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*With Composite  
Vehicle Type 2*



***TEST INFORMATION***  
***FOR THE***  
***ADVANCED***  
***ENGINE PERFORMANCE SPECIALIST***  
***TEST (L1)***

- ***OVERVIEW***
- ***TEST SPECIFICATIONS***
- ***TASK LIST***
- ***GLOSSARY OF TERMS***
- ***SAMPLE QUESTIONS***
- ***INDUSTRY TRAINING***

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## Advanced Engine Performance Specialist Test Overview

### Introduction

The Advanced Engine Performance Specialist (or L1) Test was the first advanced level test offered by ASE. It is designed to measure a technician's knowledge of the skills needed to diagnose emission failures and driveability problems on computer-controlled engine systems. It is an extension of the basic repair and diagnostic skills tested on the automobile Engine Performance (A8) test. *To register to take the L1 test (regular or recertification), you must be currently certified in A8 Engine Performance, and meet the two-year experience requirement.*

The L1 test (both regular and recertification) consists of 50 scored multiple choice questions, many of which require the use of supplied reference materials. ASE recommends that you do not register for other tests given the same night as the L1 test. This will give you plenty of time to carefully read, evaluate, and answer all the questions.

You can request the current *Registration Booklet* by calling the ASE Toll-Free Automated Information Line at 1-888-ASE-TEST. Registration information is also available on the ASE homepage ([www.ase.com](http://www.ase.com)) on the Internet. The *Registration Booklet* will give you the test dates, locations, and other important information.

### Who Writes the Questions?

Each question has its roots in an annual ASE "question-writing" workshop where service representatives from automobile manufacturers, aftermarket trainers, working technicians and vocational educators meet to share ideas and translate them into test questions. Each test question written by these experts must survive review by all members of the group. The questions deal with practical problems experienced by technicians in their daily work. Naturally, the failures described in the advanced level questions are more complex and challenging.

From there, all questions are pre-tested and quality-checked on a national sample of technicians. Those questions that meet ASE standards of quality and accuracy are included in the scored sections of future tests; the "rejects" are sent back to the drawing board, or are discarded altogether.

### How Do I Prepare for the ASE L1 Test?

To prepare for the test, we suggest the following steps be taken:

Step 1. Study the content areas listed on the Test Specification, noting which areas have more questions in the test.

Step 2. Carefully read the Task List, noting the areas in which your skills are strong or weak. You can do this by checking off each task that you do not perform often or do not understand completely.

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Step 3. Practice on the sample questions that follow. Although these same questions will not appear in the test, they are similar in style and difficulty to the actual test questions. Practice using the Composite Vehicle Type 2 Reference Booklet to answer the questions that refer to the Composite Vehicle Type 2.

Step 4. Use steps 1 through 3 to identify any skill areas where you need additional study or training. Then refer to the Industry Training reference section to locate the training sources that are right for you.

### **What is the "Composite Vehicle"?**

The Composite Vehicle has a mass airflow-type multiport fuel injection system, **and was updated in 1999 to include a V-6 engine with an electronically-controlled automatic transaxle and a complete OBD II diagnostic system.** It contains computer circuits, sensors, and actuators used in many manufacturers' vehicles, so you should already be familiar with most of the components and how they work. It is described in detail in the enclosed *Composite Vehicle Type 2 Reference Booklet*. By answering questions about the Composite Vehicle, you will be simulating the real-world activities of using reference materials and diagnosing problems based on your understanding of a specific engine system.

In the test, there will be a clearly marked section of questions that specifically deal with the Composite Vehicle. To answer these questions correctly, you will need to use the information given in the question and the information contained in the *Reference* booklet, plus your own understanding of computer controls and engine operation. *The Composite Vehicle Type 2 Reference Booklet should be used only with this group of questions.* Please take the time to become familiar with the new Composite Vehicle specifications before the actual test.

