



NOCTI
State Customized
Credential Blueprint



Automotive Mechanics Technology (PA)

Code: 7837 / Version: 01
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General Assessment Information

Blueprint Contents

General Assessment Information	Sample Written Items
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Specific Competencies Covered in the Test	Sample Performance Job

Test Type: The Automotive Mechanics Technology assessment was developed based on a Pennsylvania statewide competency task list and contains a multiple-choice and performance component. This assessment is meant to measure technical skills at the occupational level and includes items which gauge factual and theoretical knowledge.

Revision Team: The assessment content is based on input from Pennsylvania educators who teach in approved career and technical education programs.



47.0604- Automobile/Automotive
Mechanics
Technology/Technician



13- Transportation,
Distribution & Logistics



In the lower division baccalaureate/associate degree category, 3 semester hour in Automotive Trades or Automotive Technician (5/12). NOTE: An additional 1-2 credits may be awarded based on successful completion of the Performance Component when given in conjunction with the written proficiency examination.

Written Assessment

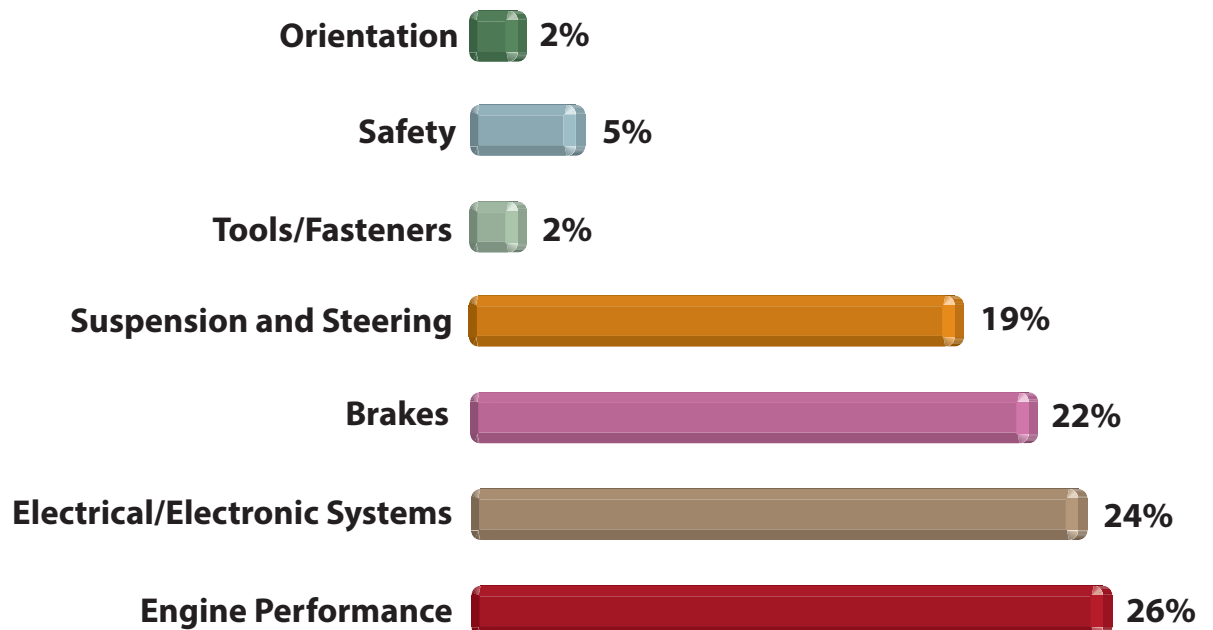
NOCTI written assessments consist of questions to measure an individual's factual theoretical knowledge.

Administration Time: 3 hours

Number of Questions: 200

Number of Sessions: This assessment may be administered in one, two, or three sessions.

