**Overview**: The following rubrics can be used to assess the individual project: a brochure detailing the science involved in the body putting an object in motion. Each rubric is aligned to one section of the *Individual Project Criteria for Success*, located on the Culminating Project Student Instructions. \*If student provides no assessable evidence (e.g., “I don’t know” or leaves answer blank), then that student response cannot be evaluated using the rubric and should be scored as a zero.

Below we provide an alignment table that details the dimensions assessed for each criterion.

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|  | **Student Criteria for Success** | **Science and Engineering Practice** | **Disciplinary Core Idea** | **Crosscutting Concept** |
| 1 | * An argument for why the motion of the object can vary: What is the relationship between kinetic energy and energy transfer? How do you know when the kinetic energy of the object changes?   + Support the argument with relevant evidence from Task 1 | **Engaging in Argument From Evidence**   * Construct, use, and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon. | **PS3.B: Conservation of Energy and Energy Transfer**   * When the motion energy of an object changes, there is inevitably some other change in energy at the same time. | **Energy and Matter**   * Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion). |
| 2 | * A description or labeled diagram of the nervous system pathway that results in the physical activity * Cite the sources you used to predict that this is the nervous system pathway used in your activity | **Obtaining, Evaluating, and Communicating Information**   * Gather, read, and synthesize information from multiple appropriate sources. | **LS1.D: Information Processing**   * Each sense receptor responds to different inputs, transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories. | **Cause and Effect**   * Cause and effect relationships may be used to predict phenomena in natural or designed systems. |
| 3 | * An argument for how subsystems of the body interact to make the activity possible. Include:   + A description of each subsystem’s function   + An explanation and/or diagram showing how the subsystems interact | **Engaging in Argument From Evidence**   * Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon. | **LS1.A: Structure and Function**   * In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together and are specialized for particular body functions. | **Systems and System Models**   * Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. |
| 4 | * An explanation of where the energy to move the object actually comes from in the human body. To support your explanation, include a model that shows:   + Different cell parts (e.g., nucleus, cell membrane, and mitochondria) and their specific functions | **Developing and Using Models**   * Develop and use a model to describe phenomena. | **LS1.A: Structure and Function**   * Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. | N/A |
| 5 | * How the function of the whole cell depends on relationships between these cell parts | N/A | **LS1.A: Structure and Function**   * Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. | **Structure and Function**   * Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts; therefore complex natural structures/systems can be analyzed to determine how they function. |

**Rubric 1**: Student uses evidence of observable features to argue that a change in the kinetic energy of their object means more or less energy was transferred to the object.

* Dimensions Assessed: SEP – Engaging in Argument From Evidence, DCI – PS3.B: Conservation of Energy and Energy Transfer, CCC – Energy and Matter

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| **Emerging (1)** | **Developing (2)** | **Proficient (3)** | **Advanced (4)** |
| Student constructs an **inaccurate or irrelevant** argument about the kinetic energy and energy transfer of their object. | Student **accurately** argues that a change in the kinetic energy of their object means more or less energy was transferred to the object. | Student uses evidence of **an** observable feature to **accurately** argue that a change in the kinetic energy of their object means more or less energy was transferred to the object. | Student uses evidence of **multiple** observable features to **accurately** argue that a change in the kinetic energy of their object means more or less energy was transferred to the object. |
| **Look Fors:**   * Student constructs an inaccurate argument (e.g., student describes that the kickball travels a shorter distance because more energy was used up in the body).   OR   * Student constructs an argument that is irrelevant to the physics concepts (e.g., the motion of the kickball can vary depending on how strong the kicker is). | **Look Fors:**   * Student accurately describes that the motion of the object can vary because the energy transferred to the object can vary (e.g., the kickball can go shorter or farther depending on how much energy is transferred from the human body). * Student provides no evidence of any observable features (e.g. motion, sound, temperature) | **Look Fors:**   * Student accurately describes that the motion of the object can vary because the energy transferred to the object can vary (e.g., the kickball can go shorter or farther depending on how much energy is transferred from the human body). * Student uses evidence to argue which object has more kinetic energy by describing an observable feature (e.g., variation in motion of the kickball as shown by speed or distance). | **Look Fors:**   * Student describes that the motion of the object can vary because the energy transferred to the object can vary (e.g., the kickball can go shorter or farther depending on how much energy is transferred from the human body). * Student uses evidence to argue which object has more kinetic energy by describing multiple observable features (e.g., variation in motion of the kickball as shown by speed or distance, variation in sound at impact). |

**Rubric 2**: Student describes the nervous system pathway that causes their object to move, citing information gathered and synthesized from multiple sources.

