Computer-Based Released Items
High School Introductory Physics MCAS
Spring 2026

The spring 2026 High School Introductory Physics test was administered in two formats: a computer-based version and a paper-based version. Most students took the computer-based test. The paper-based test was offered as an accommodation for eligible students who were unable to use a computer. More information can be found on the MCAS Test Administration Resources page at www.doe.mass.edu/mcas/admin.html.

The Department of Elementary and Secondary Education is releasing items from both versions of the test to provide information about the knowledge and skills that students are expected to demonstrate.

- Released items from the computer-based test are available online at mcas.onlinehelp.cognia.org/released-items.
- Released items from the paper-based test are available in PDF format on the Department's website at www.doe.mass.edu/mcas/release.html.

This document provides information about each released item from the computer-based test, including the following: reporting category, standard covered, science practice category, item type, item description, and correct answer (for selected-response items only). Sample responses and scoring guidelines for constructed-response items will be posted at www.doe.mass.edu/mcas/student/default.html.

A Note about Testing Mode
Most of the operational items on the Introductory Physics test were the same, regardless of whether a student took the computer-based version or the paper-based version. In places where a technology-enhanced item was used on the computer-based test, an adapted version of the item was created for use on the paper test. These adapted paper items were multiple-choice or multiple-select items that tested the same science content and assessed the same standard as the technology-enhanced item.

High School Introductory Physics
Spring 2026 Computer-Based Released Operational Items

CBT Item No.*	Reporting Category	Standard	Science and Engineering Practice Categories	Item Type**	Item Description	Correct Answer***
1	*Motion, Forces, and Interactions*	HS.PHY.2.10	B. Mathematics and Data	SR	Calculate the final velocity of an object after it accelerates.	C
2	*Motion, Forces, and Interactions*	HS.PHY.2.9	None	SR	Determine which circuit element will increase the brightness of a light bulb in a circuit when it is added to the circuit.	A
3	*Waves*	HS.PHY.4.5	C. Evidence, Reasoning, and Modeling	SR	Explain how a device uses the principles of wave interactions with matter to detect an object.	*see page 8*
4	*Motion, Forces, and Interactions*	HS.PHY.2.1	B. Mathematics and Data	SR	Interpret a free-body force diagram to determine the acceleration of an object.	B
5	*Motion, Forces, and Interactions*	HS.PHY.2.4	None	SR	Describe a similarity between electrostatic and gravitational forces.	D
6	*Motion, Forces, and Interactions*	HS.PHY.2.10	B. Mathematics and Data	SR	Determine which equation describes the distance traveled by an object undergoing constant acceleration.	D
7	*Energy*	HS.PHY.1.8	C. Evidence, Reasoning, and Modeling	SR	Interpret models of nuclear processes to determine the type of energy emitted and explain why energy is emitted.	B;C
8	*Energy*	HS.PHY.3.5	C. Evidence, Reasoning, and Modeling	SR	Describe how the magnetic force on a magnet is affected when a nearby magnet is rotated.	B
9	*Waves*	HS.PHY.4.3	C. Evidence, Reasoning, and Modeling	SR	Explain why a light source ejects electrons from a metal surface that have a greater amount of energy than the electrons ejected by another light source.	D

10	*Waves*	HS.PHY.4.1	A. Investigations and Questioning	SR	Identify which question would be most useful to determine whether a wave is transverse or longitudinal.	C
11	*Energy*	HS.PHY.3.2	C. Evidence, Reasoning, and Modeling	SR	Order the locations around a pair of charges by the strength of the electric field.	*see page 8*
12	*Motion, Forces, and Interactions*	HS.PHY.2.5	None	SR	Describe how a generator uses a changing magnetic field to convert mechanical energy into electrical energy.	*see page 8*
13	*Energy*	HS.PHY.3.2	C. Evidence, Reasoning, and Modeling	SR	Describe how the kinetic energy of an object changes as a result of a collision.	A
14	*Motion, Forces, and Interactions*	HS.PHY.2.2	C. Evidence, Reasoning, and Modeling	SR	Complete a model of the momentum of an object before and after a collision.	*see page 8*
15	*Motion, Forces, and Interactions*	HS.PHY.2.10	B. Mathematics and Data	SR	Interpret a velocity vs. time graph to determine the position vs. time graph that represents the motion of an object.	B
16	*Motion, Forces, and Interactions*	HS.PHY.2.3	B. Mathematics and Data	CR	Calculate the momentum of an object just before a collision, the change in momentum of the object as a result of the collision, and the average force applied to the object during the collision.	
17	*Motion, Forces, and Interactions*	HS.PHY.2.9	C. Evidence, Reasoning, and Modeling	SR	Complete a model of a parallel circuit with a given total current.	*see page 8*
18	*Energy*	HS.PHY.3.3	B. Mathematics and Data	SR	Analyze how the efficiencies of two devices affect the output energies of the devices.	C

