Individual Test Item Specifications

742020- Diesel Engine Service 2

2015

The contents of this document were developed under a grant from the United States Department of Education. However, the content does not necessarily represent the policy of the United States Department of Education, and you should not assume endorsement by the federal government.

Table of Contents

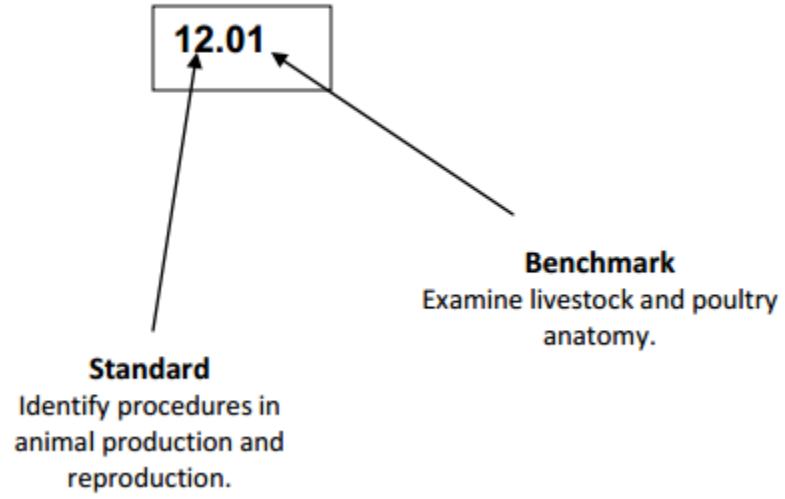
I. Guide to the Individual Benchmark Specifications

Content specific guidelines are given in the *Individual Benchmark Specifications* for each course. The *Specifications* contains specific information about the alignment of items with the Florida Standards. It identifies the manner in which each benchmark is assessed, provides content limits and stimulus attributes for each benchmark, and gives specific information about content, item types, and response attributes.

Benchmark Classification System

- Each Career and Technical Education course has its own set of course standards. The benchmarks are organized numerically, with two numbers separated by a decimal point. The first number is the standard number, and the second number is the benchmark number. You will see these numbers on the Item Specifications for each course.

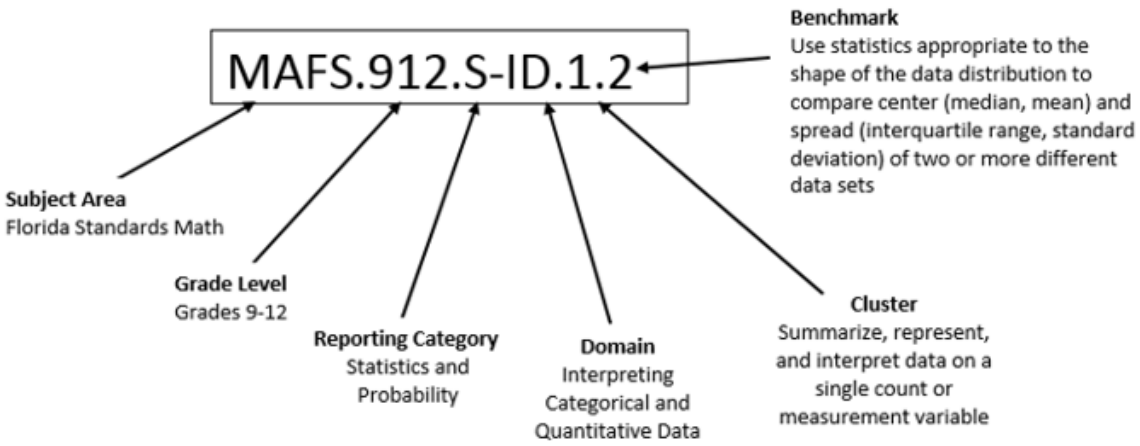
An example, from Agritechnology 1:



The image above describes the components of a Career and Technical Education Standard and Benchmark classification system.

Each MAFS benchmark is labeled with a system of letters and numbers.

- The four letters in the *first position* of the label identify the **Subject**.
- The number(s) in the *second position* represents the **Grade Level**.
- The letter(s) in the *third position* represents the **Category**.
- The number in the fourth position shows the **Domain**.
- The number in the *fifth position* identifies the **Cluster**.
- The number in the last position identifies the specific **Benchmark**.



The image above describes the components of a Florida Standard and Benchmark classification system.

