CCPS Science Unit Plan

Grade	9-12	**Subject**	Science	**Unit #**	1
Unit Name	Cells		**Timeline**	3 Weeks	
How to use the Framework	This Framework should be used to implement daily science instruction. The resources and instructional strategies reflected in the Framework will provide a foundation for effective implementation and student mastery of standards. Please see the hyperlinked abbreviation document to ensure understanding all abbreviations used with this framework.				
Unit Overview	The Cells unit provides students with a foundational understanding of cells, focusing on their structure, function, and interactions. Students explore cell organelles, cellular processes like respiration and photosynthesis, macromolecules, and mechanisms of cellular regulation. Emphasis is placed on real-world applications and critical thinking skills, preparing students to understand the complexities of living organisms at the cellular level. Through laboratory investigations and inquiry-based learning, students develop scientific literacy and an appreciation for the interconnectedness of biological systems. ***Students and their parents must review, sign, and submit the following safety acknowledge form prior to the first lab.**				
Lesson Plan guidance document and template	Department of Science Guidance Document Lesson Plan Template Week View GADOE Science Updates				
3Dimensional Instruction	**GSE**	**Science and Engineering Practices**	**Crosscutting Concepts**		
	SB1. Obtain, evaluate, and communicate information to analyze the nature of the relationships between structures and functions in living cells.	Developing and Using Models Constructing Explanations and Designing Solutions Using Mathematics and Computational Thinking Scientific Investigations Asking Questions and Defining Problems	Energy and Matter Structure and Function Stability and Change Systems and System Models		
NGSS Alignment	NGSS Alignment to Disciplinary Core Ideas				

Weekly Lesson Tasks

Week 1	
GSE: SB1. Obtain, evaluate, and communicate information to analyze the nature of the relationships between structures and functions in living cells.	**Focused Concept: SB1c.** **Construct arguments supported by evidence to relate the structure of macromolecules (carbohydrates, proteins, lipids, and nucleic acids) to their interactions in carrying out cellular processes. (Clarification statement: The function of proteins as enzymes is limited to a conceptual understanding.)**

SEP Constructing Explanations and Designing Solutions			CCC: Energy and Matter		
Phenomenon: What do bacteria do in your Intestines? (unit long)			**DQ: How do structures work together in cell systems? Pgs. 148-149**		
	Day 1	**Day 2**	**Day 3**	**Day 4**	**Day 5**
Learning Target	**Students will be able to construct an argument using evidence showing how the structure of macromolecules helps them function to carry out the cellular processes.**	**Students will be able to construct an argument using evidence showing how the structure of macromolecules helps them function to carry out the cellular processes.**	**Students will be able to construct an argument using evidence showing how the structure of macromolecules helps them function to carry out the cellular processes.**	**Students will be able to conceptualize the function of proteins as enzymes.**	**Students will be able to conceptualize the function of proteins as enzymes.**
Opening (10-15 minutes) **Essential Vocabulary this week:** amino acid ATP carbohydrate cellulose DNA glucose glycogen lipid monomer nucleotide nucleic acid polymer protein starch activation energy catalyst chemical reaction enzyme equilibrium product reactant substrate	• Show students the phenomenon and the reading passage on pages 108-109. • Use the See-Think-Wonder protocol to guide student thinking. • Teachers should provide students with opportunities to share observations and develop questions. -The students can record questions in whole groups or small groups. After the Discussion, ask the student the following question. You went to the doctor to get a prescription for an antibiotic for an illness. Why did the doctor give you an antibiotic? Plan to discuss. Use TB 109 (teacher ed.)	• Show students the phenomenon and reading passage on page 126. • Use the See-Think-Wonder protocol to guide student thinking. • Teachers should provide students with opportunities to share observations and develop questions. -The students can record questions in whole groups or small groups. Connect to the phenomena with the questions. The teacher should ask how this relates to the bacteria in your intestines. Teachers should provide students with opportunities to share	• Show students the phenomenon and read the passage on page 136 in the Textbook. The "Video 1" aligned to visual is available in Media Library Chapter 5 • Use the See-Think-Wonder protocol to guide student thinking. • Teachers should provide students with opportunities to share observations and develop questions. -The students can record questions in whole groups or small groups. Connect to the phenomena with the questions. Using your new knowledge. How would you explain what bacteria do in your intestines?	• Show students the phenomenon image. •Use the See-Think-Wonder protocol to guide student thinking in conjunction with the "Bacteria in your Gut" on page 147. • Use the See-Think-Wonder protocol to guide student thinking. • Teachers should provide students with opportunities to share observations and develop questions. -The students can record questions in whole groups or small groups.	• Show students the phenomenon image. • Use the See-Think-Wonder protocol to guide student thinking. • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. Bell work: Display the reading prompt on page 137 in the textbook. Have the students answer the question. Explain - How do you think cooking a food source changes it into a different substance?

