	Cellular Activities 3.1 Diffusion (40 minutes) 3.2 Osmosis (40 minutes) 3.3 Investigating Diffusion and Osmosis (40 minutes)	Identify the social justice issue of respect for life Demonstrate an understanding of the basic structure and function of plant and animal cells and cell processes (OE 3) SE 3.4, 2.1, 2.2, 2.4, 2.5, 2.6, 1.1	Observation, experiment, students' response, students' notes, class discussion, anecdotal, rubric, checklist Slide show (can use rubric)	Scientific procedure, diagrams of cell membranes, water, food colouring, various liquids, access to computers for slide shows, saltwater solution, plant cells, appropriate chosen experiments
4	Cellular Organizations 4.1 Unicellular and Multicellular Organisms (40 minutes) 4.2 Organizations of Cells (40 minutes) 4.3 Organ Systems Working Together (40 minutes) 4.4 Cell Specialization (40 minutes)	Develop an awareness of acceptance and respect towards their bodies Identify the social justice issue of respect for life Demonstrate an understanding of the basic structure and function of plant and animal cells and cell processes (OE 3) SE 3.5, 3.6	Observation, anecdotal, class discussion, students' responses, students' charts Experiments, students' notes and observations, students' explanations of chosen article, concept maps	Sample pictures, diagrams of germs/bacteria/other cells, diagram of cell parts, sample of stagnant water source, slides, microscopes, prepared yeast cells, grape juice, diagrams of groups of cells, chart paper, current article on research and development - the affects on plants and animals, photos of biomes, plants for studying, students' articles
5	Cell Biology Impact on Individual, Society and the Environment 5.1 Cell Wars (40 minutes)	Identify the Catholic view of social justice and its need in the world Develop an awareness of how the human person is a reflection of God	Observation, students' research skills, checklists, anecdotal, written newspaper article (can use rubric), students' responses on chart, class discussion,	Access to sources (library, internet, etc)

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	5.2 Impact of Research (40 minutes)	Develop an understanding of human rights Identify the social justice issue of respect for life Identify the personal qualities and skills that are needed to practice social justice: hope, empathy, critical thinking skills and creativity Assess the impact of cell biology on individuals, society, and the environment (OE 1) SE 1.1, 1.2		
6	Medical Research Grant (8 X 40 minutes)	Identify the Catholic view of social justice and its need in the world Develop an awareness of how the human person is a reflection of God Develop an awareness of acceptance and respect towards their bodies Develop an understanding of their responsibility to participate in building a loving and just society Develop an understanding of human rights Identify the social justice issue of respect for life Identify the personal qualities and skills that are needed to practice social justice: hope, empathy, critical thinking skills and creativity Assess the impact of cell biology on individuals, society, and the environment (OE 1) Investigate functions and processes of plant and animal cells (OE 2) Demonstrate an understanding of the basic structure and function of plant and animal cells and cell processes (OE 3)	Presentation of research and the ability to persuade, final rubric, peer assessment, observation, anecdotal	Access to sources, diagrams, paper, access to computers, presentation materials as needed

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Subtask 1: Introduction to Unit

Description
Give a brief overview of the unit, including the essential understandings and the introduction of the culminating task outlining that following the study of cells students will be asked to research a specific disease and make an application for a Medical Research Grant.

Lesson 1 Introduction to Cells
Purpose
Students will identify the basic concepts and skills to be addressed in the unit; will determine if all cells are alike; will investigate the functions and processes of plant and animal cells; will have a deeper understanding of the human person as a reflection of God.

Essential Understandings
Catholic Curriculum Map Links

- Develop an awareness of how the human person is a reflection of God (2.1, 6.1, 6.2 SBM; 1.1 FA)
- Develop an awareness of acceptance and respect towards their bodies (6.1 SBM; 3.3 FA)

Science and Technology

- Demonstrate an understanding of the postulates of the cell theory (SE 3.1)
- Identify structures and organelles in cells, including the nucleus, cell membrane, cell wall, chloroplasts, vacuole, mitochondria, and cytoplasm, and explain the basic functions of each (SE 3.2)
- Compare the structure and function of plant and animal cells (SE 3.3)

Language

- Use speaking skills and strategies appropriately to communicate with different audiences for a variety of purposes (Oral Communication OE 2)
- Read and demonstrate an understanding of a variety of literary, graphical, and informational texts, using a range of strategies to construct meaning (Reading OE 1)
- Generate, gather, and organize ideas and information to write for an intended purpose and audience (Writing OE 1)

Assessment for Learning
Observation, students' notes from lesson, students' diagrams

Teacher Notes
This lesson will begin to develop the students' knowledge of organisms by focusing on the structure and function of cells in plants and animals. As an introduction, students will need access to resources that describe cells, as well as various materials to aid in the learning of different types of cells. Students will also be able to gain a deeper understanding of the cells as a reflection of God and the wonder of life.

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Instruction

Time to Teach 20 minutes

- Introduce the unit, describe the focus of the unit (essential understandings) and show an example of the culminating task.
- Discuss with the class the major groups of living things in God's creation.
- Obtain several examples of living things (both plants and animals if available and allowed). Use these as a basis of forming characteristics that the examples have in common.
- Ask "What do you already know about life with respect to cells in both animals and plants?"
- Instruct students on the postulates of the cell theory (e.g. the cell is the basic unit of life; all cells come from pre-existing cells; all living things are made up of one or more cells, an organism can be one cell (unicellular) or it can be made up of trillions of cells (multicellular); all cells are created from existing cells through a process called cell division. Focus on the human person as a reflection of God as part of this cell theory.
- Ask "How does knowing all this about cells help us to accept and respect our bodies?"
- Review the processes of unhealthy cells and what happens to the organism

Time to Practice 10 minutes

- Students take notes and create diagrams on the structures and organelles in cells, including the nucleus, cell membrane, cell wall, chloroplasts, vacuole, mitochondria, and cytoplasm
- Students use think-pair-share to respond to question about the respect for all life. How is the analysis of cells a reflection of God? How does learning about the comparison of plant and animal cells give you a new look on respecting life?
- Students discuss in a group what would happen to a cell when given a specific disease. Students can discuss where these "diseases" might come from in terms of plant and animal life (e.g. smoking for humans, pesticides for plants)

Time to Share 10 minutes

- Students share their results from the think-pair-share with the class.
- Teacher records answers on board or chart paper.
- Encourage a class discussion on findings.
- Have students share their discussions around how cells might potentially be affected by diseases and predict how this might affect all life.

