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Definitions:

- GVW - Gross vehicle weight
- Automobile and light truck - Vehicles under 14,000 pounds GVW
- Heavy-duty truck - Vehicles 14,000 pounds GVW and higher
- R and R - Remove and replace

Disclaimer:

The State of Michigan does not provide or recommend any single textbook or published materials for your review when preparing for the mechanics tests. However, it is recommended that individuals who prefer home study acquire textbooks similar to those found in technical skill centers and two-year or four-year colleges. Typically, these types of textbooks are not found at your local library but are available through educational bookstores and various online automotive publishers.

It is suggested that you prepare by reviewing the categories and subcategories found in this guide for each exam type. Each category is given a percentage indicating how many of the test questions will be drawn from that category. This allows you to plan your study time and concentrate on those areas that are given the most emphasis on the test.

Engine repair – (Automobile and light truck)

- **Engine fundamentals - 12%**
 - Micrometer reading
 - Bolt head markings
 - Engine R and R procedures
 - Engine break in
- **General engine diagnosis - 28%**
 - Oil consumption
 - Cylinder leakage test
 - Compression test
 - Exhaust recognition
 - Engine sludge / contamination
 - Vacuum testing
 - Crankcase pressure / blow-by
 - Spark plug diagnosis
 - Engine noise
 - Power balance testing
- **Engine block diagnosis and repair - 22%**
 - Engine measurements and clearances
 - Piston installation
 - Cleaning and assembling procedures
 - Piston design
 - Piston ring diagnosis
 - Cam bearing installation
- **Cylinder head and valve train diagnosis and repair - 28%**
 - Valve deposits
 - Valve train measurements and clearances
 - Mechanical timing
 - Variable lift valves
 - Variable cam timing
 - Variable displacement
 - Valve guide wear
 - Valve spring diagnosis
 - Noise diagnosis
 - Camshaft diagnosis
- **Lubrication and cooling - 10%**
 - Cooling system diagnosis
 - Oil pressure diagnosis
 - Fluid identification

Automatic transmission – (Automobile and light truck)

- **Internal operation – 26%**
 - Gear train end play
 - Band and servo operation
 - Planetary gear set
 - Multiple disc clutch packs
 - Shifting operation
 - Torque converter
 - Valve body
 - Transmission inputs
 - Electrical / electronics
- **General diagnosis - 31%**
 - Shift quality
 - Fluid diagnosis
 - Band / clutch diagnosis
 - Fluid loss diagnosis
 - Pressure testing
 - Valve body diagnosis
 - Scan tool usage
 - External control
 - Transmission noise
 - Transmission performance
- **Component diagnosis - 12%**
 - Hydraulics
 - Torque converter
 - Clutch pack
 - Cooler operation
 - Solenoid operation and testing
- **Repair procedures - 13%**
 - Transmission remove and replace
 - Transmission seals
 - Pump to converter engagement
 - Pump operation
 - Programming / calibration
- **Fundamentals - 18%**
 - Fluids
 - Transaxle
 - Valve body components
 - General transmission operation
 - Start / stop operation
 - High-voltage safety
 - Valve identification
 - Fluid types

Manual transmission, front and rear drive axles – (Automobile and light truck)

- **Transmission / transaxle diagnosis - 13%**
 - Fluid and transmission diagnosis
 - Hard shifting complaints
 - Transmission vs. Transaxle comparison
 - Transaxle / transmission gear recognition
 - Synchronizer problems and operation
- **Clutch diagnosis and repair - 19%**
 - Clutch disc operation
 - Noise and chatter diagnosis
 - Shifting problem diagnosis
 - Hydraulic systems
- **Component remove and replace - 10%**
 - Transmission remove and replace
 - Extension housing seal remove and replace
 - Synchronizer replacement
 - Electronic manuals
- **Final drive - 30%**
 - Ring gear run-out
 - Noise diagnosis
 - Differential diagnosis
 - Ring and pinion gear sets
 - Ring and pinion backlash
 - Pinion bearing preload
 - Final drive ratio
 - Pinion seal remove and replace
 - Limited slip diagnosis
 - Differential bearing preload
 - Lubricant types
- **Axle shaft / CV repair - 9%**
 - CV boot installation
 - Drive axle diagnosis
 - CV joint operation
- **4WD / AWD systems – 9%**
 - Transfer case operation
 - 4WD actuators
 - AWD operation
- **Miscellaneous - 10%**
 - Bearing types
 - Gear type identification
 - Direct drive and gear reduction theory
 - Driveshaft angle