Definitions of Benchmark Specifications

The *Individual Benchmark Specifications* provides standard-specific guidance for assessment item development for the Florida Department of Education Career and Technical Education item banks. For each benchmark assessed, the following information is provided.

Reporting Category	is a grouping of related benchmarks that can be used to summarize and report achievement.
Standard	refers to the standard statement presented in the Florida Standards.
Benchmark	refers to the benchmark statement presented in the Florida Standards. In some cases, two or more related benchmarks are grouped together because the assessment of one benchmark addresses another benchmark.
Item Types	are used to assess the benchmark or group of benchmark.
Cognitive Complexity	ideal level at which item should be assessed.
Benchmark Clarifications	explain how achievement of the benchmark will be demonstrated by students. In other words, the clarification statements explain what the student will do when responding to questions.
Content Limits	define the range of content knowledge and that should be assessed in the items for the benchmark.
Stimulus Attributes	define the types of stimulus materials that should be used in the items, including the appropriate use of graphic materials and item context or content.
Response Attributes	define the characteristics of the answers that a student must choose or provide.
Content Focus	addresses the broad key terms and concepts associated with the examples found in the standards, benchmarks, or benchmark clarifications.
Sample Items	are provided for each type of question assessed. The correct answer for all sample items is provided.

Standard	10.0 Diagnose and repair general electrical systems
Benchmark	10.01 Read, interpret, and diagnose electrical/electronic circuits using wiring diagrams.
Item Types **(MC)-Multiple Choice** **(SA)-Short Answer** **(P)-Performance** **(ER)-Extended Response**	(MC)=X (SA)= (P)=X (ER)=
Cognitive Complexity Level	L, M
Benchmark Clarification	The student will read, interpret, and diagnose electrical/electronic circuits using wiring diagrams.
Content Focus	Schematics
Content Limits	Items should be limited to medium duty and heavy duty truck and bus DC circuits.
Stimulus Attributes	None Specified
Response Attributes	None Specified
Sample Item	Using the schematic provided by your instructor for the air conditioning blower system, trace power and ground through the low blower speed circuit. Rubric: 4 Points: The response indicates that the student has a thorough understanding of how to use a schematic to follow current through a circuit. The student has identified the following: source voltage identified red power leg identified blue ground leg identified green final grounding point identified black 3 Points: The response indicates that the student has an understanding of how to use a schematic to follow current through a circuit and has identified three of the four components. 2 Points: The response indicates that the student has a partial understanding of how to use a schematic to follow current through a circuit and has identified two of the four components. 1 Point: The response indicates that the student has a very limited understanding of how to use a schematic to follow current through a circuit and has identified one of the four components.

	0 Points: The response indicates that the student does not demonstrate an understanding of how to use a schematic to follow current through a circuit. The student has not identified any component correctly.

Standard	10.0 Diagnose and repair general electrical systems--The student will be able to:
Benchmark	10.02 Check continuity in electrical/electronic circuits using appropriate test equipment.
Item Types **(MC)-Multiple Choice** **(SA)-Short Answer** **(P)-Performance** **(ER)-Extended Response**	(MC)=X (SA)= (P)=X (ER)=
Cognitive Complexity Level	L, M
Benchmark Clarification	The student will check continuity in electrical/electronic circuits using appropriate test equipment.
Content Focus	Digital multimeter, continuity, ohmmeter
Content Limits	Items should be limited to medium duty and heavy duty truck and bus DC circuits.
Stimulus Attributes	None Specified
Response Attributes	None Specified
Sample Item	Demonstrate to your instructor how to verify the integrity of the rear stop lamp bulb using a continuity test. Rubric: 4 Points: The response indicates that the student has a thorough understanding of how to check the continuity of a bulb. Student sets the DMM to the correct scale (Ohm's) to conduct a continuity test. Student has disconnected power going to the bulb to be tested. Student correctly performs the continuity test. Student makes the correct determination of the bulb status based on the continuity test. 3 Points: The response indicates that the student has an understanding of how to check the continuity of a bulb and gets three out of the four steps correct. 2 Points: The response indicates that the student has a partial understanding of how to check the continuity of a bulb and gets two out of the four steps correct. 1 Point: The response indicates that the student has a very limited understanding of how to check the continuity of a bulb and gets one out of the four steps correct. 0 Points:

	The response indicates that the student does not demonstrate an understanding of how to check the continuity of a bulb. The student does not get any steps correct.

