

REPRODUCTION UNIT SKETCH

Essential Question: How does life keep going on?

WEEK 1	Monday	Tuesday	Wednesday	Thursday	Friday
Essential and Guiding Questions	<i>-How does life keep going on? - How a small cluster of trees become a forest?</i>	<i>-How many ways of “making more” do you know?</i>	<i>-In what ways is sexual and asexual reproduction similar and different?</i>	<i>-How does one cell become millions of cells?</i>	<i>How does the environment affect cell division?</i>
Learning Opportunities	Introduce essential question. Brainstorm. Prior knowledge. Pose question: <i>How does a small cluster of trees become a forest?</i> Read aloud, think pair share. Have students read “ <i>The Aspen Story</i> ”	Videodisc or video: “ <i>nature of sex</i> ” or “ <i>what is going on here?</i> ” (students are exposed to a number of scenes on reproduction) Have students write what they think is going on in each scene. Group work and analysis	Group work: explore similarities and differences in “ways of making more” by comparing information from a pair of organisms. Compare and contrast characteristics questioning	Answer question, visual presentation of cell division, (charts, transparency videodisc, etc. Demonstration and modeling of chromosomes. Have students write their understanding on the significance of cell division or mitosis	Lab activity: “ <i>How does the environment affect cell division?</i> ” Inquiry type investigation, hypothesizing, planning, designing and carrying out experiment. Analysis questions and conclusions. Further investigation
Assessment and Reflection	Prior knowledge, reading comprehension, questions	Writing skills Observation	Oral presentation. Questioning, informal assessment	Questioning, oral presentation, informal assessment, modeling	Analysis questions and conclusions, Laboratory report
Standards	4.1a 4.1b	4.1b	4.1a 4.1b	4.1a 4.1d	Standard 1 4.1b

REPRODUCTION UNIT SKETCH

Essential Question: How does life keep going on?

WEEK 2	Monday	Tuesday	Wednesday	Thursday	Friday
Essential and Guiding Questions	Continuation lab activity: <i>How does the environment affect cell division?</i>	<i>How are sex cells different from the rest of body cells?</i>	<i>What does it take to make an offspring?</i>	What makes a man a man? <i>What does it take to be a male?</i>	What makes a woman a woman? <i>What does it take to be a woman?</i>
Learning Opportunities	Carrying out the experiment and Analysis and conclusions	Have students observe different cells, compare and contrast. Guiding questions. Use audiovisual materials to introduce sex cells formation. Use diagrams and models to represent sequence of events.	<i>Elaborate on question.</i> Use models, charts or transparency to illustrate genetic recombination in sexual reproduction. Have students model this process. Use audio-visual material to illustrate this process	Brainstorm guiding questions. Display models, charts and transparency. Have students compare and contrast male and female characteristics. Use videodisc to illustrate the major organs of the male reproductive system	<i>Brainstorm guiding questions.</i> Display charts and models of the female reproductive system. Use audio-visual material to aid in understanding of the major organs of the female reproductive system. Compare and contrast male and female.
Assessment and Reflection	Lab report	Oral presentation, questions with diagrams	Modeling, observation, oral presentation	Pre-test, oral presentation, questioning, modeling	Pre-test, oral presentation, questioning, modeling
Standards	1 4.1b	4.1c 4.1f	4.1a 4.1c 4.1f	4.1e 4.1g	4.1f 4.1g

Unit Topic/Essential Question: How does life keep going on?

Aim/Guiding Question: Students are introduced to the essential question:
How does life keep going on?

Objectives

Students will be able to:

- Understand that living things are produced from other living things of the same kind.
- Understand that reproduction is necessary for continuity.