Front end, suspension and steering systems – (Automobile and light truck)

- **Alignment - 32%**
 - Alignment procedures
 - Vehicle pull diagnosis
 - Alignment diagnosis
 - Steering wheel center
 - Caster adjustment
 - Camber adjustment
 - "Toe" adjustment procedures

- **Suspension - 29%**
 - Ball joint diagnosis
 - Measuring curb height
 - Ball joint remove and replace procedure
 - Strut suspensions
 - Electronic suspension
 - Suspension symptom diagnosis
 - Component wear

- **Steering - 20%**
 - Rack and pinion diagnosis
 - Electric power steering
 - Tie rod end diagnosis
 - Steering linkage diagnosis
 - Hydraulic power steering

- **Fundamentals - 18%**
 - Lug nut torque
 - Wheel bearing adjustment
 - Basic alignment angle understanding
 - Tire wear

Brakes and braking systems – (Automobile and light truck)

- **System diagnosis and repair - 26%**
 - Hydraulic valves
 - Brake pedal pulsation
 - Brake performance
 - Wheel bearings
 - Power assist systems
 - Fundamental procedures
 - Noise diagnosis

- **Hydraulics diagnosis and repair - 23%**
 - Fluid diagnosis
 - Line repair
 - Hydraulic repair
 - Brake pedal feel
 - Brake bleeding
 - Leak diagnosis

- **Electronic brake system diagnosis and repair - 26%**
 - ABS pump / motor operation
 - Safety precautions
 - Speed sensors
 - Braking electrical diagnosis
 - Stability control systems

- **Drum brake diagnosis and repair - 12%**
 - Measuring and refinishing
 - Drum / shoe types
 - Brake adjustment
 - Leak diagnosis
 - Parking brake
 - Brake hardware

- **Disc brake diagnosis and repair - 12%**
 - Measuring and refinishing
 - Caliper replacement
 - Parking brake
 - Brake hardware

Electrical systems – (Automobile and light truck)

- **Electrical fundamentals - 25%**
 - High voltage safety
 - Supplemental inflatable restraint (SIR)
 - Basic electrical
 - Series circuit diagnosis
 - Relay operation
 - Circuit protection devices
 - Networking and communication
- **Testing equipment usage - 16%**
 - Ohmmeter usage
 - Voltmeter usage
 - Ammeter usage
 - Voltage drop
 - High voltage systems
- **Starting and charging system diagnosis - 19%**
 - Batteries
 - Starter diagnosis
 - Starter current draw
 - Starter circuit diagnosis
 - Generator / alternator diagnosis
 - Charging system output
 - Charging system circuit diagnosis
 - Voltage drop tests
- **Circuit diagnosis - 20%**
 - Short to ground
 - High resistance / open circuit
 - Blower motor circuit diagnosis
 - Lighting circuits
 - Cooling fan circuit
 - Warning circuits
 - Accessory circuits
- **Electrical diagrams - 20%**
 - Electrical circuit recognition
 - Diagram usage

Heating and air conditioning – (Automobile and light truck)

- **Heating and engine cooling system diagnosis - 21%**
 - Leak diagnosis
 - Freeze protection
 - Low heater output
 - Pressurized systems
 - Defrost operation
 - Overheating
- **General knowledge of A/C components and their functions - 19%**
 - Receiver drier / accumulator
 - Temperature sensors
 - Refrigerant oil
 - Compressor clutch
 - Condenser
 - Evaporator
 - Orifice tube
 - Thermostatic expansion valve
- **General knowledge of A/C systems - 12%**
 - Refrigerant types
 - Refrigerant states
 - Operating pressures
- **A/C diagnosis - 26%**
 - Condensation
 - Leak detection
 - Overcharged / undercharged system
 - Compressor clutch
 - Gauge set readings
 - Lack of cold air
 - Electrical schematic interpretation
 - Air delivery
- **A/C repair procedures - 18%**
 - Recovering refrigerant
 - Seal replacement
 - Compressor replacement
 - Charging the system
 - Component replacement
- **Refrigerant recovery, recycling and handling - 4%**
 - Refrigerant environmental concerns
 - Recycling or recovering refrigerant

Engine tune-up and performance – (Automobile and light truck)

- **Electronic controls - 28%**
 - Powertrain control module (PCM)
 - Malfunction indicator light (MIL)
 - Fault codes
 - Sensor identification / operation
 - Oxygen sensors
 - Closed loop / open loop operation
 - Scan tool usage