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Subtask 2: Using a Microscope

Description:
Students will demonstrate the understanding of how a microscope works, including labeling a microscope, preparing slides for viewing, and using a microscope correctly and safely.

Lesson 2.1: Microscopes
Purpose
Students will learn how to use a microscope correctly and safely to find and observe components of cells.

Essential Understandings
Catholic Curriculum Map Links

- Identify the social justice issue of respect for life (7.3 SBM)

Science & Technology

- Follow established safety procedures for handling apparatus and materials and use microscopes correctly and safely (SE 2.1)
- Use a microscope correctly and safely to find and observe components of plant and animal cells and make accurate drawings of their observations (SE 2.2)
- Prepare dry- and wet-mount slides of a variety of objects for use with a microscope (SE 2.3)
- Use a variety of forms to communicate with different audiences and for a variety of purposes (SE 2.6)
- Assess the role of selected technologies in enhancing our understanding of cells and cellular processes (SE 1.1)

Language

- Read and demonstrate an understanding of a variety of literary, graphical, and informational texts, using a range of strategies to construct meaning (Reading OE 1)
- Generate, gather, and organize ideas and information to write for an intended purpose and audience (Writing OE 1)

Assessment for Learning
Students' diagrams, observation

Teacher Notes
Students will be introduced to the use of microscopes. Microscopes are precision instruments and must be handled with great care. It is important that students have access to experimenting with and using a microscope. It is also important that students be able to identify and explain the importance of practices for handling and using microscopes that not only respect the fragility of the tool but also ensure their personal safety and the safety of others. You will need enough microscopes for students to at least share, as well as resources to help teach the parts of the microscope, including a diagram for labelling. When selecting and handling slides for observation, you may use this as an opportune time to discuss the fragility of and respect for life.

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Instruction

Time to Teach 15 minutes

- Review the history and background of microscopes, including how technology has advanced
- Provide students with a diagram of a microscope to label
- Provide context to respect for life discussion in regards to slides and analysis of various objects under a microscope (Ask "How do we choose samples for slides?")
- Teach proper safety methods and how to handle using a microscope properly

Time to Practice 15 minutes

- Groups create a list of safety procedures on how to bring and use the microscope
- Label the various components of a microscope independently
- Create a chart listing the names of the parts of the microscope on one side and their function
- In the Lab procedure, practice using slides and viewing various cells with a partner

Time to Share 10 minutes

- Groups share procedures for bringing a microscope to set up and the teacher records the steps for the procedure for setting up a microscope on chart paper for the class to use
- Students share findings from their group
- Hand in labeled diagrams of a microscope

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Lesson 2.2: Plant versus Animal Cells

Purpose

Students will learn how to use a microscope correctly and safely to find and observe components of plant and animal cells.

Essential Understandings

Catholic Curriculum Map Links

- Identify the social justice issue of respect for life (7.3 SBM)

Science & Technology

- Compare the structure and function of plant and animal cells (SE 3.3)
- Follow established safety procedures for handling apparatus and materials and use microscopes correctly and safely (SE 2.1)
- Use a microscope correctly and safely to find and observe components of plant and animal cells and make accurate drawings of their observations (SE 2.2)
- Prepare dry- and wet-mount slides of a variety of objects for use with a microscope (SE 2.3)
- Use a variety of forms to communicate with different audiences and for a variety of purposes (SE 2.6)
- Assess the role of selected technologies in enhancing our understanding of cells and cellular processes (SE 1.1)

Language

- Read and demonstrate an understanding of a variety of literary, graphical, and informational texts, using a range of strategies to construct meaning (Reading OE 1)
- Generate, gather, and organize ideas and information to write for an intended purpose and audience (Writing OE 1)

Assessment for Learning

Observation, students' diagrams, models of cells, science procedures, safety methods, class discussion

Teacher Notes

Continue with the lesson on microscopes. You will need materials appropriate to listed tasks, including objects that can be used to model an organelle students wish to build (recycled objects, food items, etc). Remind students about using proper materials for slides, demonstrating respect for life. Include in this lesson discussions about how technology has enabled scientists and therefore the world with the discovery of and sharing information to the public about diseases (like malaria and West Nile) and how it has enabled the science of genetically modified crops.

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Instruction

Time to Teach 10 minutes

- Present parts of plant and animal cells. Labeled diagrams for students to use of examples of both are required
- Review proper safety methods on how to use microscopes
- Provide context to respect for life issues in regards to slides and analysis of various objects under a microscope
- Explain process of examining slides under a microscope and how to prepare wet- and dry-mount slides
- Present task to design and construct a model of a plant or animal cell
- Model for students how to prepare a dry mount slide

Time to Practice 25 minutes

- Students fill in parts of diagrams for both plants and animal cells
- Compare the cells of animals and plants and record findings on chart in a group
- Design and construct a model of a plant or animal cell
- Students prepare their own dry-mount slide
- Students prepare their own wet-mount slide

Time to Share 5 minutes

- Hand in cell diagrams for accuracy
- Share models for display in class
- Keep chart of animal and plant cells in science notebook
- Discuss how you would know the difference in preparing wet- and dry-mount slides

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Subtask 3: Cellular Activities

Description:
Students will be introduced to cellular activities, specifically the processes of diffusion and osmosis.

Lesson 3.1 Diffusion
Purpose
Students will further analyze the functions of cells by examining the process of diffusion within plant and animal cells and gain a new respect for life.