New Terms:

Reproduction

Offspring

Materials/Preparations:

Class set of the story “ The Aspen Story” from BSCS Biology a Human Approach” (p.215)

Time (min)	Development	Instructional Strategies
5	Introduce essential question: How does life keep going on? Teacher will ask about what students know about the essential question. Share responses.	(Do now) question
5	Think about the following question and record your response in your journal. <i>How does a small cluster of trees become a forest?</i> Allow some time. Share responses. To help students in this task introduce the essay, "The Aspen Story", (See attached).	Guiding question, Motivation
15	Distribute copies of the story: "The Aspen Story". Read aloud to students. Have students re-read story under teacher guidance and with questions. While reading, ask for meanings of words and check for understanding. At this point it is important to introduce new terminology such as: reproduction, offspring, descendants, genetic, etc.	Reading aloud, Think-pair-share
10	Go over life functions and pose the following questions: <i>Is reproduction essential for the survival of an individual?</i> <i>Is reproduction essential for the survival of a species?</i> <i>Have students respond and share responses. Ask students to explain their responses and check for understanding. Give examples.</i>	Direct instruction, Review, Assessing prior, knowledge Sharing responses

5	Pose the following question: How does life continue on Earth? Have students summarize lesson in note books and check for understanding.	Note taking, Review and questioning
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Suggested Homework:

Assign a list of different organisms, including animals, plants and bacteria, and ask students to explain how these organisms reproduce.

References

Prentice Hall, Biology- The Study Of Life: p. 396

BSCS Biology – A Human Approach: p. 214-215

Standards Addressed:

Key Ideas: 4.1a, 4.1b

Unit Topic/Essential Question: How does life keep going on?

Aim/Guiding Question: How many ways of “making more” do you know?

Objectives

Students will be able to:

- Appreciate the diversity of reproductive strategies
- Distinguish between sexual and asexual reproduction

New Terms:

Sexual reproduction
 Asexual reproduction
 Fertilization
 Internal and external fertilization

Materials/Preparations:

Monitor, VCR
 Video: “Nature of Sex” _____ or videodisc, *What’s Going on Here?* _____
 Charts, cards with different species

Time (min)	Development	Instructional Strategies
5	<i>Review</i> homework and introduce guiding question: <i>How many ways of making more do you know?</i> Challenge students to describe different forms of reproduction by posing the following question: <i>Have you ever thought about how organisms that are very different from you reproduce?</i> (For example bacteria, and other single cells organisms.)	(Do now), Prior knowledge, Motivation

15	<p>To help students come up with viable explanations to the previous question Introduce videodisc: <i>What's Going on Here?</i> Or the video "<i>Nature of sex</i>". In both, the students are exposed to brief scenes that demonstrate a range of reproductive behaviors in a variety of organisms. While watching the video have students formulate an explanation of what must be going on each scene. Have students also compare and contrast different ways of reproduction. Expect students to come up with two types of reproduction, one in which only one parent is involved (asexual) and the other in which two parents are involved (sexual). During this activity students should keep notes in their journals, or immediately after viewing.</p>	Video analysis, Compare/contrast, Independent work, Taking notes
10	<p>After watching the video and finishing the previous assignment, ask students to form groups of three or four. Members of each group should share and discuss their notes about the video. As the teams study their work, circulate and listen to their discussion to assess their conceptual understanding of sexual and asexual reproduction. Intervene if any misconception arises or to facilitate understanding.</p>	Think-pair-share, Ongoing teacher/Peer-feedback
15	<p>As a group use a large sheet of paper or poster board to create a visual presentation of your understanding of sexual and asexual reproduction. Select one member to make a brief oral-visual presentation to the class. As each group listen to the other groups' presentation, they should take notes that they can incorporate into their presentation. Make sure to include the following questions in your presentation:</p> <ul style="list-style-type: none"> • How are the two types of reproduction similar and different? • What are the advantages and disadvantages of the two types of reproduction? • How would each one of us look like if we were all reproduced asexually? Explain. 	Response to guide questions, Schematic drawings, Discussion, Informal assessment

Suggested Homework:

Make duplicates of the essay: "Continuity through Reproduction" from BSCS Biology, A Human Approach. Each student should read this essay and answer questions. It is suggested that teacher reads it first to decide what type of question will be given to students.

Some suggested questions are:

1. What biological function is served by making more organisms?
2. Life is a continuous process. What does this statement mean?
3. List three differences between asexual and sexual reproduction. Be specific.
4. Why is reproduction essential for the survival of a species and not for the survival of a single organism?

