**Planning Commentary Directions:** Respond to the prompts below (no more than 9 single-spaced pages, including prompts) by typing your responses within the brackets following each prompt. Do not delete or alter the prompts; both the prompts and your responses are included in the total page count allowed. Refer to the evidence chart in the handbook to ensure that this document complies with all format specifications. Pages exceeding the maximum will not be scored.

1. **Central Focus**
   
   a. Describe the central focus and purpose for the content you will teach in the learning segment.

   [The content covered in this learning segment reflects ideas and theories regarding information on how the cell regulates and controls its processes and for this reason the segment has been termed “The Working Cell.” This includes the functions and processes of the cell that keep organisms alive. By the end of this unit students will be able to demonstrate how our cells use ATP as the main energy source for processes such as metabolism and membrane functions. They will investigate the molecular structure of ATP and how it can be used to release energy. They will use this knowledge about ATP to justify why our biological systems need it in order for processes to occur. Students will also discover the necessity of enzymes as catalysts in our body’s reactions. Both ATP and enzymes are imperative in cell and human function. The learning segment concludes with an investigation where students have the opportunity to observe cells at work during diffusion and osmosis.]

   b. Given the central focus, describe how the standards and learning objectives within your learning segment address the use of science concepts and the ability to apply scientific practices through inquiry to develop evidence-based explanations for a real-world phenomenon.

   [This learning segment was created based on New York State (NYS) standards, the New Common Core standards, and the districts’ specific curriculum. The NYS standards require that students use scientific skills and knowledge to perform inquiry, pose questions, and seek answers. In this learning segment students perform multiple investigations. For example, as seen in lesson plan 1, they will construct molecules of ATP and ADP, compare and contrast their molecular structure, and then demonstrate how these structures allow for the release of energy through the breaking of their chemical bonds. In lesson plan 4, students will hypothesize what will happen to substances inside and outside of a cell based on their knowledge of diffusion. They will test their hypotheses by constructing model cells containing starch and glucose that they will place in a water and iodine solution. Students will observe what substances are able to diffuse through the model membrane and then justify why this will or will not occur.

   Throughout this learning segment students are given the chance to explore and analyze the concepts related to the working cell, as well as practice writing arguments to support their claims based on their evidence, as the New Common Core suggests. Students will do this when creating their hypothesis and when answering the analysis questions in their lab packets. For example, one of the analysis questions asks students to describe in scientific terms why the salty popcorn usually consumed at movie theaters causes thirst. Students will be able to explain this after they complete the osmosis lab completed in lesson plan 5. In this lab they create wet mount slides using the epidermis of a red onion. They submit these cells to hypotonic and hypertonic environments and then observe the cells’ reactions under the microscope. After collecting this data they will be able to explain why cells may shrivel or burst and in turn why salty popcorn causes thirst. In the analysis questions they will also relate their findings to other real-world situations such as how IV solutions are used in the hospital.]
By the end of this learning segment students will recognize that cell processes are necessary to the survival of an organism. Through the observation of simulations and demonstrations, as well as the completion of laboratory investigations and class activities, students will discover the relation of their knowledge to the maintenance of living things and human physiology.

c. Explain how your plans build on each other to help students **understand relationships** between scientific concepts, scientific practices, and the phenomenon in the learning segment.

After learning about energy in the lesson prior to **lesson plan 1** student will use what they have learned thus far to examine the structure and function of ATP. In **lesson plan 1**, students will identify the different molecules that make up ATP and ADP and then construct models of these molecules using the appropriate building blocks. This activity will lead students to conclusions that allow them to demonstrate how ATP actually releases energy for use in cell processes.