		observations and develop questions. -The students can record questions in whole groups or small groups.			
Guided Practice/ Transition (20 minutes)	TTW, show the microbe found on the biology ebook platform. Break the class into groups of 3 and give each person a reading section on page 110. Have each group write a headline for the main idea of the paragraph. Have them share out. Discuss the Thinking Critical question as a class. Watch the Explorer at Work video, if available afterward. Have students write a summary of what they believe bacteria are doing in their intestines.	TTW, provide 15-20 minutes of direct instructions. Use the objectives below for your direct instruction. Lecture notes are provided in online teacher resources. Relate monomers, polymers, and hydrocarbons. Describe the structure of carbohydrates and their functions in organisms.	TTW, provide 15-20 minutes of direct instructions. Use the objectives below for your direct instruction. Lecture notes are provided in online teacher resources. Describe the structure of lipids and their functions in organisms. Explain the relationship between nucleotides and nucleic acids. Explain the relationship between amino acids and proteins.	TTW, provide 15-20 minutes of direct instructions. Use the objectives below for your direct instruction. Lecture notes are provided in online teacher resources. Explain the process of chemical reactions in biological systems. Describe how energy in organic molecules is released during chemical reactions and used for cellular processes. Characterize a reaction reaching equilibrium. Summarize how catalysts affect the rate of reactions.	TTW, provide 15-20 minutes of direct instructions. Use the objectives below for your direct instruction. Lecture notes are provided in online teacher resources. Characterize a reaction reaching equilibrium. Summarize how catalysts affect the rate of reactions.
Independent Practice (45-50 minutes) **Lab Prep is needed this week.	Divide the class into 8 groups. Two groups per macromolecule. Have the students create a poster using pages 126-134 in the textbook. Give the students one of the macromolecules and a sheet of poster paper. The groups will make a poster with the structure	The posters are complete and verified by the teacher. The students will rotate to each poster and complete their graphic organizer. Then, answer the summary questions. The rotations will be on day 2. Students can use the attached graphic	Continuation from the previous day. Once the graphic organizers are complete, assign each student one macromolecule and have them construct an argument using the information on their graphic organizer, explaining why their	**Complete the Enzymes and Lactose Intolerance investigation. (This investigation can be split into two days to ensure thought-provoking questioning. Still complete opening and transition on next day)	Complete: Enzymes and Lactose Intolerance investigation.

	(monomers, polymers, and elements), function, picture, and where they are found. After the posters are complete and verified by the teacher, the students will rotate the posters. The students will complete their graphic organizer and answer the summary questions. The rotations will be on day 2. Students can use the attached graphic organizer.	**organizer. Once the graphic organizers are complete, assign each student one macromolecule and have them construct an argument using the information on their graphic organizer, explaining why their molecule is better than the others. The students can pair and share with a student with a different molecule.**	**molecule is better than the others. The students can pair and share with a student with a different molecule**	**Suggested Homework: Complete the research by looking at the data. Read, analyze, and answer the questions.**	
Assessment Summary (5-10 minutes)	**For the closing question, use page 134 to answer question #3.**	**For the closing questions, use page 132 to have the students answer and discuss the CCC "structure and function question.**	**For the closing questions, use page 133 to have the students answer and discuss the CCC "structure and function question.**	**For the closing question, use page 141 to have the students answer and discuss the CCC "structure and function question.**	**For the closing questions, use page 147 to have the students answer #15.**
Small Group Tasks (TBA)					

Week 2	
GSE: SB1. Obtain, evaluate, and communicate information to analyze the nature of the relationships between structures and functions in living cells.	**Focused Concept: SB1a,d -Construct an explanation of how cell structures and organelles (including nucleus, cytoplasm, cell membrane, cell wall, chloroplasts, lysosome, Golgi, endoplasmic reticulum, vacuoles, ribosomes, and mitochondria) interact as a system to maintain homeostasis. -Plan and carry out investigations to determine the role of cellular transport (e.g., active, passive, and osmosis) in maintaining homeostasis.**
SEP: **Developing and Using Models** **Constructing Explanations and Designing Solutions** **Using Mathematics and Computational Thinking** **Connections to Nature of Science: Scientific Investigations Use a Variety of Methods**	**CCC:** **Energy and Matter** **Structure and Function** **Stability and Change**
Phenomenon: What do bacteria do in your intestines? (Weeklong)	**DQ: How do structures work together in cell systems? pg. 148-149**