19	*Energy*	HS.PHY.3.4	B. Mathematics and Data	CR	Complete a model to show how heat flows through a system, calculate the amount of thermal energy required for a temperature change, explain why less thermal energy is required to change the temperature of a substance compared with another substance, and explain how the temperature of a substance can remain constant when thermal energy is transferred.	
20	*Waves*	HS.PHY.4.5	C. Evidence, Reasoning, and Modeling	CR	Describe how constructive interference affects the amplitude of a wave, calculate the period and wavelength of a wave, and explain why waves with different wavelengths have different frequencies.	
21	*Motion, Forces, and Interactions*	HS.PHY.2.1	C. Evidence, Reasoning, and Modeling	SR	Interpret a velocity vs. time graph to identify when the net force on an object is zero.	*see page 9*
22	*Motion, Forces, and Interactions*	HS.PHY.2.1	A. Investigations and Questioning	SR	Identify which variable needs to be measured to determine the relationship between the net force on a falling object and air density.	A
23	*Energy*	HS.PHY.3.5	C. Evidence, Reasoning, and Modeling	SR	Determine when energy is needed to move two charged particles closer together and when the forces between two charged particles would increase if the particles were released.	*see page 9*
24	*Waves*	HS.PHY.4.3	C. Evidence, Reasoning, and Modeling	SR	Interpret a model to describe how light behaves during a double-slit experiment.	*see page 9*

25	*Motion, Forces, and Interactions*	HS.PHY.2.10	B. Mathematics and Data	SR	Calculate the height from which an object was dropped when given the amount of time it takes the object to reach the ground.	C
26	*Energy*	HS.PHY.3.4	None	SR	Describe how the procedure of an investigation about heating a liquid should be changed.	B
27	*Motion, Forces, and Interactions*	HS.PHY.2.10	C. Evidence, Reasoning, and Modeling	SR	Determine which diagram represents the applied and frictional forces acting on an object.	A
28	*Energy*	HS.PHY.3.1	B. Mathematics and Data	SR	Describe the amount of work done to lift a box and the amount of energy transferred in the process.	D
29	*Energy*	HS.PHY.3.2	None	SR	Determine which graph best represents the relationship between temperature and average molecular kinetic energy.	A
30	*Motion, Forces, and Interactions*	HS.PHY.2.4	C. Evidence, Reasoning, and Modeling	SR	Identify the model that represents the directions of the electrostatic forces acting on two charged particles and describe how moving the particles closer affects those forces.	B;D
31	*Motion, Forces, and Interactions*	HS.PHY.2.10	B. Mathematics and Data	SR	Interpret a position vs. time graph to order several time intervals by speed.	*see page 9*
32	*Motion, Forces, and Interactions*	HS.PHY.2.9	C. Evidence, Reasoning, and Modeling	SR	Compare the voltage drop across two resistors in a series circuit.	*see page 10*
33	*Motion, Forces, and Interactions*	HS.PHY.2.3	C. Evidence, Reasoning, and Modeling	SR	Determine that a slower-moving object will require a smaller force to stop it than a faster-moving object will.	B

34	*Energy*	HS.PHY.3.1	C. Evidence, Reasoning, and Modeling	SR	Interpret circuit diagrams to determine which circuit converts electric energy into thermal energy and mechanical energy.	C
35	*Motion, Forces, and Interactions*	HS.PHY.2.9	B. Mathematics and Data	SR	Calculate the current through a branch of a parallel circuit.	B
36	*Motion, Forces, and Interactions*	HS.PHY.2.5	None	SR	Describe how electric current causes a motor to spin.	C
37	*Waves*	HS.PHY.4.1	C. Evidence, Reasoning, and Modeling	CR	Explain whether the resistance in a circuit component should be increased or decreased for a given situation, calculate the wavelength of a sound wave produced by the circuit component, compare how the wavelength travels in air with how it travels in water, and explain the reasoning.	
38	*Motion, Forces, and Interactions*	HS.PHY.2.10	B. Mathematics and Data	SR	Calculate average acceleration using time, initial velocity, and final velocity.	D
39	*Motion, Forces, and Interactions*	HS.PHY.2.4	C. Evidence, Reasoning, and Modeling	SR	Describe how the gravitational forces between two objects change when the mass of one object doubles.	*see page 10*
40	*Energy*	HS.PHY.3.3	A. Investigations and Questioning	SR	Identify a variable that must be kept constant to compare the efficiency of multiple solar panels.	C
41	*Motion, Forces, and Interactions*	HS.PHY.2.1	C. Evidence, Reasoning, and Modeling	SR	Interpret a free-body force diagram to determine the net force on an object and whether the object is accelerating.	A,D

42	*Motion, Forces, and Interactions*	HS.PHY.2.2	B. Mathematics and Data	CR	Determine the momentum of a system and explain the reasoning, calculate the momentum and velocity of one of the blocks in the system, and describe how energy is conserved in the system.	