- **Ignition systems - 14%**
 - Spark plug diagnosis
 - Pre ignition / detonation
 - Coil on plug ignition system

- **Fuel system - 24%**
 - Injector pulse width
 - Types of fuel injection
 - Fuel trim
 - E85 fuel
 - Turbocharger diagnosis
 - Octane ratings

- **Diagnosis - 18%**
 - Interference engines
 - Variable valve timing
 - Vacuum testing
 - Check engine light
 - Catalytic converter
 - Compression testing

- **Emission control systems - 16%**
 - Exhaust gas recirculation (EGR)
 - Evaporative emission control
 - Catalytic converter
 - Positive crankcase ventilation (PCV)

Unitized body and structural repair

- **Materials (Characteristics and identification) - 17%**
 - Aluminum
 - Ultra-high strength steel (UHSS)
 - High strength steel (HSS)
 - Plastics
- **Material joining - 23%**
 - Flow drill screws
 - Self-piercing rivets
 - Adhesives
 - Characteristics of:
 - MIG / GMAW
 - STRSW / Spot welding
 - TIG / GTAW
 - Oxy / Acetylene
 - Welding precautions
 - Shielding gas
- **Repairing structural components - 21%**
 - Structural component identification
 - Sectioning
 - Types of welds:
 - Fillet
 - Plug
 - Butt with backing
 - Open butt
 - Anchoring
 - Corrosion protection
- **Glass replacement and installation - 5%**
 - Types of glass
- **Measuring / damage analysis - 25%**
 - Point to point
 - Direct damage
 - Indirect damage
 - Primary damage
 - Secondary damage
 - Types of damage:
 - Mash
 - Sway
 - Sag
 - Twist
 - Diamond
 - Datum plane
 - Vehicle centerline
 - Asymmetrical dimensions

Collision related mechanical repair

- **Steering and suspension - 13%**

- Component identification
- Alignment adjustments
- Steering column diagnosis
- Rack and pinion
- Power steering

- **Heating and cooling - 10%**

- General questions

- **Electrical - 33%**

- Wire repair
- Symbol identification
- Circuit diagnosis
- ADAS system
- Sensor diagnosis / repair
- Module replacement
- High voltage safety
- Airbag safety

- **Restraint systems - 11%**

- Airbag inspection
- Airbag damage
- Airbag replacement
- Pretensioner

- **Drivetrain - 15%**

- Vibration diagnosis
- Noise diagnosis
- Transaxle
- Bent parts

- **Brakes - 11%**

- Brake bleeding
- Brake line
- ABS

- **Miscellaneous - 7%**

- Tire identification
- Wheel diagnosis

Breath alcohol ignition interlock device (BAIID)

- **Ohm's law and electrical symbol recognition - 13%**
 - Ohm's Law
 - Splice symbol
 - Diode symbol
 - Relay symbol
- **Starting system diagnosis - 13%**
 - Starter current draw
 - Starter relay diagnosis
 - Circuit resistance Test
 - Battery test
- **Miscellaneous circuit diagnosis - 6%**
 - Regulator diagnosis
 - Horn circuit diagnosis
- **General - 13%**
 - Electrostatic discharge
 - Voltage drop test
 - Circuit protection
- **Test meter usage - 6%**
 - Ohmmeter usage
 - Voltmeter usage

Installation and legal questions:

- **Legal requirements - 25%**
 - Installer requirements
 - Service area requirements
 - Customer requirements
 - Customer training
- **General - 24%**
 - Violation reset
 - Tampering
 - Emergency bypass code
 - Removal of device
 - Set point

Gasoline engine repair – (Heavy-duty truck)

- **Engine mechanical diagnosis - 26%**
 - Spark plug evaluation
 - Engine noise
 - Compression test
 - Oil consumption
 - Exhaust smoke color
 - Cylinder blocks
 - Cylinder heads
 - Piston rings
 - Overheating

- **Skills in measuring - 12%**
 - Torque angle
 - Measuring cylinder bore
 - Reading a micrometer
 - Reading a dial indicator
 - Reading Plastigage
 - How to check crankshaft end play

- **Fundamentals – 31%**
 - Electrical terms and definitions
 - Series / parallel circuits
 - Understanding how engines operate
 - Cooling system operation
 - Ignition systems
 - Camshaft timing
 - Fuel systems

- **Electronic Controls – 32%**
 - EGR operation
 - Variable valve timing
 - Sensor operation / diagnosis
 - Scan tool operation
 - EVAP system

Diesel engine repair – (Heavy-duty truck)