	Day 6	Day 7	Day 8	Day 9	Day 10
Learning Target	**The students will construct an explanation of how cell structures and organelles interact.**	**The students will construct an explanation of how cell structures and organelles interact as a system to maintain homeostasis.**	**The students will construct an explanation of how cell structures and organelles interact as a system to maintain homeostasis.**	**The student will plan and conduct investigations to determine cellular transport's role in maintaining homeostasis.**	**The student will plan and conduct investigations to determine cellular transport's role in maintaining homeostasis.**
Opening (10-15 minutes) **Essential Vocabulary this week:** **cell membrane chloroplast cytoskeleton endosymbiont theory eukaryote mitochondria nucleus prokaryote endocytosis exocytosis facilitated diffusion fluid mosaic model homeostasis osmosis selective permeability** ****Use the "Revisit the anchoring phenomenon" sections in the unit to help explain the phenomenon's connection to the standard. Example: see page 129 TE**	**• Show students the phenomenon image on page 148. • Use the See-Think-Wonder protocol to guide student thinking. • Teachers should provide students with opportunities to share observations and develop questions. -The students can record questions in whole groups or small groups. After discussing, reveal the "About the photo" passage or discuss the information for a connection.**	**• Show students the phenomenon image • Use the See-Think-Wonder protocol to guide student thinking. • Teachers should provide students with opportunities to share observations and develop questions. -The students can record questions in whole groups or small groups.**	**• Show students the phenomenon image Opening questions: Answer the "Bacteria in your gut" questions on page 152. (Revisiting the anchoring phenomenon)**	**Show the student the 6.2 video. This is found in the Media Library. • Use the See-Think-Wonder protocol to guide student thinking. • Teachers should provide students with opportunities to share observations and develop questions. -The students can record questions in whole groups or small groups. Ask the students about the new information obtained What do bacteria do in your intestines?**	**• Show students the phenomenon image Have them read the caption • Use the See-Think-Wonder protocol to guide student thinking. • Teachers should provide students with opportunities to share observations and develop questions. -The students can record questions in whole groups or small groups. If you have time, you can include: Use the Science background to guide the students in understanding the specialized cells. or you can use the "On Assignment" suggestions. This would be a short discussion before continuing the investigation.**
Guided Practice/ Transition (20 minutes	**TTW, have the students complete the case study on page 149 (Artificial Cell Technology).**	**TTW, provide 15-20 minutes of direct instructions. Use the objectives below**	**TTW, provide 15-20 minutes of direct instructions. Use the objectives below**	**TTW, provide 15-20 minutes of direct instructions. Use the objectives below**	**TTW, provide 15-20 minutes of direct instructions. Use the objectives below**

	Then, discuss the "describe" on page 150 with them.	**for your direct instruction. Lecture notes are provided in online teacher resources. Identify components of all cells. Explain the Endosymbiont theory. (you can incorporate the 6.1 video)**	**for your direct instruction. Lecture notes are provided in online teacher resources. Describe the structure and function of components in prokaryotic cells. Describe the structure and function of components in eukaryotic cells. See page 157 teacher note "Address Misconceptions" of Mitochondria & Chloroplasts.**	**for your direct instruction. Lecture notes are provided in online teacher resources. Describe the structure of the cell membrane and how proteins function within it. Textbook page 162. Analysis. "Like a room with a window and window screen, what are some reasons a cell might need to control what materials can enter and exit?"**	**for your direct instruction. Lecture notes are provided in online teacher resources. Explain homeostasis and the involvement of the cell membrane in its maintenance. Summarize the different modes of transport across the cellular membrane. Revisit the gummy bear demo.**
Independent Practice (45-50 minutes) **Lab Prep is needed this week.	**Have the students use their textbooks to research information about the assigned organelle and complete the Cell match-up activity.**	**TSW be placed in groups of four, and each member take one topic and complete a summary of the main points. Component of cells (include connection) pages 150-151 prokaryotic cells (components of prokaryotic cells) pages 151-152 Eukaryotic cells pages 153- 157 Endosymbiont Theory Page 158 Have them group up with all other members with the same topic and have them discuss their summaries and make any adjustments to unify the summary. Then, have them report**	**Students will complete the "Looking at the Data (Microbiota of the Human Body)" Textbook page 159.**	**Lab investigation options: **ADI - Osmosis and Diffusion: Why Do Red Blood Cells Appear Bigger After Being Exposed to Distilled Water? OR ADI-Swimming in the Dead Sea**	**Lab investigation options: **ADI - Osmosis and Diffusion: Why Do Red Blood Cells Appear Bigger After Being Exposed to Distilled Water? OR ADI-Swimming in the Dead Sea TTW can wrap up with the "Crossing membrane" simulation. See on page166**