Essential Understandings
Catholic Curriculum Map Links

- Identify the social justice issue of respect for life (7.3 SBM)

Science and Technology

- Explain the processes of diffusion and osmosis and their roles within a cell (SE 3.4)
- Follow established safety procedures for handling apparatus and materials and use microscopes correctly and safely (SE 2.1)
- Use a microscope correctly and safely to find and observe components of plant and animal cells and make accurate drawings of their observations (SE 2.2)
- Use scientific inquiry/experimentation skills to investigate the processes of osmosis and diffusion (SE 2.4)
- Use appropriate science and technology vocabulary, including organelle, diffusion, osmosis, cell theory, selective permeability, membrane, stage, and eyepiece, in oral and written communication (SE 2.5)
- Use a variety of forms to communicate with different audiences and for a variety of purposes (SE 2.6)
- Assess the role of selected technologies in enhancing our understanding of cells and cellular processes (SE 1.1)

Language

- Use speaking skills and strategies appropriately to communicate with different audiences for a variety of purposes (Oral Communication OE 2)
- Read and demonstrate an understanding of a variety of literary, graphical, and informational texts, using a range of strategies to construct meaning (Reading OE 1)
- Generate, gather, and organize ideas and information to write for an intended purpose and audience (Writing OE 1)

Assessment for Learning
Slide show (can use rubric), observation, class discussion, students' notes, experiment

Teacher Notes
Students will already be familiar with the ways in which microorganisms meet their basic needs for food, water, and air (grade 6). They will now examine how organisms obtain food, water and gases at a cellular level. This will require them to understand the differences between permeable, selectively permeable, and impermeable membranes. Diffusion is the spreading of the molecules of one substance throughout the molecules of another. Remind students about the respect for life as they begin to examine more closely the processes of cells. Use and model the appropriate scientific procedure for experimentation.

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Instruction

Time to Teach 15 minutes

- Review the cell organelles introduced to this point. Focus on the cell membrane (a membrane is a thin, soft, pliable sheet or layer, usually of plant or animal origin, that serves as an interface)
- Explain the features of a cell membrane using a diagram to illustrate the layers
- Explain the processes of diffusion. Model using water and food colouring to show the diffusion of colouring throughout the water.
- Discuss permeability in membranes (distinguish between permeable, selectively permeable, and impermeable)
- Present experiment of whether all liquids diffuse in the same way

Time to Practice 20 minutes

- Have students work in groups to record observations of substances that have permeable, impermeable, and selectively permeable membranes.
- Students can create a slide show to explain the results of investigations into the process of diffusion
- Experiment with various liquids to determine if they all diffuse in the same way using a scientific procedure method

Time to Share 5 minutes

- Students share their results from their groups and teacher records findings
- Discuss as a class the differences in the “membranes”
- Discuss how students have a new appreciation for life after viewing cell membranes. Have students share connections to how fragile new life can be
- Students share their slide shows (this can be done on a separate day)

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Lesson 3.2 Osmosis

Purpose

Students will further analyze the functions of cells by examining the process of osmosis within plant and animal cells and further gain a new respect for life.

Essential Understandings

Catholic Curriculum Map Links

- Identify the social justice issue of respect for life (7.3 SBM)

Science and Technology

- Explain the processes of diffusion and osmosis and their roles within a cell (SE 3.4)
- Follow established safety procedures for handling apparatus and materials and use microscopes correctly and safely (SE 2.1)
- Use a microscope correctly and safely to find and observe components of plant and animal cells and make accurate drawings of their observations (SE 2.2)
- Use scientific inquiry/experimentation skills to investigate the processes of osmosis and diffusion (SE 2.4)
- Use appropriate science and technology vocabulary, including organelle, diffusion, osmosis, cell theory, selective permeability, membrane, stage, and eyepiece, in oral and written communication (SE 2.5)
- Use a variety of forms to communicate with different audiences and for a variety of purposes (SE 2.6)
- Assess the role of selected technologies in enhancing our understanding of cells and cellular processes (SE 1.1)

Language

- Use speaking skills and strategies appropriately to communicate with different audiences for a variety of purposes (Oral Communication OE 2)
- Read and demonstrate an understanding of a variety of literary, graphical, and informational texts, using a range of strategies to construct meaning (Reading OE 1)
- Generate, gather, and organize ideas and information to write for an intended purpose and audience (Writing OE 1)

Assessment for Learning

Observation, experiment, students' responses, students' notes, class discussion

Teacher Notes

The transfer of water through a membrane from dilute solutions to more concentrated solutions is osmosis. Use an appropriate experiment to model the process and gather any materials needed prior to lesson. Use and model the appropriate scientific procedure for experimentation. At the end of this lesson, you can discuss osmosis and the process used in real life examples such as dialysis in kidney/ or kidney transplant patients and the process of reverse osmosis. You can also discuss the mysteries of viruses solved through using microscopes, as well as continuing the exploration of and respect for life within the cell processes.

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Instruction

Time to Teach 10 minutes

- Review diffusion and have students explain how this concept works in some situations (i.e. ash from a volcano, smoke in a contained room, air and water pollution)
- Review the terms permeable, selectively permeable, and impermeable
- Introduce osmosis as a special case of diffusion. Using a text resource, explain the process with appropriate diagrams
- Present appropriate experiment for discovering osmosis (i.e. saltwater solution and the affect on a plant cell)

Time to Practice 20 minutes

- Work in groups to demonstrate process of osmosis by completing an experiment using the scientific procedure
- Record all findings during the experiment
- Compare results in groups with diffusion
- As a group, discuss how this process affects life

Time to Share 10 minutes

- Students share results from experiment
- Discuss as a whole class the differences between osmosis and diffusion
- Create a list of real life examples where knowing this process would benefit society
- Share how this experiment has deepened knowledge about respect for life

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3.3 Investigating Diffusion and Osmosis Experiment

Purpose

Use scientific inquiry/experimentation skills to investigate the processes of diffusion and osmosis.

Essential Understandings

Catholic Curriculum Map Links

- Identify the social justice issue of respect for life (7.3 SBM)

Science and Technology

- Explain the processes of diffusion and osmosis and their roles within a cell (SE 3.4)
- Follow established safety procedures for handling apparatus and materials and use microscopes correctly and safely (SE 2.1)
- Use a microscope correctly and safely to find and observe components of plant and animal cells and make accurate drawings of their observations (SE 2.2)
- Use scientific inquiry/experimentation skills to investigate the processes of osmosis and diffusion (SE 2.4)
- Use appropriate science and technology vocabulary, including organelle, diffusion, osmosis, cell theory, selective permeability, membrane, stage, and eyepiece, in oral and written communication (SE 2.5)
- Use a variety of forms to communicate with different audiences and for a variety of purposes (SE 2.6)
- Assess the role of selected technologies in enhancing our understanding of cells and cellular processes (SE 1.1)

Language

- Use speaking skills and strategies appropriately to communicate with different audiences for a variety of purposes (Oral Communication OE 2)
- Read and demonstrate an understanding of a variety of literary, graphical, and informational texts, using a range of strategies to construct meaning (Reading OE 1)
- Generate, gather, and organize ideas and information to write for an intended purpose and audience (Writing OE 1)

Assessment

Observation, experiment, students' response, students' notes, class discussion, anecdotal, rubric, checklist

Teacher Notes

Choose appropriate experiment to demonstrate the processes of both diffusion and osmosis. Use and model the appropriate scientific procedure for experimentation. Gather all needed materials for experiment before time to teach.