* The 2026 Introductory Physics test results were reported using 58 points instead of 60 points. DESE excluded one two-point question that students reported having technology difficulties with during test administration. This question did not count toward any student's score.

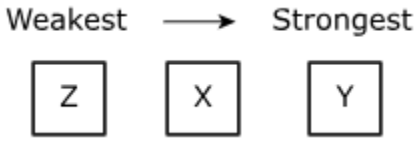
** Science item types are selected-response (SR) and constructed-response (CR).

*** Answers are provided here for selected-response items only. Pages 8–10 of this document provide correct answers for technology-enhanced (TE) items. Sample responses and scoring guidelines for constructed-response items will be posted at www.doe.mass.edu/mcas/student/default.html.

Correct Answer for CBT Item #3: Technology-Enhanced Item

The device works by emitting [electromagnetic] waves that [reflect off] a car.

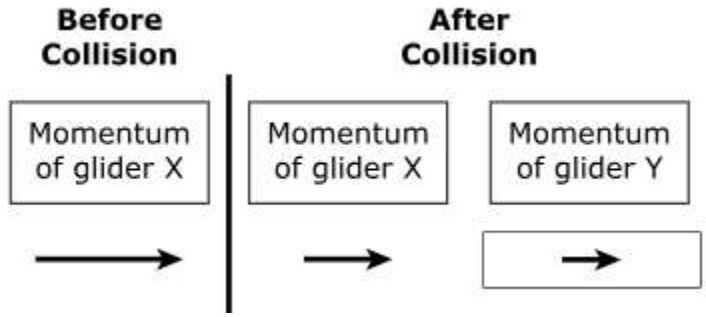
Correct Answer for CBT Item #11: Technology-Enhanced Item



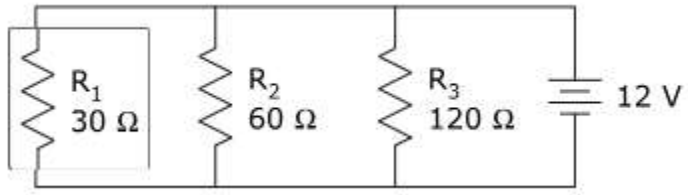
Correct Answer for CBT Item #12: Technology-Enhanced Item

A generator converts [mechanical] energy into [electrical] energy. The generator converts energy by using the forces that act on charges as a result of a changing [magnetic] field.

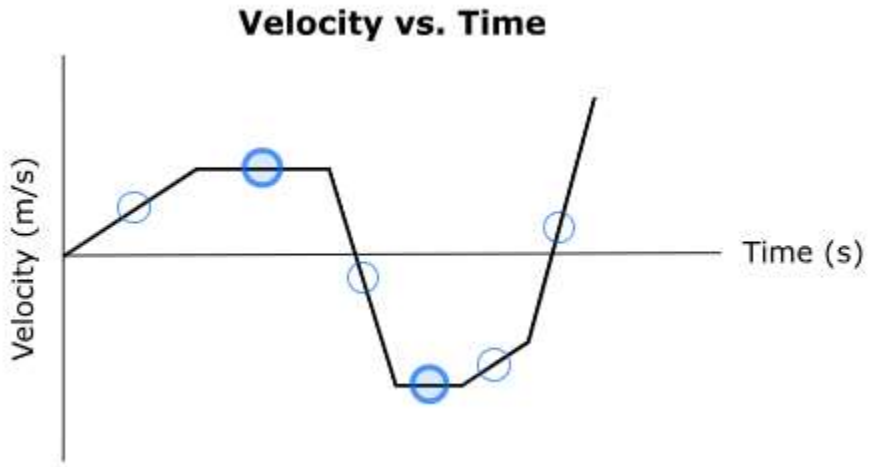
Correct Answer for CBT Item #14: Technology-Enhanced Item



Correct Answer for CBT Item #17: Technology-Enhanced Item



Correct Answer for CBT Item #21: Technology-Enhanced Item



Correct Answer for CBT Item #23: Technology-Enhanced Item

Energy is needed to move the particles closer together in pair L.

If all of the particles were released, the forces between them would increase in pair K.

Correct Answer for CBT Item #24: Technology-Enhanced Item

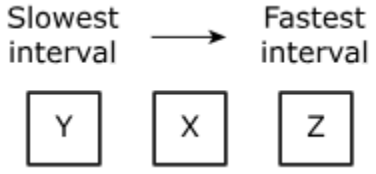
Part A

During the experiment, light was diffracted as it passed through the double slits.

Part B

The light that passed through the double slits interacted because of interference, which resulted in a pattern of light and dark regions on the wall.

Correct Answer for CBT Item #31: Technology-Enhanced Item



Correct Answer for CBT Item #32: Technology-Enhanced Item

The voltage drop across the 4 Ω resistor is one-half the voltage drop across the 8 Ω resistor.

Correct Answer for CBT Item #39: Technology-Enhanced Item

The gravitational force exerted on object X in Diagram 1 is two times the gravitational force exerted on object X in Diagram 2.