		back to their groups to share the summaries with the group members. All group members should write what they learned from all the summaries.			
Assessment Summary (5-10 minutes)	**Closing questions:** Answer questions 1,2,3 on page 178.	**Closing questions:** Answer the CCC question on page 153 and the SEP question on page 158.	**Closing question:** List the structure and function of two organelles and describe what would happen if the cell did not have these organelles.	**Closing questions:** Identify two organelles and explain how they interact to aid the cell in maintaining homeostasis. or Describe how cells maintain homeostasis.	**Closing questions:** Answer #2 & #3 on page 167 Review.
Small Group Tasks (TBA)					

Week 3					
GSE: SB1. Obtain, evaluate, and communicate information to analyze the nature of the relationships between structures and functions in living cells.		**Focused Concept: SB1.b,e** **-Develop and use models to explain the role of cellular reproduction (including binary fission, mitosis, and meiosis) in maintaining genetic continuity.** **-Ask questions to investigate and provide explanations about the roles of photosynthesis and respiration in the cycling of matter and flow of energy within the cell (e.g., single-celled alga). (Clarification statement: Instruction should focus on understanding the inputs, outputs, and functions of photosynthesis and respiration and the functions of the major sub-processes of each, including glycolysis, Krebs cycle, electron transport chain, light reactions, and Calvin cycle.)**			
SEP: **Asking Questions and Defining Problems** **Developing and Using Models** **Constructing Explanations and Designing Solutions**			**CCC:** **Systems and System Models** **Structure and Function**		
Phenomenon: What do bacteria do in your intestines? (Weeklong)			**DQ: How do cells divide and grow?**		
	Day 11	**Day 12**	**Day 13**	**Day 14**	**Day 15**
Learning Targets	**Students will ask questions to investigate and explain the roles of photosynthesis and**	**Students will ask questions to investigate and explain the roles of photosynthesis and**	**Students will develop and use models to explain the role of cellular reproduction in**	**Students will develop and use models to explain the role of cellular reproduction in**	**Students will develop and use models to explain the role of cellular reproduction in**

	respiration in the cycling of matter and the flow of energy within the cell.	**respiration in the cycling of matter and the flow of energy within the cell.**	**maintaining genetic continuity.**	**maintaining genetic continuity.**	**maintaining genetic continuity.**
Opening (10-15 minutes) **<u>Essential Vocabulary this week:</u>** **cellular respiration** **electron transport chain** **fermentation** **photosynthesis** **apoptosis** **binary fission** **cytokinesis** **interphase** **mitosis** **homologous chromosome** **sister chromatid** **cell differentiation** **stem cell**	**Show the students the video 6.3 - Media Library.** **• Use the See-Think-Wonder protocol to guide student thinking.** **• Teachers should provide students with opportunities to share observations and develop questions.** **-The students can record questions in whole groups or small groups.**	**• Show students the phenomenon image** **Opening questions:** **Answer the "Bacteria in your gut" questions on page 170. (Revisiting the anchoring phenomenon)** **• Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions.**	**Show the students the 7.1 video. - Media Library.** **• Use the See-Think-Wonder protocol to guide student thinking.** **• Teachers should provide students with opportunities to share observations and develop questions.** **-The students can record questions in whole groups or small groups.**	**Show the students the 7.2 video. - Media Library.** **• Use the See-Think-Wonder protocol to guide student thinking.** **• Teachers should provide students with opportunities to share observations and develop questions.** **-The students can record questions in whole groups or small groups.** **Read as a class and discuss Cancer on page 185. Connect the reading to the opening video.**	**• Show students the phenomenon image** **Opening questions:** **Answer the "Bacteria in your gut" questions on page 182. (Revisiting the anchoring phenomenon)** **• Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions.**
Guided Practice/Transition	**TTW, provide 15-20 minutes of direct instructions.** **Use the objectives below for your direct instruction.** **Lecture notes are provided in online teacher resources.** **Explain the importance of cells' energy usage.** **Have the students read the introduction on page 169 and discuss with their neighbor the "Explain"**	**TTW, provide 15-20 minutes of direct instructions.** **Use the objectives below for your direct instruction.** **Lecture notes are provided in online teacher resources.** **Describe the processes involved in cellular respiration and ATP synthesis.** **Summarize the stages of photosynthesis and the light-dependent and light-independent**	**TTW, provide 15-20 minutes of direct instructions.** **Use the objectives below for your direct instruction.** **Lecture notes are provided in online teacher resources.** **Compare and contrast the prokaryotic and eukaryotic cell cycle.** **Have students look at page 181 and read the passage. Discuss about "Ask Questions"**	**TTW, provide 15-20 minutes of direct instructions.** **Use the objectives below for your direct instruction.** **Lecture notes are provided in online teacher resources.** **Explain the importance of eukaryotic cell cycle regulation.** **Include Cell death and Apoptosis as you move into Mitosis.** **Show video 7.3** **Have a student read the introduction on page 188, Mitosis. Then, have the**	**TTW, provide 15-20 minutes of direct instructions.** **Use the objectives below for your direct instruction.** **Lecture notes are provided in online teacher resources.** **Describe chromosomes and the structure of DNA.** **Sequence the stages of mitosis and cytokinesis.**