### **Before the Tests**

Try to be well rested for the test so you will be alert and efficient. Bring several sharpened #2 pencils with you; pencils are not available at the test center usually. To keep track of the time, bring a watch. Finally, be sure to bring along your admission ticket and some form of current (unexpired) photo identification, like a driver's license. *You don't need to take your Composite Vehicle Type 2 Reference Booklet with you. Another copy is included in the test booklet, and will be collected when you finish your test.*

### **At the Test Center**

Once the test begins, be sure to read each question carefully, (twice, if necessary) so that you understand exactly what is being asked. There are no "trick" questions. *Each question tests a specific diagnostic skill and has a single best answer.*

If you are unsure of an answer, don't get stuck. Mark the answer that you think is correct and put a check by the question in the test book. Then go on to the next question. If you finish before the allotted time is up, you can go back to the questions that you checked. *It is to your advantage to answer every question. Do not leave any answers blank. Your score is based on the total number of correct answers that you give.*

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**Test Specifications  
for the ASE  
Advanced Engine Performance Specialist Test (L1)**

<b>Content Area</b>	<b>Questions in Test</b>	<b>Percentage of Test</b>
A. General Powertrain Diagnosis	5	10%
B. Computerized Powertrain Controls Diagnosis (Including OBD II)	13	26%
C. Ignition System Diagnosis	7	14%
D. Fuel Systems and Air Induction Systems Diagnosis	7	14%
E. Emission Control Systems Diagnosis	10	20%
F. I/M Failure Diagnosis	<u>8</u>	<u>16%</u>
<b>Total</b>	<b>50*</b>	<b>100%</b>

*\*Note:* The L1 test could contain up to fifteen additional questions that are included for statistical research purposes only. Your answers to these questions will not affect your score, but since you do not know which ones they are, you should answer all questions in the test.

The L1 Recertification Test and the regular L1 Test both cover the same content areas, and have the same number of scored questions.

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## Advanced Engine Performance Specialist Task List

### A. General Powertrain Diagnosis (5 questions)

1. Inspect and test for missing, modified, inoperative, or tampered powertrain mechanical components.
2. Locate relevant service information.
3. Research system operation using technical information to determine diagnostic procedure.
4. Use appropriate diagnostic procedures based on available vehicle data and service information; determine if available information is adequate to proceed with effective diagnosis.
5. Establish relative importance of observed vehicle data.
6. Differentiate between powertrain mechanical and electrical/electronic problems.
7. Diagnose engine mechanical condition using an exhaust gas analyzer.
8. Diagnose driveability problems and emission failures caused by cooling system problems.
9. Diagnose driveability problems and emission failures caused by engine mechanical problems.
10. Diagnose driveability problems and emission failures caused by problems or modifications in the transmission and final drive or by incorrect tire size.
11. Diagnose driveability problems and emission failures caused by exhaust system problems or modifications.
12. Determine root cause of failures.
13. Determine root cause of multiple component failures.
14. Determine root cause of repeated component failures.

### B. Computerized Powertrain Controls Diagnosis - including OBD II (13 questions)

1. Inspect and test for missing, modified, inoperative, or tampered computerized powertrain control components.
2. Locate relevant service information.
3. Research system operation using technical information to determine diagnostic procedure.
4. Use appropriate diagnostic procedures based on available vehicle data and service information; determine if available information is adequate to proceed with effective diagnosis.
5. Interpret scan tool data to determine system condition.  
*Note: Scan tool data includes data stream, diagnostic trouble codes, freeze frame data, system monitors and readiness monitors.*
6. Establish relative importance of displayed scan tool data.
7. Differentiate between computerized powertrain controls problems and mechanical problems.
8. Diagnose no-starting, hard starting, engine misfire, poor driveability, incorrect idle speed, poor idle, hesitation, surging, spark knock, power loss, poor mileage, and emission problems caused by failures of computerized powertrain controls.
9. Perform voltage drop tests on power circuits and ground circuits.
10. Perform current flow tests on system circuits.
11. Test input sensor/sensor circuit using scan tool data and/or waveform analysis.
12. Test PCM control circuit using scan tool data and/or waveform analysis.