Standard	10.0 Diagnose and repair general electrical systems--The student will be able to:
Benchmark	10.03 Check applied voltages, circuit voltages, and voltage drops in electrical/electronic circuits using a digital multimeter (DMM).
Item Types **(MC)-Multiple Choice** **(SA)-Short Answer** **(P)-Performance** **(ER)-Extended Response**	(MC)=X (SA)= (P)=X (ER)=
Cognitive Complexity Level	L, M, H
Benchmark Clarification	The student will check applied voltages, circuit voltages, and voltage drops in electrical/electronic circuits using a digital multimeter (DMM).
Content Focus	Digital multimeter, voltage drop, voltmeter, available voltage
Content Limits	The items should be limited to medium duty and heavy duty truck and bus DC circuits.
Stimulus Attributes	None Specified
Response Attributes	None Specified
Sample Item	Demonstrate to your instructor how to verify available voltage to the underhood fuse block. Rubric: 4 Points: The response indicates that the student has a thorough understanding of how to measure available voltage and completes the following tasks: Student sets the DMM to the correct setting to measure voltage. Student touches the leads together to zero out the DMM. Student connects the leads of the DMM correctly to measure available voltage. Student records the voltage reading. 3 Points: The response indicates that the student has an understanding of how to measure available voltage and completes three tasks. 2 Points: The response indicates that the student has a partial understanding of how to measure available voltage and completes two tasks. 1 Point: The response indicates that the student has a very limited understanding of how to measure available voltage and completes one task. 0 Points: The response indicates that the student does not demonstrate an understanding of how to measure available voltage and completes no tasks.

Standard	10.0 Diagnose and repair general electrical systems--The student will be able to:
Benchmark	10.05 Check resistance in electrical/electronic circuits and components using a digital multimeter (DMM).
Item Types **(MC)-Multiple Choice** **(SA)-Short Answer** **(P)-Performance** **(ER)-Extended Response**	(MC)=X (SA)= (P)=X (ER)=
Cognitive Complexity Level	L, M, H
Benchmark Clarification	The student will check resistance in electrical/electronic circuits and components using a digital multimeter (DMM).
Content Focus	Digital multimeter (DMM). Ohmmeter, resistance, ohms, Ohm's Law
Content Limits	Items should be limited to medium duty and heavy duty truck and bus DC circuits.
Stimulus Attributes	None Specified
Response Attributes	None Specified
Sample Item	The cooling fan motor fuse keeps blowing due to an overload condition. Verify the resistance of the cooling fan motors to determine if low resistance is the cause. Demonstrate to your instructor how to measure the resistance of the cooling fan motor(s). Rubric: 4 Points: The response indicates that the student has a thorough understanding of how to measure a component's resistance using a DMM by completing the following tasks: Student sets the DMM to the ohm scale to measure resistance. Student disables power from the circuit(s) to be tested. Student measures the cooling fan motor resistnace. Student provides a correct diagnosis of the cooling fan motor(s). 3 Points: The response indicates that the student has an understanding of how to measure a component's resistance using a DMM and completes three tasks. 2 Points: The response indicates that the student has a partial understanding of how to measure a component's resistance using a DMM and completes two tasks. 1 Point: The response indicates that the student has a very limited understanding of how to measure a component's resistance using a DMM and completes one task. 0 Points:

	The response indicates that the student does not demonstrate an understanding of how to measure a component's resistance using a DMM and completes no tasks.

Standard	10.0 Diagnose and repair general electrical systems--The student will be able to:
Benchmark	10.07 Diagnose parasitic (key-off) battery drain problems.
Item Types **(MC)-Multiple Choice** **(SA)-Short Answer** **(P)-Performance** **(ER)-Extended Response**	(MC)=X (SA)= (P)=X (ER)=
Cognitive Complexity Level	L, M, H
Benchmark Clarification	The student will diagnose parasitc (key-off) battery drain problems.
Content Focus	Parasitic draw, current draw, ammeter
Content Limits	Items should be limited to medium duty and heavy duty truck and bus DC circuits.
Stimulus Attributes	None Specified
Response Attributes	None Specified
Sample Item	The batteries on the bus keep dying. Demonstrate to your instructor how to diagnose the bus for a parasitic draw. Rubric: 4 Points: The response indicates that the student has a thorough understanding of how to measure parasitic draw and competes the following tasks: Student sets the DMM to measure amperes. Student installs the battery disconnect switch, makes sure no accessories are on, and tests with the 10A fused jumper. Student waits the appropriate time after setting up the DMM to make sure all modules enter sleep mode. Student records the parasitic draw of the vehicle and compares it to specifications. 3 Points: The response indicates that the student has an understanding of how to measure parasitic draw and completes three tasks. 2 Points: The response indicates that the student has a partial understanding of how to measure parasitic draw and completes two tasks. 1 Point: The response indicates that the student has a very limited understanding of how to measure parasitic draw and completes one task. 0 Points: The response indicates that the student does not demonstrate an understanding of how to measure parasitic draw and completes no tasks.