		reactions. **Identify other energy conversion pathways available to cells.**		**students answer the "Infer" questions.**	
Independent Practice (45-50 minutes) ****Lab Prep is needed this week. See the Lab manual.**	**Have the students complete the Photosynthesis vs. Respiration POGIL.** **The teacher should time the sections between the stops of the Pogil to check for understanding (CFU)**	**Have the students complete the organizers and answer the following questions.** **Photosynthesis Teacher copy:** **Have the students complete the CER - Photosynthesis**	**Have the students create a side-by-side graphic organizer. Using pages 182 and 183, models of binary fission, mitosis, and meiosis.** **Draw and explain the difference between the Prokaryotic and Eukaryotic cell cycles.**	**Teachers can prep and have students complete chapter investigation A "Plant growth through mitosis". Split into two days.** **or** ****Mini Lab "Modeling Mitosis". Two-day activity. pg. 192**	**Teachers can prep and have students complete chapter investigation A"Plant growth through mitosis. Split into two days.** **or** **Mini Lab "Modeling Mitosis two-day activity.**
Assessment/Summary (5-10 minutes)	**Closing questions:** **Answer the question on page 174 SEP: "Use a model."** **Suggested HW:** **Page 175 SEP: Construct an Explanation.**	**Closing questions:** **Answer the question on page 171 SEP "use a model"** **and question #4 on page 175 6.3 Review** **Suggested HW: page 176 Thinking Critically**	**Closing questions:** **Answer the question on page 183 SEP, "Construct an explanation"**	**Explain genetic continuity and how it is seen in binary fission.** **Suggested HW: have students read page 191, Stages of Mitosis and the cell cycle, and answer the CCC "Structure and Function question.**	**Using figures 7-11, explain what happens in the stages of mitosis and state how the cells maintain genetic continuity.**
Small Group Tasks (TBA)					

Assessment Prep

Prepare students for assessment by reviewing the following Assessment Prep Presentation.

Cell Systems Assessment Prep

Provide the following guidance:

Ask the students to use what they know about the tasks completed to answer the provided assessment prep question.

- What is the question asking you?
- What do you know about the vocabulary or concept in the question?
- Is this question similar to any investigations or tasks we've completed?
- How can what you've done help you answer this question?
- Just view the assessment question: What is the question asking you?

Guide students to think about how their experience connects to the question.

Using the answer choices provided, ask the students the following:

- Identify an incorrect answer: How do I know this answer is incorrect?
- Identify the right answer: How do we know this answer is correct?

Allow the students time to discuss in collaborative groups.
TEACHER NOTE: If students struggle with the question, review it the next day. Do not rush to the next question; instructional time is the only time they have to prepare for the end-of-year assessment.

Labs / Investigations		
Mandatory Labs	**Explore Learning Gizmo**	**Pivot Interactives/Phet**
Appear Bigger After Being Exposed to Distilled Water? OR ADI-Swimming in the Dead Sea		

Additional Resources/Tasks	
Supplemental Resources	*Enzymes and Lactose Intolerance Investigation. *ADI - Osmosis and Diffusion: Why Do Red Blood Cells *A“Plant growth through mitosis. or *Mini Lab “Modeling Mitosis.