**Cognitive Skill Level Descriptions for the Introductory Physics MCAS Test**

Below are examples of cognitive skill level descriptions for the MCAS Introductory Physics test. The examples are not an exhaustive list. How an item is written, including the stem and the options (key and distractors), may contribute to the cognitive skill assigned to the item. The cognitive skill may also depend on student experiences, such as certain investigations or experiments they are familiar with. In addition, the grade level at which the question is being asked is also a consideration.

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| **Cognitive Skill** | **Description** |
| ***Remembering*** | **Students identify or define a concept with no context.** *Note: These are not on STE MCAS tests.* |
| ***Understanding/******Level 1*** | **Students show an understanding of scientific and engineering concepts and skills by:*** Ordering events or quantities for a simple phenomenon, such as an object’s relative amount of gravitational potential energy (based on height) or the speed of a mechanical wave in different media.
* Completing a simple model, such as beta decay or the electric field around two charges.
* Identifying a scientific process, such as the photoelectric effect or refraction, in a given model or based on a description.
* Describing basic interactions between the parts of a system, such as the forces between two charges or the direction of heat transfer between two objects.
* Interpreting information to determine a straightforward conclusion, such as the amplitude of a wave, that an electric current produces a magnetic field, or that momentum was conserved during a collision.
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| ***Applying/******Level 2*** | **Students apply their science and engineering knowledge and skills by:*** Interpreting data from a simple graph or table to solve a problem or draw a conclusion, such as determining the velocity of an object from a simple position vs. time graph.
* Interpreting models to draw straightforward conclusions, such as determining the amplitude of the resulting wave pulse when two wave pulses constructively interfere or the location where a charge would have the greatest electric potential energy.
* Completing an unfamiliar or complex model, such as a free-body force diagram or circuit diagram.
* Solving a quantitative problem that requires one formula, such as solving for gravitational force, the amount of heat added to a substance, or the frequency of a wave.
* Setting up a data table for an investigation, given certain criteria.
* Providing evidence that supports a claim about a scientific phenomenon.
* Explaining a scientific concept, such as energy conservation, when given an unfamiliar context.
* Determining what scientific question to ask given certain data and criteria.
* Determining which variables should be controlled in an investigation and those that may change.
* Writing a testable question that can be asked for an investigation or experiment. (CR items only)
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| ***Analyzing & Evaluating/******Level 3*** | **Students analyze or evaluate data and information using their science knowledge and skills by:*** Analyzing an unfamiliar model, complex graph, or data table with several variables to order quantities or events, such as using proportional reasoning to order the gravitational forces between pairs of objects with different masses and distances between them.
* Extrapolating data from a graph to order quantities based on a scientific relationship among variables, such as interpreting a velocity vs. time graph to order the magnitude of the net force on an object.
* Analyzing data from multiple sources or from a complex graph or table to draw a conclusion or develop an explanation.
* Analyzing a graph to determine a variable and then using the variable to solve a problem, such as using a circuit diagram to determine the voltage drop across a resistor and then calculating the current through the resistor.
* Analyzing a model or equation and describing how changing multiple variables affects another variable, such as how changing both the mass of a substance and the thermal energy added to a system affects the temperature change of the substance.
* Revising a model based on data and explaining the reasoning for the revision(s). (CR items only)

Note: Some items will reach this level due to students needing to construct an explanation in a constructed response (CR) based on an application of their knowledge. |