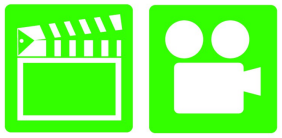
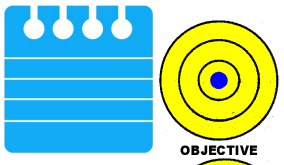
A8 Engine Performance 4th Edition

Chapter 5 GASOLINE

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers operation and service of **Automotive Engine Performance.** It correlates material to task lists specified by ASE and NATEF.
Motivate Learners	Explain how the knowledge of how something works translates into the ability to use that knowledge to figure why the engine does not work correctly and how this saves diagnosis time, which translates into more money.
State the learning objectives for the chapter or course you are about to cover and explain this is what they should be able to do as a result of attending this session or class.	Explain the chapter learning objectives to the students. 1. Describe how the proper grade of gasoline affects engine performance. 2. List gasoline purchasing hints. 3. Discuss how volatility affects driveability. 4. Explain how oxygenated fuels can reduce CO exhaust emissions. 5. Discuss safety precautions when working with gasoline.
Establish the Mood or Climate	Provide a *WELCOME,* Avoid put downs and bad jokes.
Complete Essentials	Restrooms, breaks, registration, tests, etc.
Clarify and Establish Knowledge Base	Do a round robin of the class by going around the room and having each student give their backgrounds, years of experience, family, hobbies, career goals, or anything they want to share.

ICONS	Ch05 GASOLINE
     	1. SLIDE 1 CH5 GASOLINE Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/ WEB SITE REGULARLY UPDATED POWER POINTS DONE BY INDIVIDUAL LEARNING OBJECTIVES, SO THERE IS POWER POINT FILE FOR EACH LEARNING OBJECTIVE 2. SLIDE 2 EXPLAIN OBJECTIVE CH5 AEP_LO1 3. SLIDES 3-6 EXPLAIN GASOLINE 7. SLIDES 7-8 EXPLAIN 2. SLIDE 2 EXPLAIN OBJECTIVE CH5 AEP_LO2 3. SLIDES 3-5 EXPLAIN General Gasoline Recommendations 6. SLIDE 6 EXPLAIN FIGURE 5–17 Many gasoline service stations have signs posted warning customers to place plastic fuel containers on the ground while filling. If placed in a trunk or pickup truck bed equipped with a plastic liner, static electricity could build up during fueling and discharge from the container to the metal nozzle, creating a spark and possible explosion. Some service stations have warning signs not to use cell phones while fueling to help avoid the possibility of an accidental spark creating a fire hazard.
	DISCUSSION: HAVE THE STUDENTS TALK ABOUT CHEMICAL COMPOSITION OF GASOLINE. HOW MANY CARBON ATOMS DO THE HYDROCARBONS IN GASOLINE HAVE?
	DISCUSSION: DISCUSS DANGERS OF HYDROCARBONS. IS A HYDROCARBON HARMFUL AS A LIQUID? IS IT HARMFUL AS A GAS? WHAT SAFETY PRECAUTIONS SHOULD BE TAKEN WHEN HANDLING HYDROCARBONS?
	HAVING DIFFERENT GRADES OF GASOLINE & BLENDS, AND VARYING FRESHNESS ON HAND AS YOU DISCUSS GASOLINE WILL OFFER STUDENTS A VARIETY OF FUELS TO OBSERVE & TEST.

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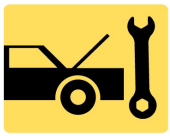	**HANDS-ON TASK:** HAVE THE STUDENTS COMPLETE AN MSDS REVIEW OF HYDROCARBONS TO DETERMINE WHETHER THEY UNDERSTAND HAZARDS OF HYDROCARBONS
	**DISCUSSION:** HAVE THE STUDENTS TALK ABOUT DISTILLATION PROCESS. IN ADDITION TO FUEL, WHAT OTHER PRODUCTS ARE PRODUCED THROUGH DISTILLATION PROCESS?
	**DEMONSTRATION:** LOCATE A VIDEO THAT DEMONSTRATES DISTILLATION PROCESS. HAVE STUDENTS WATCH IT & DISCUSS PROCESS. NATIONAL GEOGRAPHIC CHANNEL OR DISCOVERY CHANNEL ARE POSSIBLE VIDEO SOURCES.
	**DISCUSSION:** HAVE THE STUDENTS DISCUSS CRACKING PROCESS. WHAT IS DIFFERENCE BETWEEN THERMAL CRACKING, CATALYTIC CRACKING, & HYDROCRACKING?
	2. SLIDE 2 EXPLAIN OBJECTIVE CH5 AEP_LO3 3. SLIDE 3 EXPLAIN Volatility: Definition of Volatility
	4. SLIDE 4 EXPLAIN Volatility
	**DEMONSTRATION:** SHOW THE STUDENTS HOW TO TEST GASOLINE, EMPHASIZING RVP READING AS A CLASSIFICATION FOR USAGE.
	**DISCUSSION:** HAVE STUDENTS DISCUSS COLD START PROBLEMS THAT ARE RELATED TO FUEL ISSUES. WHY IS IT IMPORTANT FOR FUEL TO HAVE A SPECIFIC RVP READING?
	**HANDS ON-TASK:** CHECK FUEL RVP BASED ON DEMO
	2. SLIDE 2 EXPLAIN OBJECTIVE CH5 AEP_LO4 3. SLIDES 3-4 EXPLAIN Gasoline Additives