Standard	10.0 Diagnose and repair general electrical systems--The student will be able to:
Benchmark	10.08 Inspect and test fusible links, circuit breakers, relays, solenoids, and fuses; replace as needed.
Item Types **(MC)-Multiple Choice** **(SA)-Short Answer** **(P)-Performance** **(ER)-Extended Response**	(MC)=X (SA)= (P)=X (ER)=
Cognitive Complexity Level	L, M, H
Benchmark Clarification	The student will inspect and test fusible links, circuit breakers,, relays, solenoids, and fuses and replace as needed.
Content Focus	Fusible link (FL), Ohm's Law
Content Limits	Items should be limited to medium duty and heavy duty truck and bus DC circuits.
Stimulus Attributes	None Specified
Response Attributes	None Specified
Sample Item	Using a power probe, test light, or voltmeter, check the fuses in the fuse block. If you discover a blown fuse, document which fuse and replace it. Rubric: 4 Points: The response indicates that the student has a thorough understanding of how to check fuses. The student selects the correct tool for diagnosis The student uses the tool correctly to verify power to the fuses The student finds the blown fuse The student correctly identifies the fuse location. 3 Points: The response indicates that the student has an understanding of how to check fuses and gets three out of the four steps correct. 2 Points: The response indicates that the student has a partial understanding of how to check fuses and gets two out of the four steps correct. 1 Point: The response indicates that the student has a very limited understanding of how to check fuses and gets one out of the four steps correct. 0 Points:

	The response indicates that the student does not demonstrate an understanding of how to check fuses. The student gets none of the steps correct.

Standard	11.0 Diagnose and repair battery systems--The student will be able to:
Benchmark	11.01 Perform battery load test; determine needed action.
Item Types **(MC)-Multiple Choice** **(SA)-Short Answer** **(P)-Performance** **(ER)-Extended Response**	(MC)=X (SA)= (P)=X (ER)=
Cognitive Complexity Level	L, M, H
Benchmark Clarification	The student will perform a battery load test and determine the needed action.
Content Focus	Load tester, battery charger
Content Limits	Items should be limited to medium duty and heavy duty truck and bus DC circuits.
Stimulus Attributes	None Specified
Response Attributes	None Specified
Sample Item	The truck in the service bay will not start. Load test the batteries and make a recommendation for repair based on your findings. Rubric: 4 Points: The response indicates that the student has a thorough understanding of how to load test a battery and completes the following tasks: Student connects the load tester to the battery. Student inputs the correct information into the load tester. Student records the load test results. Student makes a correct recommendation for repair. 3 Points: The response indicates that the student has an understanding of how to load test a battery and completes three tasks. 2 Points: The response indicates that the student has a partial understanding of how to load test a battery and completes two tasks. 1 Point: The response indicates that the student has a very limited understanding of how to load test a battery and completes one task. 0 Points: The response indicates that the student does not demonstrate an understanding of how to load test a battery and completes no tasks.

Standard	11.0 Diagnose and repair battery systems--The student will be able to:
Benchmark	11.02 Determine battery state of charge using an open circuit voltage test.
Item Types **(MC)-Multiple Choice** **(SA)-Short Answer** **(P)-Performance** **(ER)-Extended Response**	(MC)=X (SA)= (P)=X (ER)=
Cognitive Complexity Level	L, M, H
Benchmark Clarification	The student will determine battery state of charge using an open circuit voltage test.
Content Focus	Open circuit voltage (OCV), voltmeter, hydrometer, refractometer
Content Limits	Items should be limited to medium duty and heavy duty truck and bus DC circuits.
Stimulus Attributes	None Specified
Response Attributes	None Specified
Sample Item	Use a voltmeter to determine the open circuit voltage (OCV) of the battery. Record your reading and determine the state of charge (SOC) of the battery. Based on the SOC level, make a determination of whether or not the battery is good for testing or needs to be charged. Rubric: 4 Points: The response indicates that the student has a thorough understanding of how to measure OCV to determine SOC. Student selects the correct DMM setting to measure voltage Student uses voltmeter correctly to measure OCV Student interprets the OCV into the correct SOC Based on the SOC, student makes the correct determination of whether to charge the battery or not. 3 Points: The response indicates that the student has an understanding of how to measure OCV to determine SOC and the student gets three out of the four steps correct. 2 Points: The response indicates that the student has a partial understanding of how to measure OCV to determine SOC and the student gets two out of the four steps correct. 1 Point: The response indicates that the student has a very limited understanding of how to measure OCV to determine SOC and the student gets one out of the four steps correct. 0 Points:

	The response indicates that the student does not demonstrate an understanding of how to measure OCV to determine SOC. The student does not get any steps correct.