Areas Covered



Specific Standards and Competencies Included in this Assessment

Orientation

- Demonstrate the use of service information
- Identify vehicle by: sight, V.I.N., and/or ID tag

Safety

- Demonstrate the ability to secure vehicles on jack stands and hydraulic lifts
- Demonstrate the ability to safely set-up/shut-down oxygen acetylene welding equipment
- Identify chemical safety, "Right-To-Know Laws" and Materials Safety Data Sheets (MSDS)
- Identify and demonstrate the safe use of hand tools
- Identify and demonstrate the safe use of power tools
- Identify and demonstrate the safe use of protective clothing and equipment
- Identify and demonstrate the safe use of fire protection equipment
- Identify and demonstrate the safe use of shop equipment
- Explain EPA and OSHA regulations

Tools/Fasteners

- Demonstrate the ability to correctly read and interpret automotive measuring tools



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Specific Standards and Competencies (continued)

Suspension and Steering

- Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction
- Identify and interpret suspension and steering system concerns; determine necessary action
- Research applicable vehicle and service information, such as suspension and steering system operation, vehicle service history, service precautions, and technical service bulletins
- Disable and enable supplemental restraint system (SRS)
- Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets
- Inspect and replace rack and pinion steering gear inner tie rod ends (sockets) and bellows boots
- Determine proper power steering fluid type; inspect fluid level and condition
- Flush, fill, and bleed power steering system
- Remove, inspect, replace, and adjust power steering pump belt
- Inspect and replace pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper
- Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps
- Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine necessary action
- Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine necessary action
- Remove, inspect, and install upper and/or lower ball joints

(Continued on the following page)

Specific Standards and Competencies (continued)

Suspension and Steering (continued)

- Remove, inspect, and install stabilizer bar bushings, brackets, and links
- Remove, inspect, and install strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount
- Inspect, remove, and replace shock absorbers
- Remove, inspect, and service or replace front and rear wheel bearings
Lubricate suspension and steering systems
- Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine necessary action
- Perform pre-alignment inspection and measure vehicle ride height; perform necessary action
- Prepare vehicle for wheel alignment on the alignment machine; perform four-wheel alignment by checking and adjusting front and rear wheel caster, camber; and toe as required; center steering wheel
- Inspect tire condition; identify tire wear patterns, check and adjust air pressure; determine necessary action
- Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action
- Diagnose tire pull problems; determine necessary action



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Specific Standards and Competencies (continued)

Brakes

- Identify and interpret brake system concerns; determine necessary action
- Research applicable vehicle and service information, such as brake system operation, vehicle service history, service precautions, and technical service bulletins
- Measure brake pedal height, travel, and free play (as applicable); determine necessary action
- Remove, bench bleed, and reinstall master cylinder
- Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear; tighten loose fittings and supports; determine necessary action
- Replace brake lines, hoses, fittings, and supports
- Fabricate brake lines using proper material and flaring procedures (double flare and ISO types)
- Select, handle, store, and fill brake fluids to proper level
- Bleed and/or flush brake system
- Test brake fluid for contamination
- Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action
- Remove, clean, inspect, and measure brake drums; determine necessary action
- Refinish brake drum; measure final drum diameter
- Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble
- Inspect and install wheel cylinders
- Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings

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Specific Standards and Competencies (continued)

Brakes (continued)

- Clean and inspect caliper mounting and slides/pins for operation, wear, and damage; determine necessary action
- Remove, inspect and replace pads and retaining hardware; determine necessary action
- Clean, inspect, and measure rotor thickness, lateral runout, and thickness variation; determine necessary action
- Refinish rotor off vehicle; measure final rotor thickness
- Install wheel, torque lug nuts, and make final checks and adjustments
- Inspect the vacuum-type power booster unit for leaks; inspect the check valve for proper operation; determine necessary action
- Remove, clean, inspect, repack, and install wheel bearings and replace seals; install hub and adjust bearings
- Identify and inspect electronic brake control system components; determine necessary action
- Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine necessary action
- Bleed the electronic brake control system hydraulic circuits
- Test, diagnose, and service electronic brake control system speed sensors (digital and analog), toothed ring (tone wheel), and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data)
- Identify traction control/vehicle stability control system components

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Specific Standards and Competencies (continued)