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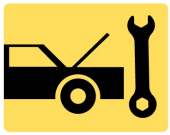
	**DISCUSSION: HAVE STUDENTS DISCUSS GASOLINE ADDITIVES. WHAT PROBLEMS CAN BE CAUSED BY ADDITIVES?**
	**DEMONSTRATION: PLACE SOME GAS AND WATER IN A CLEAR CONTAINER FOR VIEWING. HAVE STUDENTS TALK ABOUT PHASE SEPARATION. DISCUSS WHAT HAPPENS WHEN AN ENGINE COMBUSTS A LITTLE WATER. WHAT WILL HAPPEN TO CYLINDER TEMPERATURE IF THIS HAPPENS?**
	**DISCUSSION: HAVE THE STUDENTS TALK ABOUT ADDING ETHANOL TO BASE GASOLINE. WHY ARE THERE DIFFERENT METHODS FOR ADDING ADDITIVES TO CREATE AN E10 FUEL MIXTURE?**
	**DISCUSSION: HAVE THE STUDENTS TALK ABOUT OCTANE RATING. HOW IS ISOOCTANE USED IN OCTANE RATING? WHAT ARE THE METHODS USED TO RATE GASOLINE FOR ANTIKNOCK PROPERTIES?**
	**HANDS-ON TASK: HAVE THE STUDENTS LOCATE A KNOCK SENSOR ON A VEHICLE. ASK THEM TO REVIEW OEM INFORMATION ABOUT SENSOR. HAVE STUDENTS USE A SCAN TOOL TO COMPARE IT TO LIVE DATA FROM SENSOR. IS KNOCK SENSOR ACCURATE?**
	**DISCUSSION: HAVE STUDENTS DISCUSS HIGH-ALTITUDE OCTANE REQUIREMENTS. WHAT HAPPENS TO AIR WHEN ATMOSPHERIC PRESSURE DROPS? HOW DOES LOWERED ATMOSPHERIC PRESSURE AFFECT OCTANE RATING?**
	**2. SLIDE 2 EXPLAIN OBJECTIVE CH5 AEP_LO5**
	**LEARNING OBJECTIVE AEP_LO5 IS A REPEAT OF AEP_LO2**
	**DISCUSSION: HAVE THE STUDENTS TALK ABOUT HOW AIR-FUEL RATIOS ARE STATED. WHY IS THE RATIO USUALLY MEASURED BY WEIGHT AND NOT VOLUME?**