References

BSCS Biology – A Human Approach: E142-143

Standards Addressed

Key Ideas: 4.1a, 4.1b

Unit Topic/Essential Question: How does life keep going on?

Aim/Guiding Question: In what ways are sexual and asexual reproduction similar and different?

How does each way ensure survival of the species?

Objectives

Students will be able to:

- Distinguish between the similarities and differences of specific reproductive strategies
- Describe the advantage and disadvantage of sexual and asexual reproduction
- Understand the biological function of reproduction

New Terms:

Same as previous lesson

Materials/Preparations:

Charts cards or poster with pictures of different species. BSCS Biology A Human Approach has a complete set of these cards. Teachers can prepare their own, too.

Time (min)	Development	Instructional Strategies
5	Begin this activity by calling students' attention to the guiding question. Begin a discussion about sexual and asexual reproduction by recalling information from yesterday's lesson. Students should provide specific evidence from the videodisc and video shown the day before.	Do now, Prior knowledge, Brainstorming
10	Distribute copies of pictures of two different organisms that have different reproductive strategies. E.g. bacteria and birds, horses and ameba, etc. Make certain that each team has two different species to consider and that the two choices represent a sufficient diversity to show similarities and differences in the reproductive strategies. As the teams study their cards, or pictures, and look for similarities and differences, circulate and listen to their discussions to assess their current understanding. Suggest significant characteristics if the students are having trouble getting started. For example, salmon and frogs both fertilize eggs externally in water, but frog eggs hatch tadpoles in just a few days. Salmon eggs, on the other hand, hatch after several months. Encourage students to take notes. They will use this information in the next section.	Group work, Visual identification, Note taking, Compare/contrast, Conferencing group-teacher
20	Each group should prepare a short presentation. In their presentation they should address the following questions:	Guiding questions,

	<ol style="list-style-type: none"> 1. What are some of the characteristics of the reproductive strategies of each organism? They might include characteristics such as: <ul style="list-style-type: none"> • <i>The number of offspring produced during each reproductive cycle</i> • <i>The frequency of the reproductive cycle</i> • <i>The structures that are involved in reproduction</i> • <i>The lifespan of individuals</i> • <i>The mating behavior</i> 2. How does each strategy ensure survival of the species? 3. What complex organism do you have? What makes it complex? 4. What simple organism do you have? What makes it simple? 5. How do the reproductive strategies of simple and complex organisms differ? 6. Why might large number of offspring be beneficial to survival of a species? 	<p>Discussion, Oral presentation, Compare/contrast</p>
5	<p>When the presentations are finished, facilitate a class discussion. Make sure that students understand the terms: fertilization, internal and external, and offspring. Students record definitions and give examples.</p>	<p>Questioning, Informal assessment</p>

Suggested Homework:

Teacher may assign questions from textbooks, or a research paper about a specific type of reproduction or cloning.

References:

BSCS Biology – A Human Approach: Copymasters 10.la – 10.lp

Standards Addressed

NYS MST Standard 4, Key Idea 2.1e, 4.

Unit Topic/Essential Question: How does life keep going on?

Aim/Guiding Question: How does one cell become millions of cells?

Objectives

Students will be able to:

- Understand the two basic processes involved in cell division
- Appreciate the significance of mitosis

New Terms:

mitosis
 cytokinesis chromosomes
 cancer interphase

Materials/Preparations:

Growth chart (optional)
 Strips of paper (12”) – enough for entire class
 (1) strip of 100” long paper
 Tape
 Colored pencils or markers
 Model, Diagram, or Video of Mitosis