Instruction

Time to teach 10 minutes

- Review the concepts of diffusion, osmosis, and permeable membranes
- Model appropriate scientific procedure and review the experiment with the class
- Describe the procedure of the investigation to the students, explaining about each piece of the experiment, its function, and purpose

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Time to practice 20 minutes

- Investigate the processes of diffusion and osmosis using a scientific experiment
- Read the procedure and formulate hypothesis for the investigation
- Brainstorm how cells respond to change and find examples of how this process affects human life

Time to share 10 minutes

- Explain how cells respond to changes in solute concentrations of extracellular fluids on their scientific process sheet
- Share results with class
- Using the results from the experiment and the examples the students found, explain how this process might affect plant, animal and human life

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Subtask 4: Cellular Organizations

Description:
Cells organize into tissues, tissues into organs, organs into organ systems, and organ systems into organisms

Lesson 4.1 Unicellular and Multicellular Organisms
Purpose
Students will identify unicellular and multicellular organisms and compare ways in which they meet their basic needs and how social justice issues can affect these processes.

Essential Understandings
Catholic Curriculum Map Links

- Develop an awareness of acceptance and respect towards their bodies (6.1 SBM; 3.3 FA)
- Identify the social justice issue of respect for life (7.1, 7.2, 7.3 SBM; 5.2 FA)

Science & Technology

- Identify unicellular organisms and compare ways in which they meet their basic needs (SE 3.5)
- Describe the organization of cells into tissues, organs, and systems (SE 3.6)
- Follow established safety procedures for handling apparatus and materials and use microscopes correctly and safely (SE 2.1)
- Use a microscope correctly and safely to find and observe components of plant and animal cells and make accurate drawings of their observations (SE 2.2)
- Prepare dry- and wet-mount slides of a variety of objects (SE 2.3)
- Use appropriate science and technology vocabulary in oral and written communication (SE 2.5)
- Use a variety of forms to communicate with different audiences and for a variety of purposes (SE 2.6)

Language

- Use speaking skills and strategies appropriately to communicate with different audiences for a variety of purposes (Oral Communication OE 2)
- Read and demonstrate an understanding of a variety of literary, graphical, and informational texts, using a range of strategies to construct meaning (Reading OE 1)
- Generate, gather, and organize ideas and information to write for an intended purpose and audience (Writing OE 1)

Assessment for Learning
Observation, students' notes and diagrams, anecdotal, checklist, rubric

Teacher Notes
Students will be looking at unicellular organisms (e.g. amoebae) and multicellular organisms (e.g. invertebrates [worms], vertebrates [frogs]) and comparing ways in which they meet their basic needs (e.g. nutrition, movement, gas exchange). Living things must perform certain functions in order to stay alive. Refer to Fully Alive Unit 3 for extensions on respect and acceptance towards their own bodies. Students will have the opportunity to view how unicellular and multicellular organisms move. Have samples of pictures on hand, diagrams to label and all materials necessary for appropriate experiment. Use and model the appropriate scientific procedure for experimentation. Be sure to include discussion about respect and appreciation for all life when viewing the cells and how all societies may or may not be aware of problems that these organisms may face.

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Instruction

Time to Teach 20 minutes

- Present information on unicellular organisms
- Ask students what their definition of germ is. Extend the discussion to identify why people are afraid of germs.
- Introduce the features of bacteria. Identify what is necessary to sustain the cell and identify the parts of the bacterium responsible for these life processes. Discuss why bacteria have survived and changed very little.
- Include how their own bodies must perform basic functions in order to fight off diseases. Share with them the wonder and awe of God's creation of their own bodies. (Fully Alive Unit 3 can assist in this process if not already taught)
- Introduce protists. Use diagrams to reference the cell parts. Obtain a sample of water from a stagnant source to use for slides for students to view. Review procedure for using a microscope.
- Present information on multicellular organisms and specialized cells
- Review characteristics of fungi, with specific reference to yeast
- Use prepared yeast cells (dry yeast added to grape juice a few hours before) to give to students to view

Time to Practice 10 minutes

- Take notes on unicellular organisms
- Take notes on multicellular organisms and specialized cells
- View slides of stagnant source water under a microscope and record observations
- View slides of yeast cells and record observations

Time to Share 10 minutes

- Compare results of slides. Share findings with each other and record differences and similarities on chart paper
- Discuss the issue of bacteria becoming resistant to antibiotics, and how we should avoid assisting this resistance (e.g. using antibiotics too frequently, not as instructed, etc)
- Discuss how lack of needs (shelter, food, etc) affects our bodies. Relate to social justice teachings of the Church and how we need to give assistance to others.

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Lesson 4.2 Organization of Cells

Purpose

Students will describe the organization of cells into tissues, organs, and systems and how we as Christians need to be aware of the relationships.

Essential Understandings

Catholic Curriculum Map Links

- Develop an awareness of acceptance and respect towards their bodies (6.1 SBM; 3.3 FA)
- Identify the social justice issue of respect for life (7.1, 7.2, 7.3 SBM; 5.2 FA)

Science & Technology

- Describe the organization of cells into tissues, organs, and systems (SE 3.6)
- Use appropriate science and technology vocabulary in oral and written communication (SE 2.5)
- Use a variety of forms to communicate with different audiences and for a variety of purposes (SE 2.6)

Language

- Read and demonstrate an understanding of a variety of literary, graphical, and informational texts, using a range of strategies to construct meaning (Reading OE 1)
- Generate, gather, and organize ideas and information to write for an intended purpose and audience (Writing OE 1)

Assessment for Learning

Students' notes, observation, class discussion, anecdotal, concept maps

Teacher Notes

Groups of cells with similar functions combine to make up tissues. Groups of tissues with similar functions combine to make organs. Students will need diagrams of groups of cells listed below to fully understand and create their concept maps. Students should take notes on the diagrams as well. Explain how these tissues are grouped together as another respect and appreciation for life that God has created in both animal and plants. Each one is unique, yet all cells transform/transmit energy, expel wastes and reproduce. We must be aware of these relationships and of outside factors that could influence these systems.