In **lesson plan 2** students will learn that just as cells must control their production and use of energy they must also find ways to control the reactions that occur constantly within the body. This control mechanism is enzymes and they are important in the working cell. Students will find that if enzymes do not function properly, many cell processes would not occur. They will observe the function of enzymes through a computer simulation during class. **Lesson plan 3** begins with a do now that reviews what students learned about enzymes and whether or not students grasped the information. The flow of **lesson plan 3** depends on this do now because if students are still unclear about the information than a short review may be done before moving on further into cells processes. **Lesson plan 3** is when students get an introduction to the different cell processes necessary for survival. The two processes covered are osmosis and diffusion, which are introduced using direct instruction, discussion, and a video clip. Lesson plan 3 is meant to introduce these topics and sparks students’ background knowledge on these processes. In **lessons 4 and 5** they will use this information to complete laboratory experiments that test theories and confirm class concepts.

**Lessons 4 and 5** are two parts to a complete laboratory investigation. **Lesson plan 4** is part one of the lab that gives students the opportunity to observe diffusion as it occurs in a model cell that they will create. They will use indicators to show how they know what can and cannot diffuse through the model membrane. Then in lesson 5 they will see how another form of diffusion effects living organisms. They will see how osmosis occurs between the cells of the epidermis of an onion and different hypotonic or hypertonic solutions outside of the cell. At the end of this learning segment they will see that diffusion is a process that does not require energy or more specifically, ATP. They will also know that there are other processes required for life that do require ATP and our cell can use organic fuels and cellular respiration in order to create the energy necessary in order for our cells to do the work needed for survival.

2. **Knowledge of Students to Inform Teaching**

For each of the prompts below (2a–b), describe what you know about **your** students with respect to the central focus of the learning segment.

---

**Consider the variety of learners in your class who may require different strategies/support (e.g., students with IEPs, English language learners, struggling readers, underperforming students or those with gaps in academic knowledge, and/or gifted students).**

a. **Prior learning, prerequisite skills, and understanding of the nature of science related to the central focus**—What do students know, what can they do, and what are they learning to do?
The class undergoing this learning segment is a ninth grade honors level. For this reason it is important to create challenging learning experiences that will help students grow as science learners. The students in this class have learned about some cell processes prior to this unit. They know that proteins are critical to cell function and that there are many different functions of proteins. This will be useful when discussing enzymes and cell transport. They also had a brief introduction in the lesson before the start of this learning segment. Prior to the start of this learning segment students were introduced to some basic energy concepts including the different forms of energy and the principal of conservation of energy. During this lesson they also discussed how organisms such as humans take in fuels in the form of food and then convert these organic molecules to a form of energy that our cells can use, ATP. This learning segment will be the furthest these students have gone into concepts pertaining to the working cell.

Prior to the start of this segment students were assigned a vocabulary activity for homework. This activity asked students to write each of their vocabulary terms and definitions on an index card. The instructor will check to make sure all students completed this assignment and then students will have these cards as a study tool. It is useful to have students complete this prior to the start and in the beginning of this learning segment because it gives them a chance to review vocabulary terms and have some background knowledge before they are actually introduced during class. Along with this activity students were also required to read the chapter independently and complete a packet of questions for some more review. This assignment is due during lesson 4 at the end of the unit. By completing these assignments students will be exposed to the material on multiple occasions, which will increase learning.

There are laboratory skills that are required in order to complete these class activities. Thus far in this course students have learned how to used the microscope and have demonstrated these skills on a number of occasions. These skills will come in handy when students observe osmosis in plant cells under the microscope. During lesson plan 4 they will use tools such as a hot plate, test tubes, beakers, test tube holders, and cleaners. This will give them a chance to practice lab techniques that they learned in junior high school and earlier on in this course. Though they have some laboratory experience, the importance of demonstration prior to students’ independent work is still necessary. The instructor will demonstrate lab procedures before students are expected to perform them on their own. For example, during the diffusion lab the instructor will demonstrate turning on the hot plate and how to regulate how high the temperature will be. Then show students how to safely remove hot test tubes from the beaker on the hot plate using test tube holders. This will better ensure the safety of all students during active learning.

b. Personal/cultural/community assets related to the central focus—What do you know about your students’ everyday experiences, cultural backgrounds and practices, and interests?