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13. Test output actuator/output circuit using scan tool data and/or waveform analysis.
  14. Evaluate scan tool data and confirm accuracy using direct measurement.
  15. Test and confirm operation of electrical/electronic circuits not displayed in scan tool data.
  16. Determine root cause of failures.
  17. Determine root cause of multiple component failures.
  18. Determine root cause of repeated component failures.

### **C. Ignition System Diagnosis (7 questions)**

1. Inspect and test for missing, modified, inoperative, or tampered components.
2. Locate relevant service information.
3. Research system operation using technical information to determine diagnostic procedure.
4. Use appropriate diagnostic procedures based on available vehicle data and service information; determine if available information is adequate to proceed with effective diagnosis.
5. Establish relative importance of displayed scan tool data.
6. Differentiate between ignition electrical/electronic and ignition mechanical problems.
7. Diagnose no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, and emission problems on vehicles equipped with distributorless electronic ignition (EI) systems; determine needed repairs.
8. Diagnose no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, and emission problems on vehicles equipped with distributor ignition (DI) systems; determine needed repairs.
9. Test for ignition system failures under engine load conditions.
10. Test ignition system component operation using waveform analysis.
11. Confirm base ignition timing and/or spark timing control.
12. Determine root cause of failures.
13. Determine root cause of multiple component failures.
14. Determine root cause of repeated component failures.

### **D. Fuel Systems and Air Induction Systems Diagnosis (7 questions)**

1. Inspect and test for missing, modified, inoperative, or tampered components.
2. Locate relevant service information.
3. Research system operation using technical information to determine diagnostic procedure.
4. Use appropriate diagnostic procedures based on available vehicle data and service information; determine if available information is adequate to proceed with effective diagnosis.
5. Establish relative importance of displayed scan tool data.
6. Differentiate between fuel system and air induction system mechanical and electrical/electronic problems.
7. Diagnose hot or cold no-starting, hard starting, poor driveability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling and emission problems on vehicles equipped with fuel injection fuel systems; determine needed action.
8. Verify fuel quality, fuel system pressure, and fuel system volume.
9. Evaluate fuel injector and fuel pump performance (mechanical and electrical operation).

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10. Evaluate integrity of air induction system.
  11. Determine root cause of failures.
  12. Determine root cause of multiple component failures.
  13. Determine root cause of repeated component failures.

#### **E. Emission Control Systems Diagnosis (10 questions)**

1. Inspect and test for missing, modified, inoperative, or tampered components.
2. Locate relevant service information.
3. Research system operation using technical information to determine diagnostic procedure.
4. Use appropriate diagnostic procedures based on available vehicle data and service information; determine if available information is adequate to proceed with effective diagnosis.
5. Establish relative importance of displayed scan tool data.
6. Differentiate between emission control systems mechanical and electrical/ electronic problems.

*Note: Tasks 7 through 11 refer to the following emission control subsystems: Positive crankcase ventilation, ignition timing control, idle and deceleration speed control, exhaust gas recirculation, catalytic converter system, secondary air injection system, intake air temperature control, early fuel evaporation control, and evaporative emission control.*

7. Determine need to diagnose emission control subsystems.
8. Perform functional tests on emission control subsystems.
9. Determine the effect on exhaust emissions caused by a failure of an emission control component or subsystem.
10. Use exhaust gas analyzer readings to diagnose the failure of an emission control component or subsystem.
11. Diagnose hot or cold no-starting, hard starting, poor driveability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling and emission problems caused by a failure of emission control components or subsystems.
12. Determine root cause of failures.
13. Determine root cause of multiple component failures.
14. Determine root cause of repeated component failures.