Time (min)	Development	Instructional Strategies
5	Do-Now: Present the class with a chart illustrating the life process of growing. Teacher will ask what students know about this process. Brainstorming.	Do-Now, Brainstorming
5	Think about the following questions and record your responses in your journal: <i>What is growth?</i> and <i>How does it occur?</i> . Allow discussion until students come up with viable explanations.	Read aloud, Guiding questions
10	Give each student a strip of paper about 12 inches long. Have students cut this strip of paper into four pieces of variable length. Next instruct them to fold each of the four pieces in half and cut them again. Then they should place a dot of one color on one member of each pair of strips and a dot of a different color in the matching strip fragment. Then tape two pieces of strip to your chalkboard, one 100 inches long and the other 12 inches long. <i>Indicate to students that these two pieces of strips of paper represent the length of unraveled DNA found in the nucleus of the body cells of a human and a fruit fly, respectively. Indicate that this amount of DNA is cut up into eight assorted pieces in the fruit fly and 46 in a human. Note that their eight "chromosomes" are really four matching pairs. The two colors indicate that one of each pair originally came from the father and the other from the mother.</i> Think about the following questions and record your responses in your journal: In order for a cell to reproduce, what must it do to this DNA?	Demonstration, Modeling, Taking notes, Questioning

10	Use models, diagrams or videos (Britannica) to show the events that take place during mitosis. Have students formulate an explanation of what must be happening to the cell during each stage of mitosis. In this activity students work in groups of three or four.	Modeling, Video analysis, Group work, Analysis of models
10	<p>Each group should make a short presentation (3min) on the events that take place during mitosis. In your presentation answer the following questions:</p> <ul style="list-style-type: none"> • <i>Describe the major events that take place during cell division.</i> • <i>What is accomplished by mitosis in terms of the genetic information of a cell?</i> • <i>How would mitosis be affected if DNA were prevented from replicating? Why?</i> 	Group work, discussion, Informal assessment

Suggested Homework: Have students prepare a research paper on cancer. They should include causes, mechanism and give some examples of common cancers.

References:

Standards Addressed:

Unit Topic/Essential Question: How does life keep going on?

Aim/Guiding Question: How does the environment affect cell division?

Objectives

Students will be able to:

- Demonstrate understanding of mitosis
- Prepare slides of onion root tips to observe mitosis
- Make a hypothesis to describe the effect of caffeine (or other factor) on mitosis
- Compare the growth of onion roots in water and caffeine (or other factor)

New Terms:

mitosis

cytokinesis

interphase

chromosomes

cancer

Unit Topic/Essential Question: How does life keep going on?**Aim/Guiding Question: How are sex cells different from the rest of body cells?****Objectives*****Students will be able to:***

- Explain the importance of meiosis in sexual reproduction
- Sequence the series of events by which reproductive cells are produced
- Analyze the significance of meiosis with respect of evolution

New Terms:

meiosis
gametes
diploid
haploid
crossing-over

Materials/Preparations:

Video, monitor, charts illustrating the process of meiosis, charts illustrating different type of cells

Prepared handouts with questions

Time (min)	Development	Instructional Strategies
5	Do Now: Show to the class a chart with different type of body cells (e.g. brain, muscle, skin, reproductive cells, etc.) and write the following questions: <ul style="list-style-type: none"> • How are these types of cells similar and how are they different? 	Review, Motivation
5	<i>Challenge student's responses by posing the following questions:</i> <ul style="list-style-type: none"> • <i>How many chromosomes does it take to make a cell?</i> • <i>If these were human cells, would all of them contain the same genetic material?</i> • <i>What would happen if the reproductive or sex cells contained the same genetic material?</i> Lead the class to an open discussion about the need to have specialized sex cells with half the amount of chromosomes of body cells to prevent duplication of the number of chromosomes on each generation. Introduce new vocabulary: meiosis, diploid, haploid, gametes, fertilization etc.	Discussion, Guiding questions, Note taking, Vocabulary development

15	<p><i>Use a video to show the process of gamete production, meiosis, (oogenesis and spermatogenesis). Stop the video as necessary to concentrate on the pairing of homologous chromosomes and synapsis as the events that effectively shuffle up the genetic information. Mention the crossing over phenomenon. Stress the role of this genetic recombination in promoting variation among the species. Make use of charts to aid in explaining this process.</i></p>	<p>Guided learning, Video presentation</p>
15	<p><i>Prepare handouts, illustrating the process of meiosis in males and females. Make sure to include the following questions:</i></p> <ul style="list-style-type: none"> • After meiosis how does the number of chromosomes in new cell compare with those in the original cell? • Compare and contrast meiosis in males and females. • Why is meiosis essential for the survival of a species? • <i>What is the role of meiosis in evolution?</i> 	<p>Note taking, Discussion, Sharing</p>

Suggested Homework:

References:

Standards Addressed:

Unit Topic/Essential Question: How does life keep going on?