When I first met these students we played a game that helped me get to know each of them. During this game we went around the room and students were given the chance to express some of their favorite hobbies and interests. I was able to learn that many of them liked sports and outdoor activities. In the winter they like to go sledding, skiing, and snowboarding and in the summer they like to go to the beach and swim with their friends. I also learned about some of their favorite TV shows and music. I tried to use this information to advance learning in as many ways as possible.

Another aspect of these individual students is that they have been placed in an honors level course for a reason. The majority of these students enjoy learning and they tend to take their education seriously. This is helpful because many of the behavior issues that sometimes exist within a class are not a problem with these students.
3. Supporting Students’ Science Learning

Respond to prompts 3a–c below. To support your explanations, refer to the instructional materials and lesson plans you have included as part of Task 1. In addition, use principles from research or theory to support your explanations.

a. Explain how your understanding of your students’ prior learning and personal/cultural/community assets (from prompts 2a–b above) guided your choice or adaptation of learning tasks and materials.

From introduction activities I was able to use what I learned about student interest to make learning materials and instruction more engaging to them. For example, I related the content to their interest by comparing swimming in the salty ocean in the summer to cells being placed in a hypertonic solution. I found that students enjoy when science concepts are related to the situations that they have encountered themselves. This is one reason the analysis questions asked in the lesson plan 5 laboratory packet were seen as extra interesting to many students. For example, one question asked students to justify how too much salt on a snowy road could affect wild life. This was pertinent to their lives because the students’ love snow days and this winter especially has had high amounts of snowfall that have affected their everyday lives.

Another question that will increase student engagement is one where they investigate the importance of IV solution concentration levels used in the hospital. Many of the students in this honors level class are interested in science and even consider continuing further education and possibly a career in this field. This is another reason why the analysis questions from the lab packet are useful. Creating IVs may be the job of one of the students in the future and seeing this in their assignment could spark an interest in a hospital personal career in the future.

Another consideration I took when planning this lesson came from the fact that this is an honors level course. Because there are few behavior issues I was able to create lesson plans that allow students to work in cooperative groups on hands on activities. During the ATP activity (lesson plan 1) and the Diffusion and Osmosis lab (lesson plans 4 & 5) cooperative groups and scientific investigation are used to provide fun and productive learning experiences.

b. Describe and justify why your instructional strategies and planned supports are appropriate for the whole class, individuals, and groups of students with specific learning needs.

Consider students with IEPs, English language learners, struggling readers, underperforming students or those with gaps in academic knowledge, and/or gifted students needing greater support or challenge.

There are two students with special needs in this class. As discussed in the Context for Learning section, there is one student who has been diagnosed with ADHD and another student who is Autistic. Both of these students are high functioning and do well during class with just a little extra help. The first way these students are accommodated for is by their seating placement within the classroom. Both of these students have preferential seating near the front and center of the classroom. They are seated at tables with their classmates and this is helpful because it provides students with peer supports. Their classmates that are seated next to them have been selected because they are helpful students who excel in the classroom and work well with others. It is rare that either of these students requires additional help but in some cases when redirection is necessary, I will be monitoring the room and can quickly redirect these students using nonverbal techniques such as a tap on the desk or even pointing to where they should be focusing.

Along with the seating arrangement and peer supports there are many different resources available to not only the students with special needs but to the entire class. Materials such as
the note packets and the laboratory packets are extremely useful for student learning. Both of these materials keep students on track during a lesson. The note packet provides students with information that will be covered during instruction so that they can spend less time taking notes and more time listening to what is actually being taught and participating in class discussions. These packets also leave out certain information so that students will be engaged and filling in important terms and concepts as they are introduced. This packet is used in lesson plans 2 and 3 during direct instruction. At the completion of instruction students have a nice set of notes that they can use to study for their summative assessment or to refer to during other class activities that cover the same content. The lab packets serve the same type of purpose as well as act as a guide through the activity for that day by providing step-by-step procedures for students to follow along with as they complete each task. Along with this, I will demonstrate each procedure as well as be available during independent practice to guide student learning.