#### **F. I/M Failure Diagnosis (8 questions)**

1. Inspect and test for missing, modified, inoperative, or tampered components.
2. Evaluate emission readings obtained during an I/M test to assist in emission failure diagnosis and repair.
3. Evaluate HC, CO, NO<sub>x</sub>, CO<sub>2</sub>, and O<sub>2</sub> gas readings; determine the failure relationships.
4. Use test instruments to observe, recognize, and interpret electrical/electronic signals.
5. Analyze HC, CO, NO<sub>x</sub>, CO<sub>2</sub>, and O<sub>2</sub> readings; determine diagnostic test sequence.
6. Diagnose the cause of no-load I/M test HC emission failures.
7. Diagnose the cause of no-load I/M test CO emission failures.
8. Diagnose the cause of loaded-mode I/M test HC emission failures.
9. Diagnose the cause of loaded-mode I/M test CO emission failures.
10. Diagnose the cause of loaded-mode I/M test NO<sub>x</sub> emission failures.
11. Diagnose causes of evaporative emission system pressure test failures.
12. Diagnose causes of evaporative emission system purge flow test failures.
13. Verify effectiveness of repairs. ■

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## Advanced Engine Performance Specialist Test Glossary of Terms

The reference materials and questions for this test use electronic and emission terms and acronyms that are consistent with the industry-wide SAE standards J1930 and J2012. Some of these terms are listed below.

**Calculated Load Value** - The percentage of engine capacity being used, based on current airflow divided by maximum airflow.

**Data Link Connector (DLC)** - The standardized plug that is used to connect the scan tool to the vehicle's powertrain control module.

**Diagnostic Trouble Codes (DTC)** - Codes stored by the computer when a problem is detected and read using a scan tool. Each code corresponds to a particular problem. When a DTC is referred to in an L1 test question, the number and description will both be given. For instance, P0114 = Intake Air Temperature Circuit Intermittent.

**Distributor Ignition (DI)** - An ignition system that uses a distributor.

**Electronic Ignition (EI)** - An ignition system that has coils dedicated to specific spark plugs and does not use a distributor; often referred to as distributorless ignition.

**Freeze Frame** - Operating conditions which are stored in the memory of the PCM at the instant an emissions-related diagnostic trouble code is stored.

**Fuel Trim (FT)** - Fuel delivery adjustments based on closed-loop feedback. Values above the central value (>0%) indicate increased injector pulse width. Values below the central value (<0%) indicate decreased injector pulse width. Short Term Fuel Trim is based on rapidly switching oxygen sensor values. Long Term Fuel Trim is a learned value used to compensate for continual deviation of the Short Term Fuel Trim from its central value.

**Generator** - J1930 term for alternator (generating device that uses a diode rectifier).

**I/M Tests** - Inspection and Maintenance Tests; vehicle emissions tests required by state governments. Some common types of I/M tests include:

- **No-Load** - Tests that measure HC emissions in parts per million (ppm) and CO emissions in percent, while the vehicle is in neutral. Examples are idle- and two-speed.
- **Acceleration Simulation Mode (ASM)** - Loaded-mode steady-state tests that measure HC, CO and NO<sub>x</sub> emissions while the vehicle is driven on a dynamometer at a fixed speed and load. ASM5015 is a test at 15 mph with a load equivalent to 50% of the power needed to accelerate the vehicle at 3.3 mph per second. ASM2525 is a test at 25 mph with a load of 25% of the same power.
- **IM240** - A loaded-mode transient test that measures HC, CO, CO<sub>2</sub>, and NO<sub>x</sub> emissions in grams/mile second-by-second, while the tested vehicle is driven at various speeds and loads on a dynamometer for 240 seconds. Another transient load test is the
- **BAR31**, a 31 second test cycle that includes an acceleration ramp similar to the IM240.

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**Malfunction Indicator Lamp (MIL)** - A lamp on the instrument panel that lights when the PCM detects an emission-related problem; similar to a "CHECK ENGINE" light.

**Manifold Absolute Pressure (MAP)** - The pressure in the intake manifold referenced to a perfect vacuum. Since manifold vacuum is the difference between manifold absolute pressure and atmospheric pressure, all the vacuum readings in the Composite Vehicle Preparation/Reference Booklet are taken at sea level (where standard atmospheric pressure equals 101 kPa or 29.92 in. Hg).

**Mass Airflow (MAF) System** - A fuel injection system that uses a MAF sensor to measure the mass (weight) of the air drawn into the intake manifold, measured in grams per second.