- **Engine components - 22%**
 - Piston rings
 - General piston knowledge
 - Aftercooler operation
 - Oil temperature
 - Oil distribution
 - Turbo charger operation
 - Valve bridge function
- **Engine mechanical diagnosis - 20%**
 - Turbocharger diagnosis
 - Coolant in crankcase
 - Exhaust smoke diagnosis
 - Engine operating temperature
 - Oil pressure diagnosis
 - Engine tear down diagnosis
 - Blow by
 - Connecting rod diagnosis
 - Engine misfire
- **Fuel systems - 12%**
 - Types of injection
 - Leaky fuel lines
 - Fuel system diagnosis
 - Fuel filter diagnosis
- **Skills in measuring - 10%**
 - Measuring tools
 - Reading Plastigage
 - Reading a micrometer
 - Crankshaft end play
- **Fundamentals - 14%**
 - Using a digital multimeter
 - Bolt grades
 - Understanding 4-stroke engines
 - Valve lash adjustment
- **Electronic controls and after-treatment – 22%**
 - EGR operation
 - DEF function and maintenance
 - DPF function and maintenance
 - Diesel oxidation catalyst (DOC)

Drivetrain – (Heavy-duty truck)

- **Clutch components and diagnosis - 19%**
 - Causes of hard shifting
 - Clutch pedal free play
 - Slipping clutch
 - Clutch “chatter”
 - Clutch brake
 - Pilot bearing
 - Clutch adjustment
- **Driveshaft components and diagnosis - 17%**
 - Driveline angles
 - Driveshaft disassembly
 - Driveline vibration
 - U-Joint replacement
 - U-joint maintenance
- **Axle components and diagnosis - 18%**
 - Ring and pinion backlash
 - Inter-axle differential lock
 - Pinion bearing preload
 - Differential side bearing preload
- **Transmission components and diagnosis - 46%**
 - Torque converter operation
 - Planetary gears
 - Causes of hard shifting
 - Automated mechanical transmission
 - Scan tool operation
 - Overdrive / underdrive
 - Transmission fluid condition
 - Clutch disc springs
 - Transmission / clutch noise

Brakes and braking systems – (Heavy-duty truck)

- **Basic knowledge - 25%**
 - Anti-lock brakes (ABS)
 - Stability control system
 - Types of brake line flares
 - Hydro-boost systems
 - Hydraulic brake line material
 - Air brake hand valve
 - Drum brake leak diagnosis
 - Master cylinder operation
 - Preset wheel bearing
 - Grease-soaked brake linings

- **Air brake diagnosis and repair - 58%**
 - Air brake systems operation
 - Finding air leaks
 - Air pressure diagnosis
 - Air compressor operation
 - Tractor protection valves
 - Dual diaphragm brake chamber operation
 - Pushrod travel
 - Spring brake repairs
 - Air pressures for fail-safe brakes
 - Adjusting cam actuated brakes
 - Brake linkage lubrication
 - Air line material
 - Slack adjuster and pushrod angle
 - "S" cam brake operation
 - Air dryer operation
 - Trailer brakes won't release

- **Hydraulic brake diagnosis and repair - 17%**
 - Hydro-boost systems
 - Swollen master cylinder diaphragm
 - Cause of gear lube inside brake drums
 - Grabbing brakes
 - Causes of a pulsating pedal
 - Brake lining wear diagnosis

Suspension and steering systems – (Heavy-duty truck)

- **Steering system diagnosis - 19%**
 - Power steering analyzer tool
 - Power steering unit noise
 - Power steering leak
 - System bleeding
 - Aerated power steering fluid
 - Free play in steering
 - Wheel shimmy
 - Tie rod end play
- **Suspension diagnosis - 19%**
 - Air ride suspension operation
 - Leaf springs
 - Hendrickson suspensions
 - Torque rods
 - Tandem axle alignment
 - Tracking rods
- **Wheel alignment - 19%**
 - Toe-in adjustment
 - Tire inflation
 - Tire wear analysis
 - Camber / caster / toe
 - Effects of different angles on vehicle operation
- **Basic steering system knowledge - 19%**
 - Front suspension components
 - Steering gear operation / diagnosis
 - Wheel bearings
 - Steering wheel free play
 - Steering knuckle wear
 - Power steering pump replacement
- **Basic suspension knowledge - 19%**
 - Castle nut tightening
 - Lug nut tightening sequence
 - Walking beam suspension
 - Suspension adjustment
 - Equalizing beam suspensions
 - Adjustable trailer axles
- **Fifth wheel knowledge – 6%**
 - Fifth wheel adjustment
 - Fifth wheel diagnosis
 - Hardware grade