Standard	11.0 Diagnose and repair battery systems--The student will be able to:
Benchmark	11.03 Inspect, clean, and service battery; replace as needed.
Item Types **(MC)-Multiple Choice** **(SA)-Short Answer** **(P)-Performance** **(ER)-Extended Response**	(MC)=X (SA)= (P)=X (ER)=
Cognitive Complexity Level	L, M, H
Benchmark Clarification	The student will inspect, clean, and service the battery and replace as needed.
Content Focus	None Specified
Content Limits	Items should be limited to medium duty and heavy duty truck and bus DC circuits.
Stimulus Attributes	None Specified
Response Attributes	None Specified
Sample Item	Inspect the batteries on the truck. Check for voltage leaks due to dirty casings. If dirty, clean the battery tops using an approved solution. If necessary, replace the battery if it is required. Rubric: 4 Points: The response indicates that the student has a thorough understanding of how to clean a battery and completes the following tasks: Student performs a battery leakage test with a DMM. Student cleans the battery case with an approved solution. Student tests the battery to determine if it is good. Student replaces the bad battery or returns the battery to service if it is good. 3 Points: The response indicates that the student has an understanding of how to clean a battery and completes three tasks. 2 Points: The response indicates that the student has a partial understanding of how to clean a battery and completes two tasks. 1 Point: The response indicates that the student has a very limited understanding of how to clean a battery and completes one task. 0 Points: The response indicates that the student does not demonstrate an understanding of how to clean a battery and completes no tasks.

Standard	11.0 Diagnose and repair battery systems--The student will be able to:
Benchmark	11.05 Charge battery using slow or fast charge method as appropriate.
Item Types **(MC)-Multiple Choice** **(SA)-Short Answer** **(P)-Performance** **(ER)-Extended Response**	(MC)=X (SA)= (P)=X (ER)=
Cognitive Complexity Level	L, M, H
Benchmark Clarification	The student will charge the battery using a slow or fast charging method as appropriate.
Content Focus	Battery charger, trickle charge, fast charge, slow charge
Content Limits	items should be limited to medium duty and heavy duty truck and bus DC circuits.
Stimulus Attributes	None Specified
Response Attributes	None Specified
Sample Item	Demonstrate to your instructor how to properly set up a battery charger to trickle charge the battery on the truck provided. Rubric: 4 Points: The response indicates that the student has a thorough understanding of how to trickle charge a battery on-vehicle by completing the following steps: Student makes sure the charger is off. Student connects the leads of the charger to the vehicle battery. Student plugs in the charger. Student sets the charger to the correct settings. 3 Points: The response indicates that the student has an understanding of how to trickle charge a battery on-vehicle and completes three steps. 2 Points: The response indicates that the student has a partial understanding of how to trickle charge a battery on-vehicle and completes two steps. 1 Point: The response indicates that the student has a very limited understanding of how to trickle charge a battery on-vehicle and completes one step. 0 Points: The response indicates that the student does not demonstrate an understanding of how to trickle charge a battery on-vehicle and competes no steps.

Standard	11.0 Diagnose and repair battery systems--The student will be able to:
Benchmark	11.07 Jump start a vehicle using jumper cables and a booster battery or auxiliary power supply using proper safety procedures.
Item Types **(MC)-Multiple Choice** **(SA)-Short Answer** **(P)-Performance** **(ER)-Extended Response**	(MC)=X (SA)= (P)=X (ER)=
Cognitive Complexity Level	L, M, H
Benchmark Clarification	The student will jump start a vehicle using jumper cables and a booster battery or an auxillary power supply using proper safety procedures.
Content Focus	Jumper box, auxillary power supply
Content Limits	Items should be limited to medium duty and heavy duty truck and bus DC circuits.
Stimulus Attributes	None Specified
Response Attributes	None Specified
Sample Item	Demonstrate to your instructor how to use a jump box to start the vehicle. Follow proper safety procedures. Rubric: 4 Points: The response indicates that the student has a thorough understanding of how to use an auxilliary power supply to jump start a vehicle. The student connects the positive (red) cable of the jump box to the battery positive cable. The student connects the negative (black) cable of the jump box to the vehicle ground (not the battery cable). The student starts the vehicle. The student disconnects the black (negative) cable first. 3 Points: The response indicates that the student has an understanding of how to use an auxilliary power supply to jump start a vehicle and gets three out of the four steps correct. 2 Points: The response indicates that the student has a partial understanding of how to use an auxilliary power supply to jump start a vehicle and gets two out of the four steps correct. 1 Point: The response indicates that the student has a very limited understanding of how to use an auxilliary power supply to jump start a vehicle and gets one out of the four steps correct. 0 Points:

	The response indicates that the student does not demonstrate an understanding of how to use an auxilliary power supply to jump start a vehicle. The student gets none of the steps correct.

Standard	12.0 Diagnose and repair starting systems--The student will be able to:
Benchmark	12.01 Perform starter current draw test; determine needed action.
Item Types **(MC)-Multiple Choice** **(SA)-Short Answer** **(P)-Performance** **(ER)-Extended Response**	(MC)=X (SA)= (P)=X (ER)=
Cognitive Complexity Level	L, M, H
Benchmark Clarification	The student will perform starter current draw test and determine required repair.
Content Focus	Current draw, load tester
Content Limits	Items should be limited to medium duty and heavy duty truck and bus DC circuits.
Stimulus Attributes	None Specified
Response Attributes	None Specified
Sample Item	What is a technician looking for when performing a current draw test? Sample response: Cranking voltage. Current draw while cranking

Standard	12.0 Diagnose and repair starting systems--The student will be able to:
Benchmark	12.02 Perform starter circuit cranking voltage and voltage drop tests; determine needed action.
Item Types **(MC)-Multiple Choice** **(SA)-Short Answer** **(P)-Performance** **(ER)-Extended Response**	(MC)=X (SA)= (P)=X (ER)=
Cognitive Complexity Level	L, M, H
Benchmark Clarification	The student will perform starter circuit cranking voltage and voltage drop tests to determine needed repairs/action.
Content Focus	Voltage drop, Ohm's Law, digital multimeter (DMM)
Content Limits	Items should be limited to medium duty and heavy duty truck and bus DC circuits.
Stimulus Attributes	None Specified
Response Attributes	None Specified
Sample Item	Using a test light or digital multimeter, determine if voltage exists at the starter solenoid when cranking. Rubric: 4 Points: The response indicates that the student has a thorough understanding of how to check the starter solenoid for power when cranking. The student selects the appropriate tool for testing (test light, power probe, or DMM). The student identifies the correct terminal to test. The student tests the starter solenoid for a cranking signal. The student makes a correct determination of whether or not the starter solenoid is recieving power. 3 Points: The response indicates that the student has an understanding of how to check the starter solenoid for power when cranking and gets three out of the four steps correct. 2 Points: The response indicates that the student has a partial understanding of how to check the starter solenoid for power when cranking and gets two out of the four steps correct. 1 Point: The response indicates that the student has a very limited understanding of how to check the starter solenoid for power when cranking and gets one out of the four steps correct. 0 Points:

	The response indicates that the student does not demonstrate an understanding of how to check the starter solenoid for power when cranking. The student gets none of the steps correct.

Standard	12.0 Diagnose and repair starting systems--The student will be able to:
Benchmark	12.03 Inspect, test, and replace components (key switch, push button and/or magnetic switch) and wires in the starter control circuit.
Item Types **(MC)-Multiple Choice** **(SA)-Short Answer** **(P)-Performance** **(ER)-Extended Response**	(MC)=X (SA)= (P)=X (ER)=
Cognitive Complexity Level	L, M, H
Benchmark Clarification	The student will inspect, test, and replace components (key switch, push button and/or magnetic switch) and wires in the starter control circuit.
Content Focus	Ignition switch, starter control circuit, safety switches
Content Limits	Items should be limited to medium duty and heavy duty truck and bus DC circuits.
Stimulus Attributes	None Specified
Response Attributes	None Specified
Sample Item	The truck in the service bay does not start and has no power at the starter control circuit at the solenoid. Diagnose the circuit. You may use service information to aid in your diagnostics. Document what test you performed for each component. Based on your findings, obtain a replacement part from your instructor and proceed to replace the faulty component and verify your repair. Rubric: 4 Points: The response indicates that the student has a thorough understanding of how to test components of the starter control circuit completes the following tasks: Student verifies no power at the starter solenoid terminal. Student uses service information to identify all of the components in the circuit. Student tests the components in the circuit. Student identifies the problem. 3 Points: The response indicates that the student has an understanding of how to test components of the starter control circuit and completes three tasks. 2 Points: The response indicates that the student has a partial understanding of how to test components of the starter control circuit and completes two tasks. 1 Point: The response indicates that the student has a very limited understanding of how to test components of the starter control circuit and completes one task. 0 Points:

	The response indicates that the student does not demonstrate an understanding of how to test components of the starter control circuit and completes no tasks.