One of the best ways this learning segment provides for each individual student is by using differentiation often. These lessons are differentiated in that they present the materials to students in multiple ways. For example, students will first learn about ATP through direct instruction prior to this learning segment. Then in the beginning of lesson plan 1, a do now is used to spark background knowledge and review the basics about ATP. After the completion of the do now students will read aloud the introduction to ATP located in the activity packet. Once they begin the activity they will color each different component of ATP and cut it out to be used as building blocks in create an ATP paper model. Once they construct a model they will be asked to answer questions using the model. At this point they have analyzed the structure of ATP by reading, coloring, cutting, and examining a model. After this they will watch a video clip about ATP to reiterate the information yet again in another form. By presenting the information in multiple ways, all of the different types of learners within the class will benefit.

c. Describe common preconceptions (based on prior learning and experiences) within your central focus and how you will identify and address them.

It is often difficult for students to understand that the energy cells use comes from the breaking of bonds to release energy and that before this can occur, we must convert the food we eat into a form that cells can use. In order to clarify this concept to students I asked if they thought that their cell could just take in a hamburger and use it for energy. Many of them giggled and realized this did not sound correct. Then I continued on to explain that we must break down the foods we eat and then use cellular respiration to create ATP because this is the form of energy that our cells can actually use. The same way we can use the cash in our wallet more readily than the money stored in the bank.

When students encounter the idea of diffusion it is important that they understand that it does not require ATP and why this is so. Using an analogy of pushing a ball up or down hill students can better see how traveling along a concentration gradient is more natural than going against it. This idea is also clarified in the video that is presented to them at the end of lesson plan 4, which also explains why certain materials can pass through a membrane easily and why others cannot. This information is a review from the previous unit where they learned about the different functions of the parts of the cell.

4. Supporting Science Development through Language

a. Language Function. From the list below, choose one language function essential for student learning within your central focus:

<table>
<thead>
<tr>
<th>Analyze</th>
<th>Explain</th>
<th>Interpret</th>
<th>Justify with evidence</th>
</tr>
</thead>
</table>

Throughout this learning segment students are constantly expected to analyze information and come to conclusions. For example, in lesson plans 1, 4, and 5, students
complete laboratory investigations where they test theories, seek answers, find solutions, and come to conclusions. During these activities they are asked to collect data through observation and experimentation and then use this data to connect theory and what they know. For example, they create models of ATP and ADP and then compare and contrast the molecular structure of each. They are also asked to explain their conclusions and specifically state how they came to these explanations based on their analysis. Analyzing is especially important in this learning segment because the central focus is on the working cell and it is imperative that student investigate why and how cell processes occur.

b. Identify a key learning task from your plans that provides students with opportunities to practice using the language function. Identify the lesson in which the learning task occurs. (Give the lesson/day and number.)

During lesson plan 4 students analyze the process of diffusion through a semi permeable membrane in multiple ways and then draw conclusions from their evidence. Throughout this task students must analyze what they see based on a model cell that they will construct using dialysis tubing and starch and glucose. They will investigate using different indicators such as Lugol’s iodine and Benedict’s Solution. These indicators will allow students to compare and contrast what substances were able to diffuse and which were not. They will be able to find this information by looking for color changes inside or outside of the cell. The presence of starch or glucose will cause these color changes.

Students will express their analyzing by answering questions in their lab packets. Some of these questions ask students to record what they see happening inside and outside of the cell. They will also have to explain whether or not the indicators yielded positive or negative results and how they came to these decisions. They will compare and contrast starch and glucose in order to justify why glucose passed through the membrane while starch did not. For example, based on their investigation and their knowledge of diffusion principles, they will be able to conclude that starch did not pass through the membrane because it is too big and complex while glucose was able to diffuse through because it is a small, simple sugar.

c. Additional Language Demands. Given the language function and learning task identified above, describe the following associated language demands (written or oral) students need to understand and/or use:

- Vocabulary and/or symbols
- **Plus** at least one of the following:
  - Syntax
  - Discourse

Consider the range of students’ understandings of the language function and other language demands—what do students already know, what are they struggling with, and/or what is new to them?

