















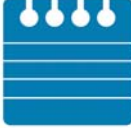





Automotive Heating and Air Conditioning, 7e

Chapter 6 Refrigerants and Refrigerant Oils

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers operation and service of Automotive Heating and Air Conditioning, 7e . 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. <ol style="list-style-type: none">1. Prepare for the ASE Heating and Air Conditioning (A7) certification test content area "A" (A/C System Service, Diagnosis and Repair).2. Discuss the depletion of the ozone layer and the resulting issues of global warming.3. Explain the impact of legislative laws on automotive A/C systems.4. Discuss identifying refrigerants and proper storage container.5. State the changes considered for future refrigerants.6. Explain refrigerant safety precautions.7. Discuss the different types and viscosities of refrigerant oils.
Establish the Mood or Climate	Provide a <i>WELCOME</i> , 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	Ch03 Refrigerants and Refrigerant Oils
	<p>1. SLIDE 1 Refrigerants and Refrigerant Oils 2. SLIDES 2-3 EXPLAIN OBJECTIVES</p>
 	<p>Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/ WEB SITE IS CONSTANTLY UPDATED</p>
  <p>QUESTION</p>	<p>DISCUSSION: ASK STUDENTS TO TALK ABOUT THE REQUIREMENTS OF AUTOMOTIVE TECHNICIANS STEMMING FROM SECTION 609 OF THE CLEAN AIR ACT OF 1990. FIGURE 37-15</p>
	<p>4. SLIDES 4-5 EXPLAIN Depletion of Ozone Layer and Resulting Issues of Global Warming 6. SLIDE EXPLAIN Figure 6-4 Chlorofluorocarbon molecules break apart in the atmosphere.</p>
	<p>7. SLIDES 7-10 EXPLAIN Impact of Legislative Laws on Automotive A/C Systems <u>OZONE DEPLETION</u></p>
	<p>ALL CARS SINCE 1990S USE HFC-134A AS REFRIGERANT BECAUSE IT IS LESS HARMFUL TO OZONE THAN ITS PREDECESSOR, CFC-12. <u>DISCUSS WHY THIS IS SO IMPORTANT.</u></p>
 	<p><u>SHOW ANIMATION: OZONE DEPLETION</u> <u>WWW.MYAUTOMOTIVELAB.COM</u></p>
	<p><small>HTTP://MEDIA.PEARSONCMG.COM/PH/CHET/CHET_MYAUTOMOTIVELAB_2/ANIMATIONS/A77_ANIMATION/CHAPTER48 FIG_48_15/INDEX.HTM</small></p>
	<p>11. SLIDE 11 EXPLAIN Figure 6-6 R-1234yf refrigerant is sold in white containers with a red stripe. 12. SLIDE 12 EXPLAIN Refrigerants and Proper Storage Container</p>
	<p><u>DEMONSTRATION: SHOW TESTER FOR IDENTIFYING REFRIGERANT GASES</u></p>
	<p>13. SLIDE 13 EXPLAIN Figure 6-1 Large 30 pound containers of R-134a are light blue for easy ID 14. SLIDE 14 EXPLAIN Figure 6-2 The stamped text at the top of this container reads “DOT-4BA400.”</p>

ICONS	Ch03 Refrigerants and Refrigerant Oils
   	<p>DISCUSSION: ASK STUDENTS TO TALK ABOUT THE TYPES OF REFRIGERANTS THAT HAVE BEEN USED IN AUTOMOTIVE SYSTEMS AND IN RESIDENTIAL HOME AC SYSTEMS. HOW DO THESE REFRIGERANTS WORK? WHY IS CFC-12 NO LONGER USED? RESIDENTIAL HOME REFRIGERANTS CAN'T BE USED IN AUTOMOTIVE SYSTEMS, EXCEPT IN BUSES.</p> <p>DISCUSSION: ASK STUDENTS TO DISCUSS WHY <u>CARBON DIOXIDE (CO2)</u> IS NOT A GOOD REFRIGERANT</p> <ol style="list-style-type: none"> 15. SLIDES 15-16 EXPLAIN Changes Considered for Future Refrigerants 17. SLIDE 17 EXPLAIN Figure 6–8 The label on a Toyota Fuel Cell Hybrid Vehicle (FCHV) showing that CO₂ (R744) is being used as the refrigerant. 18. SLIDE 18 EXPLAIN Figure 6–9 A secondary loop A/C system keeps the potentially dangerous or flammable refrigerant out of the passenger compartment by using a chiller/heat exchanger to cool an antifreeze and water mixture. This fluid then transfers heat from the cooling core in the air distribution section to the chiller. 19. SLIDES 19-21 EXPLAIN Refrigerant Safety Precautions 22. SLIDE 22 EXPLAIN Figure 6–10 When recovering refrigerant, the container should be filled to a maximum of about 80%.
  	<p>DISCUSSION: ASK STUDENTS TO TALK ABOUT ROLE OF <u>REFRIGERANT OILS</u> IN LUBRICATING COMPRESSOR. WHAT ARE THE TYPES OF REFRIGERANT OIL AND THEIR CHARACTERISTICS? HYBRID VEHICLES OFTEN USE SPECIAL OIL THAT IS NONCONDUCTIVE. USING WRONG OIL COULD CAUSE DEATH OR INJURY FROM ELECTRICAL SHOCK. SYSTEMS USE 200 VOLTS TO DRIVE COMPRESSOR RATHER THAN A BELT.</p> <ol style="list-style-type: none"> 23. SLIDE 23 EXPLAIN Different Types and Viscosities of Refrigerant Oils 24. SLIDE 24 EXPLAIN Figure 6–12 PAG oil is the type

ICONS

Ch03 Refrigerants and Refrigerant Oils



of refrigerant oil specified for use in most R-134a systems and the “150” is the viscosity.

25. SLIDE 25 EXPLAIN Figure 6–13 This under hood decal gives a Mercedes-Benz part number (A 001 989 08 03) instead of the type and viscosity of refrigerant oil. Service information was needed to determine that it was PAG 46.

26. SLIDES 26-27 EXPLAIN Summary