Instruction

Time to Teach 15 minutes

- Review the relationship between structure and function. Discuss with the students some related examples that demonstrate how the structure of something determines its function (e.g. Why could you not use a bowling ball in a game of golf?)
- Explain that even though cells are basically of the same structure, they have different functions
- Present the four major kinds of cells (epithelial, nerve, connective, muscle) and discuss why each is necessary to the body
- Present a diagram of each kind of cell and note at least one distinctive feature that relates to its function (e.g. muscle cells – contractility)
- Present the three main types of plant tissue (protective, transport, and photosynthetic)

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Time to Practice 20 minutes

- Students complete diagrams of cells
- Record notes and diagrams in notebook
- Construct a concept map of one of the human organ systems
- Create a chart listing the three main types of plant tissue, its function, and where it can be found
- Make a chart comparing the levels of cell organization to the levels in an organization that the student is familiar with (e.g. sports organization)
- Reflect on why tissues, organs, and organ systems are required in large multicellular organisms
- Give examples of situations when one system is missing. Explain how this relates to our own bodies. Reflect on how this might affect other people in the world?
- Discuss in groups how the relationship of the systems is part of God's plan for life for all plants and animals (including human)

Time to Share 5 minutes

- Share reflections within group
- Display models of concept maps in the classroom
- Hand in chart of plant tissue

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Lesson 4.3 Organ Systems Working Together

Purpose
Students look at animal organ systems and how they work together to maintain the health of the animal and how we as Christians need to protect these systems.

Essential Understandings
Catholic Curriculum Map Links

- Develop an awareness of acceptance and respect towards their bodies (6.1 SBM; 3.3 FA)
- Identify the personal qualities and skills that are needed to practice social justice: hope, empathy, critical thinking skills and creativity (1.4, 7.1, 7.2, 7.3 SBM; 5.3 FA)
- Identify the social justice issue of respect for life (7.1, 7.2, 7.3 SBM; 5.2 FA)

Science & Technology

- Identify unicellular organisms and compare ways in which they meet their basic needs (SE 3.5)
- Describe the organization of cells into tissues, organs, and systems (SE 3.6)
- Follow established safety procedures for handling apparatus and materials and use microscopes correctly and safely (SE 2.1)
- Use a microscope correctly and safely to find and observe components of plant and animal cells and make accurate drawings of their observations (SE 2.2)
- Prepare dry- and wet-mount slides of a variety of objects (SE 2.3)
- Use appropriate science and technology vocabulary in oral and written communication (SE 2.5)
- Use a variety of forms to communicate with different audiences and for a variety of purposes (SE 2.6)

Language

- Read and demonstrate an understanding of a variety of literary, graphical, and informational texts, using a range of strategies to construct meaning (Reading OE 1)
- Generate, gather, and organize ideas and information to write for an intended purpose and audience (Writing OE 1)

Assessment
Experiments, observation, students' notes and observations, students' explanations of chosen article, anecdotal

Teacher Notes
Continuing the grouping of cells into tissues, and tissues into organs, students will come to understand that groups of organs work together as organ systems. Organs do not work in isolation. The health of organ systems, organs, and tissues depends on the health of the cells. This brings the students back to the cells as the basic unit of life. Encourage discussion on the need for social justice issues with regard to the respect of life and how we need to respect and protect animals. You will need to find an article of a current event dealing with research and/or development and its affects on plant and animal life.

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Instruction

Time to Teach 15 minutes

- Discuss how long it takes for a cut to heal on your skin for example. How do the skin cells know what to do?
- Review the human organ systems (skeletal, muscular, circulatory, respiratory, nervous, digestive, excretory, integumentary, endocrine, and lymphatic systems)
- Present that no organ system in an animal is more important than the other. Present experiment purpose "Is it the same for plants?"
- Model an example of an article that deals with a current social issue regarding the latest development or research or finding with respect to animal and plant life
- Provide students with photographs to illustrate "biomes" as a grounding for how development can lead to problems that affect both plant and animal life

Time to Practice 15 minutes

- Students experiment whether one organ system is more important for the survival of a plant. Prepare scientific procedure using appropriate experiment. (small group)
- Students observe what happens to plant over the course of a few days to a week. (individual)
- Students begin to gather articles that deal with social issues regarding the developments in research that can affect plant and animal life (individual)
- List how Catholics can continue to protect these systems or take a stand on issues which do not reflect the teachings of Jesus

Time to Share 10 minutes

- Results from experiment can be recorded daily and observed at the beginning of each class
- Share articles from students when they are handed in. Use as a basis for class discussion (whole group)
- Allow time for discussion regarding protecting systems, plans for how Catholics can work together to provide for the health and well being of animals and plants

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Lesson 4.4 Cell Specialization

Purpose

To assess the potential that our understanding of cells and cell processes has for both beneficial and harmful effects on human health and the environment.

Essential Understandings

Catholic Curriculum Map Links

- Identify the Catholic view of social justice and its need in the world (7.3 SBM)
- Develop an awareness of acceptance and respect towards their bodies (6.1 SBM; 3.3 FA)
- Develop an understanding of their responsibility to participate in building a loving and just society (7.1, 3.1, 3.2 SBM; 5.1 FA)
- Develop an understanding of human rights (7.3 SBM; 5.2 FA)
- Identify the social justice issue of respect for life (7.1, 7.2, 7.3 SBM; 5.2 FA)
- Identify the personal qualities and skills that are needed to practice social justice: hope, empathy, critical thinking skills and creativity (1.4, 7.1, 7.2, 7.3 SBM; 5.3 FA)