Standard	12.0 Diagnose and repair starting systems--The student will be able to:
Benchmark	12.04 Inspect, test, and replace starter relays and solenoids/switches.
Item Types **(MC)-Multiple Choice** **(SA)-Short Answer** **(P)-Performance** **(ER)-Extended Response**	(MC)=X (SA)= (P)=X (ER)=
Cognitive Complexity Level	L, M, H
Benchmark Clarification	The student will inspect and replace starter relays and solenoids/switches.
Content Focus	Starter, starter solenoid, relay
Content Limits	Items should be limited to medium duty and heavy duty truck and bus DC circuits.
Stimulus Attributes	None Specified
Response Attributes	None Specified
Sample Item	Bench test the starter/solenoid assembly. Document your findings, determine the cause of failure, and make your recommendation for repair. Rubric: 4 Points: The response indicates that the student has a thorough understanding of how to bench test a starter assembly to verify solenoid operation by completing the following tasks: Student secures the starter in a bench vise. Student powers up the starter using an auxilliary source. Student tests the solenoid. Student determines the problem with the starter. 3 Points: The response indicates that the student has an understanding of how to bench test a starter assembly to verify solenoid operation and competes three steps. 2 Points: The response indicates that the student has a partial understanding of how to bench test a starter assembly to verify solenoid operation and completes two steps. 1 Point: The response indicates that the student has a very limited understanding of how to bench test a starter assembly to verify solenoid operation and completes one step. 0 Points:

	The response indicates that the student does not demonstrate an understanding of how to bench test a starter assembly to verify solenoid operation and completes no steps correctly.

Standard	13.0 Diagnose and repair charging systems--The student will be able to:
Benchmark	13.01 Diagnose instrument panel mounted volt meters and/or indicator lamps that show a no charge, low charge, or overcharge condition; determine needed action.
Item Types **(MC)-Multiple Choice** **(SA)-Short Answer** **(P)-Performance** **(ER)-Extended Response**	(MC)=X (SA)= (P)=X (ER)=
Cognitive Complexity Level	L, M, H
Benchmark Clarification	The student will diagnose instrument panel mounted volt meters and/or indicator lamps that show a no charge, low charge, or overcharge condition and determine a course of action.
Content Focus	Charging system, indicator lamp, voltmeter, ammeter, low charge, over charge, no charge
Content Limits	Items should be limited to medium duty and heavy duty truck and bus DC circuits.
Stimulus Attributes	None Specified
Response Attributes	None Specified
Sample Item	The medium duty truck in the service bay displays 9.5 volts on the instrument panel gauge, however, the voltage measured at the battery is 13.9 volts. Diagnose the charging system. Document the test(s) that you perform and the results. Based on your findings make a recommendation for repair. 4 Points: The response indicates that the student has a thorough understanding of how to diagnose a voltmeter indicator that shows a no charge condition of the charging system. The student obtains the correct service information to diagnose the concern. The student follows the trouble tree diagnosis. The student performs the diagnostic tests correctly. The student determines the correct repair solution. 3 Points: The response indicates that the student has an understanding of how to diagnose a no charge condition of the charging system and gets three of the four steps correct. 2 Points: The response indicates that the student has a partial understanding of how to diagnose a no charge condition of the charging system and gets two of the four steps correct. 1 Point: The response indicates that the student has a very limited understanding of how to diagnose a no charge condition of the charging system and gets one of the four steps correct. 0 Points:

	The response indicates that the student does not demonstrate an understanding of how to diagnose a no charge condition of the charging system. The student gets none of the steps correct.