Electrical/Electronic Systems

- Identify and interpret electrical/electronic system concerns; determine necessary action
- Research applicable vehicle and service information, such as electrical/electronic system operation, vehicle service history, service precautions, and technical service bulletins
- Diagnose electrical/electronic integrity of series, parallel and series-parallel circuits using principles of electricity (Ohm's Law)
- Use wiring diagrams during diagnosis of electrical circuit problems
- Demonstrate the proper use of a digital multimeter (DMM) during diagnosis of electrical circuit problems, including: source voltage, voltage drop, current flow, and resistance
- Check electrical circuits with a test light; determine necessary action
- Locate shorts, grounds, opens, and resistance problems in electrical/electronic circuits; determine necessary action
- Measure and diagnose the cause(s) of excessive parasitic draw; determine necessary action
- Inspect and test fusible links, circuit breakers, and fuses; determine necessary action
- Inspect and test switches, connectors, relays, solenoid solid state devices, and wires of electrical/electronic circuits; perform necessary action
- Perform solder repair of electrical wiring
- Identify location of hybrid vehicle high voltage circuit disconnect (service plug) and safety procedures
- Perform battery state-of-charge test; determine necessary action
- Perform battery capacity test; confirm proper battery capacity for vehicle application; determine necessary action
- Maintain or restore electronic memory functions
- Inspect, clean, fill, and/or replace battery, battery cables, connectors, clamps, and hold-downs

(Continued on the following page)

Specific Standards and Competencies (continued)

Electrical/Electronic Systems (continued)

- Perform battery charge
- Start a vehicle using jumper cables or an auxiliary power supply
- Perform starter current draw tests; determine necessary action
- Perform starter circuit voltage drop tests; determine necessary action
- Inspect and test starter relays and solenoids; determine necessary action
- Differentiate between electrical and engine mechanical problems that cause a slow-crank or no-crank condition
- Perform charging system output test; determine necessary action
- Perform charging circuit voltage drop tests; determine necessary action
- Diagnose the cause of brighter than normal, intermittent, dim, or no light operation; determine necessary action
- Inspect, replace, and aim headlights and bulbs
- Inspect and diagnose incorrect turn signal or hazard light operation; perform necessary action
- Inspect and test gauges and gauge sending units for cause of abnormal gauge readings, determine necessary action
- Diagnose incorrect horn operation; perform necessary action
- Diagnose incorrect wiper operation; diagnose wiper speed control and park problems; perform necessary action
- Diagnose incorrect washer operation; perform necessary action
- Diagnose incorrect operation of motor-driven accessory circuits; determine necessary action



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Specific Standards and Competencies (continued)

Engine Performance

- Identify and interpret engine performance concern; determine necessary action
- Research applicable vehicle and service information, such as engine management system operation, vehicle service history, service precautions, and technical service bulletins
- Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action
- Diagnose abnormal engine noise or vibration concerns; determine necessary action
- Diagnose abnormal exhaust color, odor, and sound; determine necessary action
- Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action
- Perform cylinder power balance test; determine necessary action
- Perform cylinder cranking and running compression tests; determine necessary action
- Perform cylinder leakage test; determine necessary action
- Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine necessary action
- Verify engine operating temperature; determine necessary action
- Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action
- Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable
- Diagnose the causes of emissions or drivability concerns with stored or active diagnostic trouble codes; obtain, graph, and interpret scan tool data
- Diagnose emissions or drivability concerns without stored diagnostic trouble codes; determine necessary action
- Inspect and test computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO); perform necessary action
- Access and use service information to perform step-by-step diagnosis
- Perform active tests of actuators using a scan tool; determine necessary action

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Specific Standards and Competencies (continued)

Engine Performance (continued)

- Inspect and test ignition primary and secondary circuit wiring and solid state components; test ignition coil(s); perform necessary action
- Diagnose hot or cold no-starting, hard starting, poor drivability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems; determine necessary action
- Inspect and test fuel pumps and pump control systems for pressure, regulation, and volume; perform necessary action
- Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air
- Inspect and test fuel injectors
- Perform exhaust system back-pressure test; determine necessary action
- Diagnose oil leaks, emissions, and drivability concerns caused by the positive crankcase ventilation (PCV) system; determine necessary action
- Diagnose emissions and drivability concerns caused by the exhaust gas recirculation (EGR) system; determine necessary action
- Inspect and test catalytic converter efficiency
- Diagnose emissions and drivability concerns caused by the evaporative emissions control system; determine necessary action
- Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action
- Perform engine oil and filter change
- Describe the importance of running all OBDII monitors for repair verification
- Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor drivability, spark knock, power loss, poor mileage, and emissions concerns; determine necessary action

Sample Questions

Where does a technician find wheel torque specifications?