Aim/Guiding Question: What does it take to make an offspring?

Objectives

Students will be able to:

- Explain advantages of sexual reproduction over asexual reproduction
- Explain how fertilization takes place
- Distinguish between internal and external fertilization

New Terms:

gametes
sperm
egg
zygote
fertilization

Materials/Preparations:

Monitor, VCR, Video: Unity and Diversity, models, charts, overhead projector

Time (min)	Development	Instructional Strategies
5	<p><i>Write on board: Where do living things come from? Allow discussion until students come up with the concept that all living things come from other living things of the same species. Give examples.</i></p>	<p>Writing, Motivation</p>
15	<p><i>Ask: for an organism to make another organism, what is necessary? Solicit as many answers as possible. Use this opportunity to assess students' understanding on sexual and asexual reproduction.</i></p> <p><i>Record on board students' responses. Point out that almost all living things large (elephant) and small (frog) begins life as a single cell. Explain that most single cell organism reproduce by simple cell division (mitosis), but more complex organisms cannot reproduce in the same way. Point out that one of the greatest achievements of life was the appearance of sexual reproduction, combining genes of two parents to produce a unique offspring.</i></p> <p><i>Look for opportunities to help students make connections back to the concept of sexual reproduction and evolution. Ask them to recall some of the benefits of sexual reproduction by posing the following questions:</i></p> <ul style="list-style-type: none"> • <i>If you have a good set of genes, why mix it up?</i> • <i>Wouldn't be much better to make an identical copy of yourself?</i> • <i>If you live well, if you are well adapted to your environment, why take chance of mixing up your genes?</i> <p><i>Allow some time for discussion until students come up with plausible explanations. If students have trouble making the connection, intervene and explain. For example:</i></p> <p><i>If you are beautifully adapted to one set of conditions and all your offspring</i></p>	<p>Brainstorming Reviewing, Direct instruction, Feedback, Guiding questions, Vocabulary development</p>

	<p>are identical to you, but the conditions change, could this be a problem for your offspring. Sexual reproduction produces a great variety of different offspring and this ensure that at least some of them will have a reasonable chance to be adapted to changing conditions. Sexual reproduction promotes variation among the species.</p> <p><i>Ask: What is a fertilized egg? Introduce the term zygote.</i> <i>At this point you may use a transparency, chart or models to show the process of fertilization.</i></p> <p><i>Ask: The fusion of what two cells lead to the formation of a zygote?</i> <i>Write on board their answers. Introduce and define sperm and egg. Take this opportunity to assess students' understanding of meiosis, by asking what process is responsible for the production of these sex cells? Can you explain what important event occurs during that process?</i></p>	
15	<p><i>Present to the class a video or videodisc about fertilization in different kind of organisms. Ask the students to think about the following questions as they watch the video:</i></p> <ul style="list-style-type: none"> • How is the number of eggs produced related to the method of fertilization? • What adaptations in aquatic animals help ensure that external fertilization will occur? • What advantages for land animals does internal fertilization have over external fertilization? 	Video, Think-pair-share, questioning
10	<p>After students have finished watching the tape or videodisc, have each students participate in a class discussion about internal and external fertilization. <i>Ask students to answer guiding question: What does it take to make an offspring?</i> Allow discussion until students come up with a viable explanation: In sexual reproduction all living things develop from a single fertilized cell, the zygote. Use transparency to show the process of fertilization. <i>Ask:</i></p> <ul style="list-style-type: none"> • <i>What is accomplished by this process in terms of genetic information of a cell?</i> • <i>Compare the variety among offspring produced in this way with the variety among offspring produced by mitosis.</i> • <i>How does fertilization increases genetic variation?</i> 	Group work, Presentation, Informal assessment

Suggested Homework:

Answer the following questions:

1. Why does asexual reproduction result in a clone? Explain.
2. Explain how asexual reproduction in animals can result in an entire population of females with no males.