Science & Technology

- Identify unicellular organisms and compare ways in which they meet their basic needs (SE 3.5)
- Describe the organization of cells into tissues, organs, and systems (SE 3.6)
- Follow established safety procedures for handling apparatus and materials and use microscopes correctly and safely (SE 2.1)
- Use a microscope correctly and safely to find and observe components of plant and animal cells and make accurate drawings of their observations (SE 2.2)
- Prepare dry- and wet-mount slides of a variety of objects (SE 2.3)
- Use appropriate science and technology vocabulary in oral and written communication (SE 2.5)
- Use a variety of forms to communicate with different audiences and for a variety of purposes (SE 2.6)

Language

- Use speaking skills and strategies appropriately to communicate with different audiences for a variety of purposes (Oral Communication OE 2)
- Read and demonstrate an understanding of a variety of literary, graphical, and informational texts, using a range of strategies to construct meaning (Reading OE 1)
- Generate, gather, and organize ideas and information to write for an intended purpose and audience (Writing OE 1)

Assessment

Observation, anecdotal, class discussion, students' responses, students' charts

Teacher Notes

Students observe adaptations to climate and speculate about structural specialization of plants. Students will identify specialized structures and explain how structural variation in plants permits adaptation to different environments. They will use models to explain how plants acquire the needed raw materials for photosynthesis. Encourage discussion about what happens when these needs are not met and how this influences other systems.

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Instruction

Time to Teach 15 minutes

- Define Catholic social justice. How do we as Catholics reflect this issue throughout the world and why?
- Review the difference between unicellular and multicellular animals, and the levels of organization in complex, multicellular organisms. Use an analogy to ground student learning (e.g. compare a school of today to a school 100 years ago, "What has changed? What has stayed the same? How have we adapted? What would happen if we didn't adapt? What has happened that might affect the school?)
- Discuss how we need to protect cells in the environment. Use examples of articles to support discussion on the need for protection
- Present the idea of chemicals and medicines that affect plants and animals (humans). Get students thinking about what happens to the systems when a substance is introduced? How does this affect the individual system? Does it affect other systems? Does it affect other outside systems? (e.g. chemicals in plants that animals eat)
- Share some human rights issues with regard to disposal of wastes and chemicals

Time to Practice 15 minutes

- Create a chart listing chemicals and medicines students have used lately. In the other column, students note how the materials they used were disposed. (individual)
- Groups discuss results of disposal (small groups)

Time to Share 10 minutes

- Groups share with class their findings about chemicals and medicines (whole class)
- Discuss whether chemicals or products should be made available before their effects on cells can be tested
- Discuss the results of disposing of chemicals and materials from group
- Share how does this information provide for us the viewpoint as Catholics that we are responsible for building a just society

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Subtask 5: Cell Biology Impact on Individual, Society, and the Environment

Description:
Students will assess the impact of cell biology on individuals, society, and the environment.

Lesson 5.1 Cell Wars
Purpose
Healthy organisms depend on healthy tissues and cells. Students will focus on the need for respecting cells as the basic unit of life and how diseases and viruses can easily be spread.

Essential Understandings
Catholic Curriculum Map Links

- Identify the Catholic view of social justice and its need in the world (7.3 SBM)
- Develop an awareness of how the human person is a reflection of God (2.1, 6.1, 6.2 SBM; 1.1 FA)
- Develop an understanding of human rights (7.3 SBM; 5.2 FA)
- Identify the social justice issue of respect for life (7.1, 7.2, 7.3 SBM; 5.2 FA)
- Identify the personal qualities and skills that are needed to practice social justice: hope, empathy, critical thinking skills and creativity (1.4, 7.1, 7.2, 7.3 SBM; 5.3 FA)

Science & Technology

- Assess the role of selected technologies in enhancing our understanding of cells and cellular processes (SE 1.1)
- Assess the potential that our understanding of cells and cell processes has for both beneficial and harmful effects on human health and the environment, taking different perspectives into account (SE 1.2)
- Use appropriate science and technology vocabulary in oral and written communication (SE 2.5)
- Use a variety of forms to communicate with different audiences and for a variety of purposes (SE 2.6)

Language

- Use speaking skills and strategies appropriately to communicate with different audiences for a variety of purposes (Oral Communication OE 2)
- Read and demonstrate an understanding of a variety of literary, graphical, and informational texts, using a range of strategies to construct meaning (Reading OE 1)
- Generate, gather, and organize ideas and information to write for an intended purpose and audience (Writing OE 1)

Assessment
Observation, class discussion, students' responses and charts

Teacher Notes
Cell biology is a growing field of study. New technology has allowed a wide range of areas of study and has enabled scientists to experiment further with cells. Review with the class the listed units above from the Religion texts, specifically chapter 5 in Fully Alive, to build a foundation for the class discussion about the topic.

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Instruction

Time to Teach 15 minutes

- Present a scenario where a new student joins the class. After a week, the student becomes ill. Shortly after, all the other students in the class become ill except for one.
- Suggest to students that they explain what is happening without the benefit of any knowledge of micro-organisms
- Focus student attention on the differences between a communicable and a noncommunicable disease. Present students with ideas of some diseases.
- Discuss how research about cells has helped in combating diseases. Share with students current Catholic criteria for bioethical investigation.

Time to Practice 15 minutes

- Students brainstorm possible scenarios that could explain the above scenario
- In groups, students decide which diseases are contagious, discuss the symptoms within their group and record their explanations
- Complete a list or chart of diseases caused by bacteria and viruses, allowing the students to research unfamiliar diseases
- List problems associated with their findings that conflict with Church teachings

Time to Share 10 minutes

- Groups share results of brainstorming to create a list of possible scenarios
- Groups share explanations of contagious diseases
- List/chart handed in
- Discuss why we should wash our hands
- Share solutions to the problems found in the practice section that we as responsible Catholics need to address

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Lesson 5.2 Impact of Research

Purpose

Students will begin to explore and assess the impact of cell biology on individuals, society, and the environment.