**Pulse Width Modulation (PWM)** - An electronic signal with a variable on-off time.

**On-Board Diagnostics (OBD)** - A diagnostic system contained in the PCM which monitors computer inputs and outputs for failures. OBD II is an industry-standard, second generation OBD system that monitors emission control systems for degradation as well as failures.

**Powertrain Control Module (PCM)** - The electronic computer that controls the engine and transmission; similar to an ECM, VCM, ECA, ECU, or SBEC.

**Root Cause of Failure** - A component or system failure which, if not repaired, can cause other failures. If the secondary failure is repaired, but the root cause is not repaired, the secondary failure will reoccur. For example, a plugged PCV passage can cause high crankcase pressure, resulting in leaking gaskets and seals. Replacing the gaskets and seals may stop the oil leak, but if the root cause (the PCV restriction) is not diagnosed and repaired, the oil leak will eventually return.

**Scan Tool** - A test instrument that is used to read powertrain control system information.

**Scan Tool Data** - Information from the computer that is displayed on the scan tool, including data stream, DTCs, Freeze Frame, systems monitors, and readiness monitors.

**Secondary Air Injection** - A system that provides fresh air to the exhaust system under controlled conditions to reduce emissions; can be either pulse or air-pump type.

**Sequential Multiport Fuel Injection (SFI)** - A fuel injection system that uses one electronically pulsed fuel injector for each cylinder. The injectors are pulsed individually.

**Speed-Density System** - A fuel injection system that calculates the amount of air drawn into the engine using engine rpm, air temperature, manifold vacuum and volumetric efficiency, rather than measuring the mass or volume of air directly with an airflow meter.

**Three Way Catalytic Converter (TWC)** - A catalytic converter system that reduces levels of HC, CO, and NO<sub>x</sub>.

**Trip** - A driving cycle that allows an OBD II diagnostic test (monitor) to run.

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## Advanced Engine Performance Specialist Test Sample Questions

Questions 1, 2, and 3 are to be answered without using the *Composite Vehicle Type 2 Reference Booklet*.

Engine Speed	Idle	2000 RPM
HC (ppm)	500	15
CO (percent)	0.3	0.1
CO <sub>2</sub> (percent)	13.0	14.2
O <sub>2</sub> (percent)	0.2	0.5

1. An engine with multiport fuel injection idles roughly but smooths out as engine speed increases. The emissions readings are shown above. Which of these is the most likely cause?
- (A) A leaking intake manifold gasket
  - (B) A partially clogged fuel injector
  - (C) A secondary ignition wire shorting to ground
  - (D) An EGR valve that does not fully close

**Question #1 Explanation:**

The description of the problem and the excessive amount of HC indicates an engine misfire at idle. This can be caused by a number of problems. To properly diagnose the cause, the other gas readings must be evaluated.

Option (A) is wrong. While a vacuum leak at the intake manifold could cause a lean misfire and high HC readings at idle, it would also cause a high tailpipe O<sub>2</sub> reading. Option (B) is wrong. A clogged fuel injector could cause a misfire, but the misfire would be evident at 2000 rpm as well as idle.

Option (C) is wrong. A bad spark plug wire would also cause a misfire at engine speeds above idle.

Option (D) is correct. An EGR valve that is not fully seated could cause a random engine misfire and high HC at idle, but will not cause a problem at 2000 rpm, where EGR operation is expected. The O<sub>2</sub> reading is low at idle because the EGR gas displaces a large amount of the fresh air charge entering the cylinders. Note: The problems described in options A, B, and C would each cause the idle O<sub>2</sub> reading to measure high.



MAF Sensor	
Terminal	Voltage
a	5.1v
b	0.05v
c	3.2v

5. With the key on and engine off, the voltage readings shown above are measured at the mass airflow (MAF) sensor. These readings indicate:
- (A) excessive reference voltage.
  - (B) a poor circuit ground.
  - (C) a bad MAF sensor.
  - (D) normal circuit operation.
6. A vehicle has a stored code P0442 “EVAP system small leak detected.” Which of these is the most likely cause?
- (A) A short-to-ground at EVAP vent solenoid terminal b.
  - (B) A faulty gas cap
  - (C) An open circuit at EVAP purge solenoid terminal b.
  - (D) A faulty fuel level sensor
7. A vehicle has an illuminated malfunction indicator lamp (MIL). The scan tool shows two starts and two good trips since the diagnostic trouble code was stored.