Electrical systems – (Heavy-duty truck)

- **System diagnosis - 28%**
 - Parallel versus series
 - Trailer light diagnosis
 - Relay testing / diagnosis
 - Ground faults
 - Windshield wiper circuit
 - Circuit diagnosis

- **General - 11%**
 - Batteries
 - Data bus
 - Welding
 - Module replacement

- **Vehicle lighting - 11%**
 - Turn signal circuit
 - Tail lamp circuit
 - Head lamp circuit
 - Trailer wiring
 - Clearance lights

- **Starting and charging system diagnosis - 36%**
 - Battery charging
 - Battery load test
 - Alternator output
 - Charging system voltage
 - Circuit resistance
 - Voltage drop test
 - Starter diagnosis
 - Starter draw test
 - Starter terminal identification

- **Test methods and equipment - 14%**
 - Voltmeter use
 - Ohmmeter use
 - Circuit testing
 - Diode operation
 - High voltage fuel system
 - Voltage drop test

Motorcycle repair

- **Fuel systems - 21%**
 - Lean / rich mixture identification
 - Causes of a lean mixture
 - Causes of a rich mixture
 - Exhaust color diagnosis
 - Backfire diagnosis
 - Carburetor components and operation
 - Fuel Injection components and operation
 - Spark plug fouling / diagnosis
 - Fuel pressure
 - Oxygen sensor operation
- **Measuring and tools - 11%**
 - Using Plastigage
 - Using a dial indicator
 - Using a Volt-Ohm meter
 - Using a bore gauge
 - Using a feeler gauge
 - Using a micrometer
 - Shaft run out
 - Understanding decimal equivalents up to 1/1000"
 - Piston ring end-gap
 - Understanding metric system measurements
 - Compression / leak down testing
- **Ignition and electrical - 20%**
 - Types of position sensors and their function
 - Function of a relay / solenoid
 - Function of a stator / rotor
 - Function of a regulator / rectifier
 - Ignition coil diagnosis
 - Splicing electrical connections
 - Continuity testing
 - Voltage drop
 - Parasitic draw
 - Diagnosing turn signal circuits
 - Alternator output problems
- **Drivetrain - 9%**
 - Clutch operation and diagnosis
 - Transmission shifting problems
 - Drive chain diagnosis / repair / maintenance
 - Drive belt diagnosis / maintenance
 - Shaft drive diagnosis / maintenance

- **Brakes – 9%**
 - Hydraulic brake system operation / maintenance
 - Brake pad wear diagnosis
 - Brake rotor diagnosis / repair
 - ABS system
 - Brake system bleeding

- **Suspension and Chassis - 10%**
 - Hydraulic fork diagnosis / repair
 - Wheel bearing diagnosis / repair
 - Tire replacement
 - Stem / neck bearing diagnosis / repair

- **Engine Repair / Performance - 20%**
 - Understanding the 4-stroke / cycle engine
 - Camshaft operation
 - Valve lash diagnosis / adjustment
 - Low oil pressure diagnosis / repair
 - Worn valve guide diagnosis
 - Cylinder bore diagnosis / measurement
 - Cylinder deglazing
 - Proper cylinder finish
 - Head bolt torque sequence
 - Piston ring identification
 - Bearing / race installation
 - Piston slap
 - Oil pressure relief valve operation

Recreational trailer

- **Electrical diagnosis - 36%**
 - Trailer tail lamps
 - Ground wire problems
 - Turn signal circuits
 - Determine voltage drop
 - Trailer stop lamps
 - Brake controllers
 - 4-Wire connectors
 - Current supply for trailer brakes
 - Electrical symbols
 - Flasher diagnosis
 - Color codes
 - Causes of blown fuses
 - Current flow / resistance
- **Brake diagnosis - 26%**
 - Loss of brakes
 - Grabby brakes
 - Dragging brakes
 - Erratic braking, surging
 - Pull to one side during braking
 - Adjusting trailer brakes
 - Brake shoe recognition
- **Springs / hitches - 16%**
 - Leaf springs
 - Equalizing hitches
 - Adjustment of hitches
 - Types of trailer springs
 - Spring maintenance
- **General knowledge - 12%**
 - Surge brakes
 - Reducing sway
 - Wheel bearing adjustment
 - Hydraulic brake lines
 - Metric measurements
 - Tire wear diagnosis
- **Wheels / hubs - 10%**
 - Wheel bearing diagnosis
 - Wheel bolt torque pattern