Refrigeration and Air Conditioning Training Course

Principles of Refrigeration

32 hours, 32 NATE CEHs, 3.2 CEUs – 250 pages

Lesson 1 - Introduction to Refrigeration and Air Conditioning

Objectives:

- Define refrigeration.
- Identify the basic components of a refrigeration cycle.
- Identify the various gas laws and their importance to your basic knowledge of physics.
- State the date and place of the founding of RSES.
- List six modern-day applications serviced by the refrigeration and air conditioning industry.

Lesson 2 - Basic Physics

Objectives:

- Define the basic structure of matter.
- Describe the fundamental structure of an element, a molecule, and a compound.
- Define and give one example of sensible, latent, and specific heat.
- Explain the methods of measuring the intensity and quantity of heat.
- Identify the physical changes that occur when matter changes state from solid to liquid to gas.
- Calculate the amount of sensible and latent heat added to a solid, a liquid, and a gas.
- List three types of energy (in addition to heat energy) and give an example of each.
- State the latent heat of fusion for ice and the latent heat of vaporization for water.

Lesson 3 - Major Component Functions

Objectives:

- Define heat and cold.
- State the basic law of heat flow.
- Define the British thermal unit (Btu) and the calorie.
- List the three physical states of matter and define each.
- Name the two temperature scales in general use today.
- Using a simple refrigeration system, identify and explain the functions of the four major components in the system.
- Define a ton of refrigeration.

Lesson 4 - Gas Laws (Part 1)

Objectives:

- Name three men who established fundamental gas laws governing the actions and reactions of refrigerants.
- State Boyle's Law and use it to solve problems involving gases.
- State Charles' Law for a constant volume process, and use it to solve problems involving gases.
- State Charles' Law for a constant pressure process, and use it to solve problems involving gases.

Lesson 5 - Gas Laws (Part 2)

Objectives:

- Explain Dalton's Law.
- Describe what is meant by the "density" of a material.
- Define specific volume.

- Use the general gas law to determine the temperature, mass, volume, or pressure of a gas.
- Use specific gravity to determine the density of a material.

Lesson 6 - Pressure/Temperature Relationship (Part 1)
Objectives:

- Calculate temperature conversion from Fahrenheit to Celsius, and from Celsius to Fahrenheit.
- Define absolute temperature and be able to calculate it in either scale.
- Define pressure.
- Explain the terms psig and psia.
- Define superheat.
- Define saturation.

Lesson 7 - Pressure/Temperature Relationship (Part 2)
Objectives:

- State the effects of pressure and temperature on the boiling point of a liquid.
- Use the saturated refrigerant tables to obtain information.
- Describe the behavior of a superheated gas as it responds to changes in temperature.
- Use the superheated refrigerant tables to obtain information.
- Demonstrate the use of pressure-temperature tables.

Lesson 8 - The Compression Refrigeration Cycle (Part 1)
Objectives:

- Explain why a liquid boils and changes to a saturated vapor and, conversely, why a saturated vapor changes to a liquid.
- Describe a refrigeration system.
- Explain the function of a receiver.
- Explain the function of a metering device.
- List three types of metering devices.

Lesson 9 - The Compression Refrigeration Cycle (Part 2)
Objectives:

- Define net refrigeration effect.
- State the conditions on which the standard refrigeration ton is based.
- Explain what is meant by the term volumetric efficiency.
- Determine coefficient of performance.

Lesson 10 - The Compression Refrigeration Cycle (Part 3)
Objectives:

- Calculate displacement and volumetric efficiency.
- Name the factors affecting volumetric efficiency.
- Explain what is meant by the term compression ratio.
- Calculate the compression ration of a compressor.
- Define the terms heat of compression and mechanical efficiency.
- Determine horsepower per ton.
- Determine Btu per watt.

Lesson 11 - Using Pressure and Enthalpy Diagrams (Part 1)
Objectives:

- List five properties of a refrigerant that must be understood in order to interpret a pressure-enthalpy diagram.
- Explain superheated gases and vapor pressure.
- Define the terms enthalpy and entropy.
- Determine evaporator pressure and condensing pressure, using the pressure-enthalpy diagram.
- Calculate compression ration, net refrigeration effect, and other values, using the pressure-enthalpy diagram.

Lesson 12 - Using Pressure and Enthalpy Diagrams (Part 2)
Objectives:

- Describe how to use pressure-enthalpy diagrams for estimating energy requirements.
- Explain compressor power.
- Describe the effects of lower condensing-temperature liquid subcooling and suction-vapor superheating.

Lesson 13 - Safe Practices and Public Relations
Objectives:

- List the causes and nature of accidents.
- Demonstrate safe practices regarding the use of tools.
- Describe the precautions that should be observed when working around moving machinery.
- Identify electrical and fire hazards, and the steps that should be taken to avoid them.
- Explain how injuries resulting from explosive gases, high pressures, and refrigerant cylinders may be prevented.
- Describe what should be done to promote good customer relations.

Lesson 14 - Glossary of Terms