Technician A says that the fault is intermittent.

Technician B says that the MIL will turn off the next time the vehicle is started.

Who is right?

- (A) A only
- (B) B only
- (C) Both A and B
- (D) Neither A nor B

Answer Key : 1. <b>D</b> 2. <b>C</b> 3. <b>A</b> 4. <b>D</b> 5. <b>C</b> 6. <b>B</b> 7. <b>A</b>
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## Advanced Engine Performance Specialist Test Industry Training

The training sources listed in this guide are designed to help you sharpen your technical skills in advanced emission and driveability diagnostics. Since the L1 test reflects these skills - the more you learn, the better your chances of passing this test.

Please call or write the listed organizations for availability, schedules, and prices. In addition, many new sources of training in this area are being developed. You may wish to check with auto manufacturers, community colleges, tool and equipment suppliers, and technical training organizations for the latest training information. Training resources can also be found on ASE's home page (<http://www.ase.com>), or the iATN Technician's Network (<http://www.iatn.net>).

**ASPIRE Inc.'s** FAST PASE preparation series is a complete set of video-based training programs for ASE test preparation. The L1 program consists of a videotape and workbook with ASE-style questions. ASPIRE also offers other self-study and leader-led training programs, including the Master Technician series, Essentials in Engine Diagnostics, and the Enhanced Emission Program. For more information on all of these programs, write: ASPIRE, Inc., 925 Lincoln Highway, Morrisville, PA 19067, or call (800) 247-1099. Internet: [www.aspireinc.com](http://www.aspireinc.com)

**Automotive Video, Inc.** offers videotape training on engine performance testing, computer controlled ignition systems, and computerized fuel control testing, as well as manufacturer-specific systems. For more information, call: (800) 718-7246. Internet: [www.auto-video.com](http://www.auto-video.com)

**Chek-Chart** offers a newly revised L1 Test Study Guide which includes the new Composite Vehicle, a new 65-question practice test with explanations for all answers, and coverage of all test areas. Write: Motor/Chek-Chart, 5600 Crooks Road, Suite 200, Troy, MI 48098, or call (800) 426-6867. Internet: [www.CHEKCHART.com](http://www.CHEKCHART.com)

**Delmar Publishers** provides training textbooks covering many areas of automotive repair, including [A Technician's Guide to Advanced Automotive Emissions Systems](#), and a [Preparation Guide for the ASE L1 Test](#). Delmar now has an interactive computer

software program called the ATC Challenge to prepare technicians for the ASE tests, including L1. For a free catalog, write: Delmar Publishers, P.O. Box 8007, Clifton Park, NY 12065, or call (800) 347-7707. Internet: [www.autoed.com](http://www.autoed.com)

**JENDHAM, Inc.** offers training seminars and manuals on Acura/Honda systems, Chrysler Engine Performance, Ford EEC systems, GM Fuel Injection, OBD II Diagnosis & Repair, and Scan Tool Diagnosis. In addition, JENDHAM publishes a Technician Handbook series that include trouble codes, PID data known good values and Pin Chart known good values for Acura/Honda, Ford, GM, Toyota, and OBD II vehicles. For information, write: JENDHAM, Inc., 13230 Evening Creek Dr. #202, San Diego, CA 92128, or call (858) 486-8525. Internet: [www.JENDHAM.com](http://www.JENDHAM.com)

**Linder Technical Services** provides 'real world' technician training on underhood electronics. LTS currently offers 28 class sessions in Indianapolis, as well as remote seminars tailored to your needs. One week 'Guru' school covers advanced driveability and emissions diagnosis methods. Write or call: Linder Technical Services, 4-D Gasoline Alley, Indianapolis, IN 46222, or call (317) 487-9460. Internet: [www.lindertech.com](http://www.lindertech.com)