Essential Understandings

Catholic Curriculum Map Links

- Identify the Catholic view of social justice and its need in the world (7.3 SBM)
- Develop an awareness of how the human person is a reflection of God (2.1, 6.1, 6.2 SBM; 1.1 FA)
- Develop an understanding of human rights (7.3 SBM; 5.2 FA)
- Identify the social justice issue of respect for life (7.1, 7.2, 7.3 SBM; 5.2 FA)
- Identify the personal qualities and skills that are needed to practice social justice: hope, empathy, critical thinking skills and creativity (1.4, 7.1, 7.2, 7.3 SBM; 5.3 FA)

Science & Technology

- Assess the role of selected technologies in enhancing our understanding of cells and cellular processes (SE 1.1)
- Assess the potential that our understanding of cells and cell processes has for both beneficial and harmful effects on human health and the environment, taking different perspectives into account (SE 1.2)
- Use appropriate science and technology vocabulary in oral and written communication (SE 2.5)
- Use a variety of forms to communicate with different audiences and for a variety of purposes (SE 2.6)

Language

- Use speaking skills and strategies appropriately to communicate with different audiences for a variety of purposes (Oral Communication OE 2)
- Read and demonstrate an understanding of a variety of literary, graphical, and informational texts, using a range of strategies to construct meaning (Reading OE 1)
- Generate, gather, and organize ideas and information to write for an intended purpose and audience (Writing OE 1)

Assessment

Observation, students' research skills, checklists, anecdotal, written newspaper article (can use rubric), students' responses on chart

Teacher notes

Research projects in cell biology include working to stop diseases (e.g. cancer); regenerating nerve cells to repair spinal cord injuries; developing vaccines; discovering biological tools to aid in cleaning up the environment; stopping the spread of infectious diseases not yet discovered; and increasing world food production. You will need to bring in the social justice issue of whether all countries have access to the same technology and resources. If not, how are we called to help out in this world?

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Instruction

Time to Teach 10 minutes

- Present the idea of research in cell biology in each of the areas listed above
- Explain the 4 column chart the students will use in working within their group and researching and discussing their findings

Time to Practice 20 minutes

- Students research within groups one of the areas and create a mini report based on their findings. Students can create a simple advantages, disadvantages, interesting findings, and Catholic view 4 column chart to record observations
- Independently, students can write a newspaper article on one of the issues presented that they find the most interesting

Time to Share 10 minutes

- Students share with their class the findings of the group.
- Allow for discussion about the interesting findings column from each area
- Allow for opinions to be shared, but reinforce the notion of cell biology and God's respect for life and human rights to be addressed
- Should we test on animals? Should everyone get a flu shot? Should public smoking now be banned everywhere in the world? Should we use pesticides on plant crops? How far can we go in changing the basic unit of life? Should there be restrictions on the work one is allowed to do that changes the cells of living things? Cloning? In vitro?

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Subtask 6: Culminating Task - Medical Research Grant

Description:
As a culminating task students will create a presentation on a chosen disease in order to "apply" for a Medical Research Grant that will benefit society in dealing with the specific disease. They will research and present how the disease originates, how it affects every organ system in the body, how it affects other individuals, the availability of medicine to all people in different societies, and the impact on the environment this disease could have. Peers work as part of an Ethical Review Board to discuss the impact of the specific disease on society based on their presentations.

Purpose
In doing this presentation, students will:

- Develop an awareness of the Catholic view of social justice and their responsibility in society
- Assess the impact of cell biology on individuals, society, and the environment
- Investigate functions and processes of plants and animal cells
- Demonstrate an understanding of the basic structure and function of plant and animal cells and cell processes
- Identify the personal qualities that are needed to practice social justice and how we are called as Catholics to develop an awareness of human rights

Essential Understandings
Catholic Curriculum Map Links

- Identify the Catholic view of social justice and its need in the world (7.3 SBM)
- Develop an awareness of how the human person is a reflection of God (2.1, 6.1, 6.2 SBM; 1.1 FA)
- Develop an awareness of acceptance and respect towards their bodies (6.1 SBM; 3.3 FA)
- Develop an understanding of their responsibility to participate in building a loving and just society (3.1, 3.2, 7.1 SBM; 5.1 FA)
- Develop an understanding of human rights (7.3 SBM; 5.2 FA)
- Identify the social justice issue of respect for life (7.1, 7.2, 7.3 SBM; 5.2 FA)
- Identify the personal qualities and skills that are needed to practice social justice: hope, empathy, critical thinking skills and creativity (1.4, 7.1, 7.2, 7.3 SBM; 5.3 FA)

Science & Technology

- Assess the impact of cell biology on individuals, society, and the environment (OE 1)
- Investigate functions and processes of plant and animal cells (OE 2)
- Demonstrate an understanding of the basic structure and function of plant and animal cells and cell processes (OE 3)

Language

- Use speaking skills and strategies appropriately to communicate with different audiences for a variety of purposes (Oral Communication OE 2)
- Read and demonstrate an understanding of a variety of literary, graphical, and informational texts, using a range of strategies to construct meaning (Reading OE 1)
- Generate, gather, and organize ideas and information to write for an intended purpose and audience (Writing OE 1)

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Mathematics

- Apply a variety of data management tools and strategies to make convincing arguments about data (Data Management & Probability OE 2)
- Use probability models to make predictions about real-life events (Data Management & Probability OE 3)

Assessment of for Learning

Presentation of research and the ability to persuade, final rubric, peer assessment, observation, anecdotal

Teacher Notes

This culminating task will require a number of working sessions. Allow the students class time, as well as home time, to research and compile all the necessary information. They can use all of the work they have completed so far to aid in the research which supports their position. Provide diagrams and help students find specific information during the class work periods. For all members to present, depending on class size, they may work individually, or in small groups. If working individually, the presentation of their medical research to their peers may take two periods.

Instruction

Time to Teach 40 minutes

- Present the Medical Research Culminating task. Students will be asked to present their findings to their class in order to "win" a grant to continue to research their disease. The student who has presented the most persuasive facts about impacts on society and the need to further fund their research will be awarded the final "grant money".

Time to Practice 5 X 40 minutes

- Students research and create a presentation based on their chosen disease. Students' work should have diagrams, scientific examples of the processes this disease takes on cells, how this disease affects cell systems and therefore organs within the body, how the disease may affect others outside of the organ system, the impact this disease has on the society and the environment, and what research is already being done to help or stop the disease. Their persuasive argument needs to be present the case for more money to further aid in the development of resources to stop or protect society from this disease.