3. Why is the reduction of chromosome number important in sexual reproduction?
4. Why are the chromosome number of species even numbers rather than odd numbers?
5. How does sexual reproduction affect genetic variation among individuals of a species?
6. How are meiosis and fertilization complementary process?

References:

Standards Addressed:

Unit Topic/Essential Question: How does Life keep going on?

Aim/Guiding Question: What makes a man a man? What does it take to be a male?

Objectives

Students will be able to:

- Identify the reproductive parts of the male reproductive system
- Relate the male reproductive structures to its function
- Trace the path of sperm from its site of formation to the outside

New Terms:

testes	scrotum
epididymis	Vas deferens
prostate gland	seminal vesicles
semen	penis
ejaculation	

Materials/Preparations:

Monitor, VCR, videodisc or videotape on male reproductive system
 Charts and models of male reproductive system
 Unlabeled diagram of male reproductive system
 Large paper or poster board

Time (min)	Development	Instructional Strategies
5	<p>Do-Now: <i>Write</i> on board: In what ways are men different from women? Allow some time for discussion. Be ready to accept possible answers. You might want to write them on the board or transparency. <i>Ask</i> students whether each answer is correct or not, and explain what is right and wrong about the answers. Keep the discussion going until their attention remains focused on the reproductive organs.</p>	Brainstor-ming, Compare/contrast, Questioning
20	<p>Group students in threes or fours. Explain to them that they will be watching a video about the Male Reproductive System. If a video is unavailable you may use a chart or a model or even their textbooks. Before they start, distribute handouts of the male reproductive system. Make sure that the diagram is unlabeled. Along with the diagram distribute the following questions:</p> <ol style="list-style-type: none"> 1. Where are the male gametes produced? 2. Which part of the male reproductive system is located outside the body? Why? 3. Trace the path of sperm from the testes to the outside of the body? 	Group work, Video analysis, Think-pair-share, Guiding questions

	In what ways do the prostate gland and seminal vesicle help the sperm?	
20	<p>After watching the video and having finished with the previous assignment, ask each group to make a presentation to the class. In the presentation they will use the video again but with the sound off. They will describe each organ and explain its function in reproduction. They should trace the path of sperm from the testes to the outside.</p> <p>As each group listens to the other group's presentation they should take notes that they can incorporate into their presentation.</p> <p>Make sure that they refer to the following structures in their presentation:</p> <ul style="list-style-type: none"> • Testis • Epididymis • Scrotum • Penis • Vas deferens • Prostate gland, seminal vesicles 	Group discussion, Oral presentation

Suggested Homework:

Selected text readings and questions.

References

Standards Addressed:

Key ideas: 4.1g

Unit Topic/Essential Question: How does life keep going on?**Aim/Guiding Question: What makes a woman a woman?
What does it take to be a female?****Objectives*****Students will be able to:***

- Identify the reproductive parts of the female reproductive system
- Relate the female reproductive structures to its function

New Terms:

ovaries oviduct or Fallopian tubes
uterus cervix
vagina

Materials/Preparations:

Monitor, VCR, videodisc or videotape on female reproductive system
Charts, models of female reproductive system
Large paper or poster board

Time (min)	Development	Instructional Strategies
5	Do-Now: write on board: In what ways is a woman different from a man? Allow some time for discussion. Be ready to accept possible answers. As the students answer, write all answers on the board or a transparency. Ask student whether each answer is correct or not, and explain what is right and wrong about the answer. Keep the discussion until their attention remain focus on the reproductive organs.	Brainstorming, Compare/ contrast, Questioning
20	Explain to them that they will be working on an activity very similar yesterday's. They might want to work in the same group or in different groups. Distribute hand outs of the female reproductive system (unlabeled). If videos are unavailable you may use the same resources as previous lesson. You may want to write on the board the following questions: <ol style="list-style-type: none"> 1. Where are the eggs produced? 2. What is ovulation? 3. How long does it take for an egg to be released? 4. What happens after the egg is released? 5. Where does fertilization take place? As the students watch the video. Walk around the room and be available for	Group work, video analysis Think-pair-share, Guiding questions

	individual questions.	
20	<p>After watching the video and having finished with their previous assignment, ask each group to make a presentation to the class. In their presentation they will use the video again but with the sound off. They will describe each organ and relate them to its function.</p> <p>Make sure that they refer to the following structures in their presentation:</p> <ul style="list-style-type: none"> • Ovaries • Egg • Fallopian tubes or oviducts • Uterus • Vagina • cervix. 	