The **Mechanic's Education Association (MEA)** is a technician-based organization in New Jersey that offers over 90 instructor-led courses (including the latest on I/M failure diagnosis), a telediagnostic hotline, and an

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on-site diagnostic van to help with the toughest problems. For information, contact: MEA, 1805 Springfield Ave., Maplewood, NJ 07040, or call (973) 426-9001. Internet: [www.meatraining.com](http://www.meatraining.com)

**Mitchell Repair Information Company** publishes the Mitchell ASE Test Preparation Series of books, including an L1 book. The books may be ordered separately, or as a set. For more information, call: (888) 724-6742 ext. 7012, or write: Mitchell Repair Information Co., 14145 Danielson St., Poway, CA 92064. Internet: [www.mitchellrepair.com](http://www.mitchellrepair.com)

**Motor Age** Training for ASE Certification is a self-study training guide that was completely updated in 1999 and contains both technical information and sample questions. For ordering information, write: Motor Age Training, P.O. Box 6310, Duluth, MN 55806, or call (800) 240-1968. Internet: [www.motorage.com](http://www.motorage.com)

The **NAPA Institute of Automotive Technology (N.I.A.T.)** provides a broad self-study curriculum, including electronic engine management systems, strategies of exhaust and emission control, no-code driveability diagnosis, distributorless ignition systems, lab scope diagnostics, use of four- and five-gas analyzers, and automotive electrical/electronic diagnosis. There are also specialized courses in European and Asian engine management systems, OBD II, and fuel injection system diagnosis. To get more information about prices, specific course content, or to order any of these courses, write to: N.I.A.T., 121 N. River St., Fenton, MI 48430 or call (800) 292-6428. Internet: [www.niat-training.com](http://www.niat-training.com)

The **National Center for Vehicle Emissions Control and Safety (NCVECS)** at Colorado State University offers three courses, dealing with IM240 and ASM diagnosis and catalytic converters. NCVECS also publishes a series of I/M training manuals covering IM Testing, and Catalytic Converter Testing. NCVECS is also conducting extensive OBDII research. For information, write: NCVECS, Colorado

State University, Room 100 Industrial Sciences - MTCM, Fort Collins, CO 80523, or call (970) 491-7240. Internet: [www.ncvecs.colostate.edu](http://www.ncvecs.colostate.edu)

**Standard Motor Products, Inc.** offers professional technician seminars that focus on real-world problems and solutions, not just theory. Engage in actual diagnosis using virtual vehicles to apply what you've learned. An ASE-Certified professional instructor conducts the eight-hour seminars over two nights, with a heavy emphasis on diagnostics and troubleshooting. The registration fee includes a diagnostic manual based on typical driver complaints and vehicle symptoms. Internet: [www.smp-training.com](http://www.smp-training.com)

**Target Training Systems, Inc.** has a Technical Mastery Series of video programs that cover subjects such as L1 test preparation and 5-gas failure analysis. They also offer manufacturer-specific training videos, instructor-led classes, and diagnostic manuals that employ specification-based test procedures. For a catalog, write: Target Training Systems, Inc., 751 Main Street East, Owatonna, MN 55060, or call (800) 366-8724. Internet: [www.target-training.net](http://www.target-training.net)

**Tools For Education, Inc.** offers interactive computer-based training software on CD-ROM. The SMOGHOUSE program includes five-gas theory, failed vehicle case studies, and diagnostic flow charts. The ATACS program covers theory, analysis, and case studies of automotive current waveforms using a digital storage oscilloscope. The EDDI program teaches the use of 5 gas analysis to diagnose emission failures. For information, contact: Tools For Education, 140 N. Ridge Ave., Ambler, PA 19002, or call (888) 404-8320. Internet: [www.toolsforeducation.com](http://www.toolsforeducation.com)

**TrainingForTechs.com** is a free service that allows technicians to search for training in their areas of interest, such as OBD II, emissions, driveability, etc. provided by a wide range of companies and instructors. Internet: [www.trainingfortechs.com](http://www.trainingfortechs.com)