Time to Share 2 X 40 minutes

- Students present their research in the form of a presentation to their peers. Students can choose various methods to present (e.g. power point, video, speech, etc)
- Students as the audience become an Ethics Review Board that makes decisions based on the information presented on the ethical and moral implications of the disease on society

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Student Name: _____				
Categories	**Level 1**	**Level 2**	**Level 3**	**Level 4**
Knowledge and Understanding – Subject-specific content acquired in each grade (knowledge), and the comprehension of its meaning and significance (understanding)				
Knowledge of cells and the terminology specific to the unit	The student: • demonstrates limited knowledge of cells • demonstrates limited knowledge of the terminology specific to the study of cells	The student: • demonstrates some knowledge of cells • demonstrates some knowledge of the terminology specific to the study of cells	The student: • demonstrates considerable knowledge of cells • demonstrates considerable knowledge of the terminology specific to the study of cells	The student: • demonstrates thorough knowledge of cells • demonstrates limited knowledge of the terminology specific to the study of cells
Understanding of the impact of cell biology on humans, society, and the environment	The student: • demonstrates limited understanding of the impact of cell biology on humans, society, and the environment	The student: • demonstrates some understanding of the impact of cell biology on humans, society, and the environment	The student: • demonstrates considerable understanding of the impact of cell biology on humans, society, and the environment	The student: • demonstrates thorough understanding of the impact of cell biology on humans, society, and the environment
Thinking and Investigation - – The use of critical thinking skills and inquiry and problem-solving skills and/or processes				
Use of initiating and planning skills and strategies to identify the issue and how peoples' actions demonstrate social justice and the respect for life	The student: • uses initiating and planning skills and strategies to identify the issue and how peoples' actions demonstrate social justice and the respect for life with limited effectiveness	The student: • uses initiating and planning skills and strategies to identify the issue and how peoples' actions demonstrate social justice and the respect for life with some effectiveness	The student: • uses initiating and planning skills and strategies to identify the issue and how peoples' actions demonstrate social justice and the respect for life with considerable effectiveness	The student: • uses initiating and planning skills and strategies to identify the issue and how peoples' actions demonstrate social justice and the respect for life with a high degree of effectiveness
Use of processing skills and strategies to identify the positive and negative aspects of the issue	The student: • uses processing skills and strategies to identify the positive and negative aspects of the issue with limited effectiveness	The student: • uses processing skills and strategies to identify the positive and negative aspects of the issue with some effectiveness	The student: • uses processing skills and strategies to identify the positive and negative aspects of the issue with considerable effectiveness	The student: • uses processing skills and strategies to identify the positive and negative aspects of the issue with a high degree of effectiveness
Use of critical/creative thinking processes, skills and strategies to make connections between the issue and respect for all life	The student: uses creative/critical thinking skills and strategies to make connections between the issue and respect for all life with limited effectiveness	The student: • uses creative/critical thinking skills and strategies to make connections between the issue and respect for all life with some effectiveness	The student: • uses creative/critical thinking skills and strategies to make connections between the issue and respect for all life with considerable effectiveness	The student: • uses creative/critical thinking skills and strategies to make connections between the issue and respect for all life with a high degree of effectiveness

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Communication - The conveying of meaning through various forms				
Expression and organization of ideas and information in presentation format	The student: • expresses and organizes the ideas and information in letter format with limited effectiveness	The student: • expresses and organizes the ideas and information in letter format with some effectiveness	The student: • expresses and organizes the ideas and information in letter format with considerable effectiveness	The student: • expresses and organizes the ideas and information in letter format with a high degree of effectiveness
Communication in form of presentation to peers	The student: • communicates his/her knowledge of the issue in a presentation to their peers with limited effectiveness	The student: • communicates his/her knowledge of the issue in a presentation to their peers with some effectiveness	The student: • communicates his/her knowledge of the issue in a presentation to their peers with considerable effectiveness	The student: • communicates his/her knowledge of the issue in a presentation to their peers with a high degree of effectiveness
Use of conventions for presentation format, vocabulary, and terminology of the unit	The student: • uses conventions for letter writing, vocabulary, and terminology of the unit with limited effectiveness	The student: • uses conventions for letter writing, vocabulary, and terminology of the unit with some effectiveness	The student: • uses conventions for letter writing, vocabulary, and terminology of the unit with considerable effectiveness	The student: • uses conventions for letter writing, vocabulary, and terminology of the unit with a high degree of effectiveness
Application - The use of knowledge and skills to make connections within and between various contexts				
Application of knowledge of cells and cell processes, basic function and structures of cells, and the impact on individuals, society and the environment with respect to life	The student: • applies knowledge of cells and cell processes, basic function and structures of cells, and the impact on individuals, society and the environment with respect to life with limited effectiveness	The student: • applies knowledge of cells and cell processes, basic function and structures of cells, and the impact on individuals, society and the environment with respect to life with some effectiveness	The student: • applies knowledge of cells and cell processes, basic function and structures of cells, and the impact on individuals, society and the environment with respect to life with considerable effectiveness	The student: • applies knowledge of cells and cell processes, basic function and structures of cells, and the impact on individuals, society and the environment with respect to life with a high degree of effectiveness
Transfer of knowledge of cells to how we are called to a Christian life	The student: • transfers knowledge of cells to how we are called to a Christian life with limited effectiveness	The student: • transfers knowledge of cells to how we are called to a Christian life with some effectiveness	The student: • transfers knowledge of cells to how we are called to a Christian life with considerable effectiveness	The student: • transfers knowledge of cells to how we are called to a Christian life with a high degree of effectiveness

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Making connections between science, technology, society, and the environment through the understanding of the effects of human influence on cell biology	The student: • makes connections between science, and technology, society and the environment through the understanding of the effects of human influence on cell biology with limited effectiveness	The student: • makes connections between science, technology, society and the environment through the understanding of the effects of human influence on cell biology with some effectiveness	The student: • makes connections between science, technology, society and the environment through the understanding of the effects of human influence on cell biology with considerable effectiveness	The student: • makes connections between science, technology, society and the environment through the understanding of the effects of human influence on cell biology with a high degree of effectiveness
Proposing courses of practical action to deal with problems relating to the issue	The student: • proposes courses of practical action relating to the issue of limited effectiveness	The student: • proposes courses of practical action relating to the issue of some effectiveness	The student: • proposes courses of practical action relating to the issue of considerable effectiveness	The student: • proposes highly effective courses relating to the issue of practical action