- A. unit repair manual
- B. computerized service information system
- C. wheel weight chart
- D. decal under the hood

Acetylene gas becomes unstable above

- A. 4 psi
- B. 8 psi
- C. 12 psi
- D. 15 psi

When checking for parallelism on a disc brake rotor, the technician should use a

- A. protractor
- B. micrometer
- C. dial indicator
- D. linear caliper

When bench bleeding a master cylinder, the technician should bleed

- A. front or nose end outlet
- B. rear or pedal side outlet
- C. both outlets simultaneously
- D. crossbleed outlets

Which of the following circuits has two or more paths for the current to follow?

- A. series circuit
- B. parallel circuit
- C. open circuit
- D. split phase circuit

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Sample Questions (continued)

Interviewing the customer prior to servicing the vehicle is

- A. unnecessary for complete service
- B. primarily the responsibility of the shop owner
- C. necessary to determine the malfunction
- D. necessary only with older model cars

A fuel-injected vehicle that has high or surging idle most likely has

- A. water in the gas
- B. a clogged air filter
- C. a vacuum leak
- D. a locked up converter clutch

Where does a technician find wheel torque specifications?

- A. unit repair manual
- B. computerized service information system
- C. wheel weight chart
- D. decal under the hood

The end of the steering gear sector shaft, which is located outside the steering gear-box housing, has splines that attach to the

- A. drag link
- B. pitman arm
- C. idler arm
- D. tie rod end

Proper dynamic tire balancing can help prevent

- A. torque steer reaction
- B. high speed steering wheel shake
- C. front end pull
- D. low speed steering wheel shake

Performance Assessment

NOCTI performance assessments allow individuals to demonstrate their acquired skills by completing actual jobs using the tools, materials, machines, and equipment related to the technical area.

Administration Time: 2 hours and 30 minutes

Number of Jobs: 6

Areas Covered:

6% Identification of Parts

Participants will identify suspension and steering parts, brake parts, electrical and electronic parts, and engine performance parts.

24% Disc Brake Assembly Service

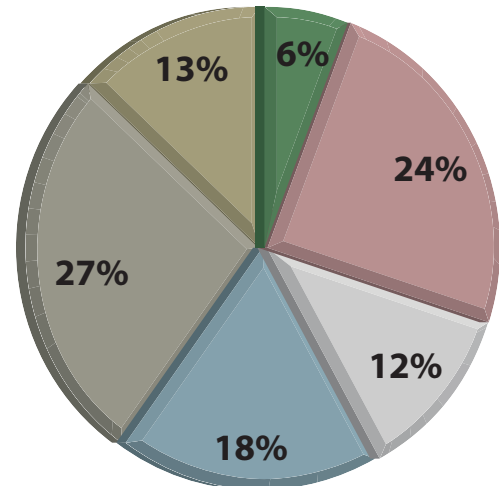
Participants will remove caliper mounting bolts, replace brake pads, record caliper mounting bolt torque specs, remount and torque caliper, measure and record rotor thickness and manufacturer's discard specs, refinish rotor, measure and record thickness, and determine the usability of the rotor.

12% Tire Service and Balance

Participants will dismount the tire from the wheel, and mount, inflate, and balance the replacement tire.

18% Perform Fuel System Pressure Test

Participants will look up and record fuel pressure specs, install the fuel pressure tester, inspect fuel pump for leaks, record pressure, start engine and record regulated pressure, compare to specs, perform a leak down test and drain and disconnect test equipment.



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Areas Covered (continued)

27% Test and Diagnose Battery, Starting, and Charging System

Participants will perform open circuit voltage test, record battery load test specs, perform battery test, record starter draw specs, perform starter draw test, record alternator output specs, perform alternator output test, and record alternator recommendations.

13% Test Electronic Engine Control Components

Participants will retrieve and document numerical trouble codes, identify trouble code set, locate trouble code components, but do not clear codes or repair.

Sample Job

Identification of Parts

Maximum Time: 20 minutes

Participant Activity: The participant will identify each part laid out on the workbench and write in the name of the part beside the corresponding number.