The two main vocabulary terms necessary for appropriate analysis in this learning task is diffusion and semi permeability. Once students understand these concepts they will be able to relate what is happening during the investigation to what actually happens in our cells. In order to grasp these ideas students will need to know that molecules tend to move from an area where they are highly concentrated to an area in which they are less concentrated. If students understand this then they will better grasp why glucose diffuses the way it dos and why the iodine does the same.

This task begins by asking students to create a hypothesis, which is an important step in scientific discourse that students will use throughout this course and in their future science
classes. These students have learned how to create a hypothesis in earlier science classes and also at the beginning of this course. They understand that the format of their hypothesis should be in an “If...then...” format. For example, one of the student’s hypothesis was as follows, “If starch and glucose are placed inside a cell in a beaker containing H2O and iodine then the iodine will diffuse inside of the cell.” Though this hypothesis is only partially correct, this student did use the correct format when creating it. This is also proof of the trend that seems to exist among these students. Many of them can create a hypothesis in the correct format but oftentimes they leave out important aspects of it. In the example above, the student did not mention what they predicted would happen to the starch or glucose inside of the cell. This is a common mistake and for that reason during this activity students will be asked to volunteer to share their hypothesis with their classmates. Multiple students will share their hypothesis that way they can compare and contrast what is acceptable and correct.

When students begin to describe their conclusions they must be able to use terms that describe the concentrations of each solutions inside or outside of the cell. This way they can make statements like, “The glucose diffused out of the cell from an environment that was highly concentrated in solute to an area that was less concentrated.” This may be challenging for some students. As I monitor their work during cooperative group work, I will use probing questions to help students use this vocabulary to describe what they are observing.]

d. **Language Supports.** Refer to your lesson plans and instructional materials as needed in your response to the prompts.

- Describe the instructional supports (during and/or prior to the learning task) that help students understand and successfully use the language function and additional language demands identified in prompts 4a–c.

[There are many supports that students should take advantage of in order to be successful in using language during this learning task. First, students will have read the chapter for homework and also completed the vocabulary index cards that they can use as study tools. The lab packet also provides an introduction to diffusion that is a review of the direct instruction from the previous day and is readily available for their use during the lab. They have peer supports seated with them in their laboratory groups. If a student is unclear or confused they have 4-5 classmates at their table that can provide clarification. I will also be monitoring students during the completion of this task in order to provide help when necessary. The use of visuals and graphic organizers throughout the lab is another helpful way for students to come to conclusions through analysis. They are asked to record their findings in tables and also to draw what they see. Both of these activities can help support language and help students to better express themselves in science class.

5. **Monitoring Student Learning**

In response to the prompts below, refer to the assessments you will submit as part of the materials for Task 1.

a. **Describe how your planned formal and informal assessments will provide direct evidence of students’ understanding of science concepts and the phenomenon, the nature of science, and the application of scientific practices through inquiry throughout the learning segment.**

[There are a number of different assessments used during this learning segment. The simplest form of assessment used is observation. Throughout each lesson I will collect information about student learning and progress based on what I observe as they complete the activity or assignment for that day. This will provide me with evidence as to whether or not I need to reinforce a certain concept, students are grasping the material well, and they are
progressing appropriately through the activity. For example, during cooperative group work if I notice there is a student not really participating during collaboration I may try to redirect their attention back on task or investigate further into their lack of participation.

Another informal formative assessment used in this learning segment other than observation is the use of questioning to assess student understanding. The use of questioning helps students find answers from the information they have and also allows the instructor to gauge understanding. For example, in lesson plan 4, when students observe their model cell changing color they may need some probing questions to help them see that the iodine actually diffuses into the “cell.” Questioning will also be used along with direct instruction. There will be times when I will ask a quick concept check question after teaching about a concept. I will use questions like, “Raise your hand if you want me to repeat that definition.” or “Who can point to the active site on this diagram?” These questions are quick assessments that are extremely helpful. I will also do this during the simulation used in lesson plan 2. There are breaks throughout the simulation where I ask questions like, “What did we just see happening?” or “Who can tell me the difference between competitive and noncompetitive inhibition?”

