Automotive Heating and Air Conditioning, 7e

Chapter 4 Refrigeration Cycle

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. 1. Prepare for the ASE Heating and Air Conditioning (A7) certification test content area "A" (A/C System Service, Diagnosis and Repair). 2. Explain how the A/C system works. 3. Identify the low and high side of an A/C system. 4. Explain the purpose and function of evaporators in an A/C system. 5. Explain the purpose and function of thermal expansion valves and orifice tube systems. 6. Explain the purpose and function of condensers.
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	Ch04 Refrigeration Cycle
	1. SLIDE 1 REFRIGERATION CYCLE 2. SLIDES 2-3 EXPLAIN OBJECTIVES
	Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/ WEB SITE IS CONSTANTLY UPDATED
	4. SLIDES 4-9 EXPLAIN How A/C System Works
	SHOW ANIMATION: REFRIGERANT FLOW WWW.MYAUTOMOTIVELAB.COM HTTP://MEDIA.PEARSONCMG.COM/PH/CHET/CHET_MYAUTOMOTIVELAB_2/ANIMATIONS/A77_ANIMATION/CHAPTER48_FIG_48_22/INDEX.HTM
	A/C SYSTEM OPERATION
	DISCUSSION: DISCUSS WHY AEROSOL CANS BECOME COLD WHEN SPRAYED CONTINUOUSLY & WHY A CAN OF NONFLAMMABLE REFRIGERANT CAN EXPLODE WHEN HEATED BY FIRE. HINT: HAVE THEM FOCUS ON RELATIONSHIP BETWEEN PRESSURE AND TEMPERATURE FOR A VAPOR.
	DISCUSSION: DISCUSS RELATIONSHIPS BETWEEN PRESSURE AND TEMPERATURE IN AN HVAC SYSTEM.
	10. SLIDE 10 EXPLAIN Figure 4–2 evaporator removes heat from air that enters a vehicle by transferring it to the vaporizing refrigerant.
	11. SLIDE 11 EXPLAIN Figure 4–3 compressor provides mechanical force needed to pressurize the refrigerant
	SWASH PLATE COMPRESSOR
	12. SLIDE 12 EXPLAIN Figure 4–4 Condenser changes refrigerant vapor into liquid by transferring heat from refrigerant to air stream that flows between condenser fins.

ICONS	Ch04 Refrigeration Cycle
	**DEMONSTRATION: SHOW CONDENSER & EXPLAIN ITS PURPOSE AND FUNCTION. USE A CONDENSER THAT HAS A CUT-THROUGH AREA TO SHOW THAT THE TUBES ARE HOLLOW**
	13. **SLIDES 13-14 EXPLAIN** Low & High Side of A/C System: A/C System Operation 15. **SLIDE 15 EXPLAIN Figure 4–5** Refrigerant changes state to a vapor as it absorbs heat in the low side and into a liquid as it loses heat in the high side. 16. **SLIDE 16 EXPLAIN** Low & High Side of A/C System
	HEAT TRANSFER & BOILING HEAT TRANSFER HEAT TRANSFER THROUGH LATENT HEAT
	17. **SLIDE 17 EXPLAIN** Purpose & Function of Evaporators in an A/C system 18. **SLIDE 18 EXPLAIN Figure 4–8a** tube-&-fin. Each type has a large contact area for heat to leave air and enter the refrigerant. 19. **SLIDE 19 EXPLAIN Figure 4–8b** plate evaporator. Each type has a large contact area for heat to leave air and enter refrigerant. 20. **SLIDE 20 EXPLAIN** Purpose & Function of Evaporators in A/C system
	**DEMONSTRATION: SHOW STUDENTS' EVAPORATOR IN AN AUTOMOTIVE A/C SYSTEM. DESCRIBE ITS PURPOSE & HOW IT WORKS**
	**DISCUSSION: DISCUSS HOW AN EVAPORATOR HELPS REMOVE MOISTURE FROM THE AIR AND LOWER HUMIDITY.**
	21. **SLIDES 21-23 EXPLAIN** Purpose & Function of Thermal Expansion Valves and Orifice Tube Systems
	**DEMONSTRATION: SHOW AN ORIFICE TUBE, DESCRIBE ITS PURPOSE, AND EXPLAIN HOW IT WORKS. SHOW THEM SPECIAL TOOL REQUIRED TO REMOVE ORIFICE TUBE FROM SYSTEM**

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	**DISCUSSION:** DISCUSS HOW ORIFICE TUBES SEPARATE THE HIGH-PRESSURE & LOW-PRESSURE SIDES OF THE A/C SYSTEM. HOW DOES THIS METHOD DIFFER FROM THE ONE USED IN AN EXPANSION VALVE SYSTEM?
	**DEMONSTRATION:** SHOW EXAMPLE OF A THERMO, ICING, OR DEFROST SWITCH (THERMOSTAT), & DESCRIBE HOW IT WORKS.
	TXV OPERATION HEAT TRANSFER & BOILING HEAT TRANSFER HEAT TRANSFER THROUGH LATENT HEAT
	**DEMONSTRATION:** SHOW STUDENTS AN EXAMPLE OF **H-VALVE** FROM **CHRYSLER** VEHICLE AND DESCRIBE HOW IT WORKS BLOCK-TYPE, H VALVE
	24. **SLIDE 24 EXPLAIN** Purpose & Function of Condensers 25. **SLIDE 25 EXPLAIN Figure 4–14** condenser is a heat exchanger that transfers heat from refrigerant to air flowing through it. 26. **SLIDES 26-29 EXPLAIN** Summary