* Dimensions Assessed: SEP – Obtaining, Evaluating, and Communicating Information, DCI – LS1.D: Information Processing, CCC – Cause and Effect

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| **Emerging (1)** | **Developing (2)** | **Proficient (3)** | **Advanced (4)** |
| Student **inaccurately** describes the nervous system pathway that causes their object to move. | Student **partially** describes the nervous system pathway that causes their object to move, **using** information gathered from **at least one** source. | Student **completely** describes the nervous system pathway that causes their object to move, **using** information gathered and synthesized from multiple sources. | Student **completely** describes the nervous system pathway that causes their object to move, **citing** information gathered and synthesized from multiple sources. |
| **Look Fors:**   * Student inaccurately describes the nervous system pathway for the movement of their object because of major omissions and/or errors (e.g., student leaves out multiple parts of the nervous system or has many inaccuracies in description and order). | **Look Fors:**   * Student partially describes the nervous system pathway for the movement of their object with some minor omissions and/or errors (e.g., student leaves out one of the parts of the nervous system, describes the role of one incorrectly, or mixes up one step in the order of the pathway). * Student may or may not cite sources from Task 2. | **Look Fors:**   * Student completely describes an accurate nervous system pathway for the movement of their object (e.g., stimulus of kickball coming towards person, sensory neuron in the eye receives stimulus, sends message to the brain, brain decides to kick the ball, sends message down spinal cord, received by motor neuron in the leg, and response is to kick the ball). * Student clearly uses information gathered and synthesized from the sources in Task 2 but does not specifically cite them. | **Look Fors:**   * Student completely describes an accurate nervous system pathway for the movement of their object (e.g., stimulus of kickball coming towards person, sensory neuron in the eye receives stimulus, sends message to the brain, brain decides to kick the ball, sends message down spinal cord, received by motor neuron in the leg, and response is to kick the ball). * Student cites the sources from Task 2 as the information used. |

**Rubric 3**: Student uses evidence to argue how multiple body subsystems with specific functions interact to make their activity possible.

* Dimensions Assessed: SEP – Engaging in Argument From Evidence, DCI – LS1.A: Structure and Function, CCC – Systems and System Models

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| **Emerging (1)** | **Developing (2)** | **Proficient (3)** | **Advanced (4)** |
| Student uses evidence to **inaccurately** argue how multiple body subsystems with specific functions **work** to make their activity possible. | Student uses evidence to **partially** argue how multiple body subsystems with specific functions **work** to make their activity possible. | Student uses evidence to **partially** argue how multiple body subsystems with specific functions **interact** to make their activity possible. | Student uses evidence to **completely** argue how multiple body subsystems with specific functions **interact** to make their activity possible. |
| **Look Fors:**   * Student describes the functions of few major body subsystems (See *Advanced Look-Fors* for full list) without a description of interactions and with major errors. | **Look Fors:**   * Student describes the functions of at least some of the major body subsystems (See *Advanced Look-Fors* for full list) or all systems with some minor errors. * However, student describes these body subsystems in isolation rather than explicitly providing evidence for their interactions. | **Look Fors:**   * Student describes the functions of most, but not all major body subsystems (See *Advanced Look-Fors* for full list). * For the body subsystems identified, student accurately describes most of the interactions between these body subsystems that make their activity possible (See Task 4 Teacher Version for examples of these interactions). | **Look Fors:**   * Student describes the functions of all major body subsystems (Nervous, circulatory, respiratory, digestive, muscular, skeletal). * Student accurately describes all of the interactions between these body subsystems that make their activity possible (See Task 4 Teacher Version for examples of these interactions). |