In lesson plans 2 and 3 direct instruction is used along with student note packets. Students will complete their notes packet in the beginning of class as direct instruction is done. They are given a printed, student version of the power point that leaves out some information so that they can fill it in as they learn in. I will observe as they complete these packets and it will allow me to assess if students are on track or if they are having trouble keeping up with the pace of instruction.

Do now’s are a more formal formative assessment used on multiple occasions throughout this learning segment for a few different purposes. The do now used at the beginning of the class period during lesson plan 1 provides information on previous knowledge and students’ basic understanding. This is meant to be a preassessment of knowledge on concepts for this learning segment. There are two other do nows used in lesson plans 3 and 5 are also formative assessments used to provide me with an evaluation of how well students are grasping concepts and whether or not there is a need for a more in depth review. Students know that they are to begin their do nows immediately when they get settled into their seats and take out their materials. We will go over the do nows the students have about 5-10 minutes to complete it. As I do this I can provide feedback to students and clear up misconceptions.

There are two laboratory packets used throughout the lab investigations in this learning segment. Students will hand in a packet that helped them to complete their molecule models along with their finished models of the ATP-ADP cycle. Throughout this packet students will be asked to answer questions based on their progress and what they learn as they complete their models. This packet also uses visuals such as graphs and models of reactions and cycles to help students grasp information and answer questions along the way.

The diffusion through a membrane packet used in lesson plans 4 and 5 is a lot like the ATP packet. This will take students through the lab procedures but also asks them to answer questions and organize the data they collect during their experiment. These packets also include students’ hypotheses and conclusions. I will be able to evaluate not only their progress through the lab but also their ability to follow directions and put their knowledge into proficient writing. Students will hand these packets in at the completion of the lab to be graded. When the students receive their lab grades they will get these packets back with written feedback on them. For example if a student had an incorrect answer I may reply with a probing question that helps them find the correct answer. I yes write, “Yes, but how did you know that the glucose was able to diffuse through the membrane? Or what indication lead you to believe glucose diffused through the membrane?” From this information a student will be able to complete further
investigation to find the correct answer. The returned packets will also be great reference tools for students in this course.

The last assessments used in this learning segment are two quizzes. One quiz will be strictly assessing students' knowledge of vocabulary terms. This will be a ten question quiz that has students match the definition with the vocabulary term. The other quiz will be given during Lesson Plan 3 where students will be assessed on the information presented to them in during lesson plan 1 through the completion of the ATP-ADP model activity. Students will be asked questions about the structures of the different building blocks of these molecules and also asked to label the ATP-ADP cycle that they created two days earlier with their molecule models.

There are many different forms of assessment used throughout this learning segment that will help evaluate and promote learning for all students. These are not in place only to test students' abilities and knowledge but also to gather evidence of learning for the instructor to use to adapt instruction to meet all students' needs.

b. Explain how the design or adaptation of your planned assessments allows students with specific needs to demonstrate their learning.

| Consider all students, including students with IEPs, English language learners, struggling readers, underperforming students or those with gaps in academic knowledge, and/or gifted students. |

Each of the assessments used have a purpose that related to providing the best learning environment for all students. One of the best ways that these assessments do this for all students is by providing students with feedback about their learning and also to act as references for students. For example, the do now used in lesson plan 5, is a graphic organizer for osmosis that organizes tonicity and how it affects both plant and animal cells. Though students completed these charts independently, it was also gone over in class so that students could correct their answers and have valid information as a reference. These tables will be great study tools, especially for those students who have trouble organizing and understanding complex information. Many of the other assessments could also be used as study tools.

Assessments have also been manufactured to benefit students by being used at appropriate times. For example students will be given a quiz on ATP during lesson plan 3, which is two days after the ATP activity completed during lesson plan 1. Students will be informed about this quiz and all other formal assessments with enough time to prepare in advance. The quizzes used also have word banks for students who struggle. ]