Standard	13.0 Diagnose and repair charging systems--The student will be able to:
Benchmark	13.02 Diagnose the cause of a no charge, low charge, or overcharge condition; determine needed action.
Item Types **(MC)-Multiple Choice** **(SA)-Short Answer** **(P)-Performance** **(ER)-Extended Response**	(MC)=X (SA)= (P)=X (ER)=
Cognitive Complexity Level	L, M, H
Benchmark Clarification	The student will diagnose the cause of a no charge, low charge, or overcharge condition and determine the repair needed.
Content Focus	Charging system, overcharge, low charge, voltage drop, load test
Content Limits	Items should be limited to medium duty and heavy duty truck and bus DC circuits.
Stimulus Attributes	None Specified
Response Attributes	None Specified
Sample Item	The medium duty truck in the stall is not charging. Diagnose the concern. Document the test(s) you perform and the result(s). Based on your diagnosis, make a recommendation for repair. Rubric: 4 Points: The response indicates that the student has a thorough understanding of how to diagnose a low charge condition by completing the following tasks: Student determines the battery state-of-charge (SOC). Student load tests the charging system. Student performs voltage drop test of the charging system. Student identifies the problem. 3 Points: The response indicates that the student has an understanding of how to diagnose a low charge condition and completes three tasks. 2 Points: The response indicates that the student has a partial understanding of how to diagnose a low charge condition and completes two tasks. 1 Point: The response indicates that the student has a very limited understanding of how to diagnose a low charge condition and completes one task. 0 Points: The response indicates that the student does not demonstrate an understanding of how to diagnose a low charge condition and completes no tasks.

Standard	13.0 Diagnose and repair charging systems--The student will be able to:
Benchmark	13.04 Perform charging system voltage and amperage output test; determine needed action.
Item Types **(MC)-Multiple Choice** **(SA)-Short Answer** **(P)-Performance** **(ER)-Extended Response**	(MC)=X (SA)= (P)=X (ER)=
Cognitive Complexity Level	L, M, H
Benchmark Clarification	The student will perform charging system voltage and amperage output test and determine required repairs.
Content Focus	Load test, voltmeter, ammeter, inductive pickup
Content Limits	Items shoudl be limited to medium duty and heavy duty truck and bus DC circuits.
Stimulus Attributes	None Specified
Response Attributes	None Specified
Sample Item	Demonstrate to your instructor how to determine charging system voltage and amperage using a digital multimeter (DMM). Rubric: 4 Points: The response indicates that the student has a thorough understanding of how to measure charging system output voltage and amperage using a DMM and completes the following tasks: Student sets the DMM to the correct scale to measure voltage. Student connects the leads correctly to measure voltage. Student sets the DMM to use an amp probe to measure current. Student connects the amp probe correct to take an accurate measurement. 3 Points: The response indicates that the student has an understanding of how to measure charging system output voltage and amperage using a DMM and completes three tasks. 2 Points: The response indicates that the student has a partial understanding of how to measure charging system output voltage and amperage using a DMM and completes two tasks. 1 Point: The response indicates that the student has a very limited understanding of how to measure charging system output voltage and amperage using a DMM and completes one task. 0 Points:

	The response indicates that the student does not demonstrate an understanding of how to measure charging system output voltage and amperage using a DMM and completes no tasks.

Standard	13.0 Diagnose and repair charging systems--The student will be able to:
Benchmark	13.05 Perform charging circuit voltage drop tests; determine needed action.
Item Types **(MC)-Multiple Choice** **(SA)-Short Answer** **(P)-Performance** **(ER)-Extended Response**	(MC)=X (SA)= (P)=X (ER)=
Cognitive Complexity Level	L, M, H
Benchmark Clarification	The student will perform charging circuit voltage drop tests and determine needed action.
Content Focus	voltage drop, Ohm's Law, digital Multimeter (DMM)
Content Limits	Items should be limited to medium duty and heavy duty truck and bus DC circuits.
Stimulus Attributes	None Specified
Response Attributes	None Specified
Sample Item	Demonstrate to your instructor how to perform a voltage drop test of the charging circuits. Rubric: 4 Points: The response indicates that the student has a thorough understanding of how to perform a voltage drop test of the charging system and completes the following tasks: Student sets the DMM to the correct setting to measure voltage. Student measures voltage drop of the B+ circuit. Student measures voltage drop of the alternator ground circuit. Student measures voltage drop of the battery negative terminal to frame ground. 3 Points: The response indicates that the student has an understanding of how to perform a voltage drop test of the charging system and completes three tasks. 2 Points: The response indicates that the student has a partial understanding of how to perform a voltage drop test of the charging system and completes two tasks. 1 Point: The response indicates that the student has a very limited understanding of how to perform a voltage drop test of the charging system and completes one task. 0 Points: The response indicates that the student does not demonstrate an understanding of how to perform a voltage drop test of the charging system and completes no tasks.