Suggested Homework:

References

Standards Addressed

Materials/Preparations:

Onion bulbs (4), toothpicks, 150-ml glass jars (4), different concentration of any environmental factor (caffeine, etc), microscope, metric ruler, scalpel, distilled water, paper towels, slides (4), cover slips (4), Feulgen stain, fixative, 3%HCl, 45% acetic acid, forceps, graduated cylinders (2), test tubes (8)

Time (Min)	Development	Instructional Strategies
10	<p><i>Start the lesson by reviewing cell division in both animal and plant cells (mitosis)</i></p> <p><i>You may use videodisc or transparency to illustrate the stages of mitosis.</i></p> <p><i>Introduce guiding question: How does the environment affect cell division?</i></p> <p><i>Brainstorm and write possible answers on the board.</i></p> <p><i>Discuss with students about anything that might influence mitosis and what could the impact of this on the health of the plant or animal.</i></p>	<p>Do-Now, Brainstorming, Guiding question</p>
10	<p>Tell the students that the next activity or investigation will allow them to make a simplified study of the relationship between the environment and mitosis. Tell them that first they will observe onion bulbs grow roots by mitotic division. Then you will test the rate of growth of the same onions when exposed to an environmental chemical (you may decide on any available material that you are familiar with, such as caffeine, alcohol, etc.)</p> <p>One month before conducting this investigation, plant an onion bulblet in the top of a glass jar or test tube filled with water. Gently scrape the base of each bulblet with a knife before planting. Be sure that the base of the bulblet is always in water. Make sure light is adequate when leaves begin to form.</p>	<p>Group work, Guiding Questions, Research</p>

	Have students research on growth of onion root tips.	
25	<p>Problem: What part of an onion root grows most rapidly? Develop a hypothesis base on your knowledge of mitosis and your previous research. Make sure to explain your reasons for making your hypothesis.</p> <ol style="list-style-type: none"> 1. As a group, make a list of possible ways you might test your hypothesis using the materials your teacher has made available. 2. Agree on one idea from your group's list that could be investigated in the classroom 3. Design an experiment that will test one variable at a time. 4. Write the procedure. You may list all directions that anyone could follow 5. Make a list of all materials and quantities you will need. 	Conferencing, Feedback, Guiding questions, Experimentation, Think-pair-share, Using scientific method
5	<p><i>During the last five minutes of this period make sure that students have followed instructions and have answered the questions above. Tell students that the next day or next period they will proceed to discuss some important points about this investigation.</i></p>	Taking notes, Questioning
10	<p>Next day give students the following questions:</p> <ol style="list-style-type: none"> 1. What variables will need to be controlled 2. What is your control? 3. What will you measured or count? 4. How will you determine which part of the root tip is growing fastest? 5. How many cells or roots will you count, measure, or examine? 6. Have you designed and made a table for collecting data? <p>After discussing these questions, agreed with your partner and carry out your experiment, make your measurements, and complete your data table. Make a graph of your results.</p>	Guiding questions, Group work problem solving, Graphing, Collecting data, Discovery learning
20	<p>Analysis and Conclusions</p> <ol style="list-style-type: none"> 1. According to your results, which part of the onion root is growing fastest? 2. What is the experimental evidence for this conclusion? 3. Was your hypothesis supported by your data? Explain 4. Consult with other groups. Were their conclusions the same as yours? Why or why not? 5. Speculate about why onion roots grow rapidly in some regions and not in others. 6. Write a conclusion to your experiment. 	Guiding questions, Compare contrast, Writing process, group work
15	Have each group explain major findings.	Oral presentation

Suggested Homework:

Design the second part of this investigation.

References

Standards Addressed:

Key Ideas 4: 4.1b