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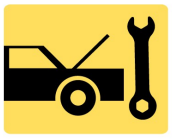
	**DEMONSTRATION: show how fuel injector sprays fuel into combustion chamber by creating an external fuel system in which students can view an injector spraying fuel into visible container. For safety reasons, you can perform this demonstration with water instead of fuel, keeping in mind that injectors and pump sustain damage from water after long-term use.**
	**DISCUSSION: HAVE THE STUDENTS DISCUSS AIR-FUEL RATIOS. WHAT MAKES AN AIR-FUEL MIXTURE TOO RICH OR TOO LEAN?**
	**DISCUSSION: HAVE THE STUDENTS TALK ABOUT THE GASOLINE COMBUSTION PROCESS. WILL A CONTAMINATED ATMOSPHERE HAVE AN EFFECT ON COMBUSTION PROCESS? _**
	**DISCUSSION: DISCUSS WHAT HAPPENS TO NO_x, CO, AND HC IN THREE-WAY CATALYTIC CONVERTER. WHY DOES STOICHIOMETRIC RATIO WORK BEST TO CONTROL THESE MIXTURES? ANS: STOICHIOMETRIC IS CONCERNED WITH, INVOLVING, OR HAVING THE EXACT PROPORTIONS FOR A PARTICULAR CHEMICAL REACTION.**
	**ANIMATION: TOO RICH/TOO LEAN MIXTURE: WWW.MYAUTOMOTIVELAB.COM** HTTP://MEDIA.PEARSONCMG.COM/PH/CHET/CHET_MYAUTOMOTIVELAB_2/ANIMATIONS/A16_ANIMATION/CHAPTER52_FIG_52_10/INDEX.HTM
	**HANDS-ON TASK: HAVE STUDENTS USE A 5-GAS ANALYZER ON A VEHICLE. ASK THEM TO RECORD READINGS AND INTERPRET THEIR FINDINGS. GRADE THEM ON THEIR UNDERSTANDING OF BY-PRODUCTS OF COMBUSTION PROCESS AND THEIR AWARENESS OF WHAT IS REQUIRED TO REDUCE HARMFUL EMISSIONS.**
	**DISCUSSION: HAVE THE STUDENTS TALK ABOUT GRADES OF GASOLINE. IS IT ALWAYS BETTER TO USE PREMIUM GAS? POINT OUT THE PROBLEMS OF HARD START & AND ROUGH IDLE USING PREMIUM-GRADE GASOLINE DURING COLD WEATHER CONDITIONS.**

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	**DISCUSSION:** HAVE THE STUDENTS TALK ABOUT INJECTOR FLOW RATE. WHAT IS THE RELATION OF INJECTOR FLOW RATE TO HORSEPOWER?
	**DISCUSSION:** HAVE STUDENTS TALK ABOUT REFORMULATED GASOLINE. WILL REFORMULATED GAS WORK WELL IN COLD WEATHER CONDITIONS? HAVE STUDENTS DISCUSS CHANGES MADE TO REFORMULATE GASOLINE. WHAT HAS BEEN RESULT IN AREAS WHERE REFORMULATED GAS IS BEING USED?
	**DISCUSSION:** HAVE THE STUDENTS TALK ABOUT OXYGENATED FUEL ADDITIVES. UNDER WHAT CONDITIONS CAN ADDITIVES BE USED TO IMPROVE DRIVEABILITY?
	**DEMONSTRATION:** SHOW THE STUDENTS HOW TO CHECK FOR ALCOHOL CONTENT IN GAS. REMIND THEM OF SAFETY PRECAUTIONS TO TAKE WHEN TESTING GASOLINE. FIGURE 5-15
	ON-VEHICLE NATEF TASK (A8-D-2) CHECK FUEL FOR CONTAMINANTS AND QUALITY; DETERMINE NECESSARY ACTION. (P-2) PAGE 221
	**DISCUSSION:** REMIND STUDENTS OF IMPORTANCE OF TESTING FUEL FOR ALCOHOL & WATER. HOW CAN *NOT* TESTING FUEL FOR ALCOHOL AND WATER AFFECT REPAIR OF DRIVEABILITY PROBLEMS ASSOCIATED WITH FUEL MIXTURE?
	**DEMONSTRATION:** DEMONSTRATE A SNIFF TEST ON STALE GASOLINE. TALK ABOUT WHAT GASOLINE STABILIZER IS, WHEN TO USE IT, AND WHERE TO FIND IT.
	**DISCUSSION:** HAVE STUDENTS DISCUSS KEEPING THE FUEL LEVEL ABOVE ¼ TANK. WHY SHOULD FUEL LEVEL BE KEPT ABOVE THAT LEVEL?
	WHEN A RICH MIXTURE IS DETECTED & FUEL GAUGE READS FULL, REMIND THE STUDENTS TO CHECK CHARCOAL CANISTER

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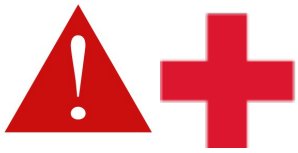	OUTLET TO THE ENGINE. VERIFY TO SEE WHETHER LIQUID GAS IS BEING SUCKED INTO THE ENGINE. TEMPORARY BLOCKAGE OF LINE AND REPEATED CHECKING OF O_2 SENSOR READINGS COULD VERIFY CONDITION. **SAFETY** DISCUSS IMPORTANCE OF HAVING A FIRE EXTINGUISHER AVAILABLE WHEN WORKING WITH FUEL, AND OF WEARING PPE INCLUDING SAFETY GLASSES, RESPIRATOR, AND GLOVES.