**Rubric 4**: Student develops a model to describe the specific functions of main cell parts.

* Dimensions Assessed: SEP – Developing and Using Models, DCI – LS1.A: Structure and Function

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| **Emerging (1)** | **Developing (2)** | **Proficient (3)** | **Advanced (4)** |
| Student develops a model to **inaccurately** describe the specific functions of main cell parts.  OR  Student **partially** describes the specific functions of **some** cell parts, but **no model is present**. | Student develops a model to **partially or completely** describe the specific functions of **some** main cell parts.  OR  Student **completely** describes the specific functions of **all** cell parts, but **no model is present**. | Student develops a model to **partially** describe the specific functions of **all** main cell parts. | Student develops a model to **completely** describe the specific functions of **all** main cell parts. |
| **Look Fors:**   * Student draws a model that shows and describes the functions of at least some main cell parts but does so with major inaccuracies (See *Advanced Look-Fors* for accurate descriptions).   OR   * Student describes the functions of some main cell parts with partial accuracy in words, but no model is present. | **Look Fors:**   * Student draws a model that partially or completely shows and describes the functions of some main cell parts (e.g., mitochondria and nucleus, but not cell membrane). The descriptions present might be completely accurate (See *Advanced Look-Fors* for accurate descriptions) or may have minor errors or missing details.   OR   * Student accurately describes the functions of all main cell parts in words, but no model is present (See *Advanced Look-Fors* for accurate descriptions). | **Look Fors:**   * Student draws a model that partially shows and describes the functions of the mitochondria, nucleus, and cell membrane. Some detail is missing from at least one of the cell parts or minor errors are present (See *Advanced Look-Fors* for accurate descriptions). | **Look Fors:**   * Student draws a model that accurately shows and describes the functions of the mitochondria, nucleus, and cell membrane (e.g., the mitochondria breaks down food molecules into the kind of energy that can used by the cell to function; the nucleus has all the instructions for the cell’s functioning and decides what proteins are made by the cell; the cell membrane holds in all cell parts and has door-like openings to allow only certain materials to be let into and out of the cell). |

**Rubric 5**: Student develops a model to describe how the function of the cell depends on relationships among its parts.

* Dimensions Assessed: SEP – Developing and Using Models, CCC – Structure and Function

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| **Emerging (1)** | **Developing (2)** | **Proficient (3)** | **Advanced (4)** |
| Student develops a model to **inaccurately** describe how the function of the cell depends on relationships among its parts. | Student develops a model to **generally** describe how the function of the cell depends on relationships among its parts.  OR  Student **partially or completely** describes how the function of the cell depends on relationships among its parts, **but no model is present**. | Student develops a model to **partially** describe how the function of the cell depends on relationships among its parts. | Student develops a model to **completely** describe how the function of the cell depends on relationships among its parts. |
| **Look Fors:**   * Student draws a diagram that may or may not show all the cell parts, but relationships are either inaccurate or irrelevant. For example, student says that the different cell parts talk to each other in order for them all to work together and make energy. | **Look Fors:**   * Student draws a diagram that may show all the cell parts, but does not describe any specific relationships between the parts. However, student’s model does make a general statement that each cell part does a specific job that the cell needs and allows it to function as a whole.   OR   * Student uses words to describe at least one specific way that the main cell parts interact to make the cell function (See *Advanced Look-Fors*). However, no model is present. | **Look-Fors**   * Student draws a diagram that shows at least two cell parts and one specific way that they interact to make the cell function. For example, student draws an arrow between the cell membrane and the mitochondria, including a caption that reads, “The cell membrane lets in the sugar that the mitochondria needs to make energy for the cell.” | **Look Fors:**   * Student draws a diagram that shows all three main cell parts and multiple specific ways that they interact to make the cell function. For example, student draws an arrow between the cell membrane and the mitochondria, including a caption that reads, “The cell membrane lets in the sugar that the mitochondria needs to make energy for the cell.” Student also draws an arrow between the nucleus and the cell membrane, including a caption that reads, “The nucleus has the instructions to create protein products, which is the job of the cell, and these products are released through the cell membrane.” |