CIMC CURRICULUM

AIR CONDITIONING
& REFRIGERATION

Fundamentals
Electrical Components & Systems
Domestic Refrigeration
Residential & Light Commercial HVAC

Embedded PASS Core Curriculum

- Math----------Met minimal PASS requirements

- **Science----------Met majority of PASS requirements**

Will meet all PASS requirements for Science: Physics when suggested supplements have been implemented

CIMC CURRICULUM

AIR CONDITIONING & REFRIGERATION

Fundamentals
Electrical Components & Systems
Domestic Refrigeration
Residential & Light Commercial HVAC

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AIR CONDITIONING & REFRIGERATION Fundamentals

MATH

ALGEBRA 1

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Math

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Math

PASS Skills Sub-Core: Algebra I

PASS Content Standard Area I.
Number Sense/Algebraic Operations

Content Skill Knowledge	Matching Curriculum Objectives
A. Translate word phrases and sentences into expressions and equations and vice versa.	**14:7** Solve problems about gauges, charts, and pressure/temperature relationships. **14:11** Solve problems about bubble point and dew point and what they mean.
B. Apply the laws of exponents to perform operations on expressions with integral exponents.	
C. Simplify and evaluate expressions	**11:9** Solve problems about system design and sensory troubleshooting. **14:7** Solve problems about gauges, charts, and pressure/temperature relationships.

	14:11 Solve problems about bubble point and dew point and what they mean. **14:17** Compute temperature/pressure relationships.
D. Add, subtract, and multiply polynomials.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Math

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Math

PASS Skills Sub-Core: Algebra I

PASS Content Standard Area II.
Functions and Relations

Content Skill Knowledge	Matching Curriculum Objectives
A. Define and distinguish between relations and functions, dependent and independent variables, and domain and range using function notation.	
B. Recognize the parent graph of the functions y=k, y=x, y=|x|, and predict the effects of transformations on the parent graph (e.g., y=|x| + 2, change slope, change intercepts, change slope and intercept).	
C. Evaluate a function using tables, verbal rules, equations, or graphs.	
D. Find the slope of a line.	

E. Write the equation of and graph linear relationships.	
F. Use slope to determine if lines are parallel, perpendicular, horizontal, or vertical.	
G. Collect and graph real data.	
H. Describe rates of constant change experienced within the context of everyday life as the slope of a linear relation (e.g., cost of hamburger meat based on weight, cost of gas based on cost per gallon, telephone charges based on base rate plus rate per minute).	
I. Solve linear equations by graphing or using properties of equality.	
J. Solve linear inequalities by graphing or using properties of inequalities.	
K. Match appropriate equations or inequalities (1 or 2 variables) to a graph, table, or situation and vice versa.	**4:14** Complete statements about measuring and converting pressure readings. **4:15** Complete statements about measuring and converting vacuum readings. **4:16** Solve problems about measuring and converting weight readings.

	4:17 Complete statements about measuring Btu and Btuh.
L. Solve a system of linear equations.	
M. Solve routine two-step and three-step problems using concepts such as rate, distance, ratio, and proportion, average and percent.	**4:14** Complete statements about measuring and converting pressure readings. **4:15** Complete statements about measuring and converting vacuum readings. **4:16** Solve problems about measuring and converting weight readings. **4:17** Complete statements about measuring Btu and Btuh.

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Math

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Math

PASS Skills Sub-Core: Algebra I

PASS Content Standard Area III.
Geometry/Measurement

Content Skill Knowledge	Matching Curriculum Objectives
A. Use the formulas from geometry (perimeter, circumference, area and volume), science, and statistics, to solve problems within an algebraic context.	**4:18** Measure lines to the nearest quarter, eighth, and sixteenth of an inch.
B. Apply units of measure to interpret results (e.g., miles per gallon, cost per unit).	**4:18** Measure lines to the nearest quarter, eighth, and sixteenth of an inch.

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Math

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Math

PASS Skills Sub-Core: Algebra I

PASS Content Standard Area IV.
Data Analysis, Statistics, and Probability

Content Skill Knowledge	Matching Curriculum Objectives
A. Translate from one representation of data to another and understand the data can be represented using a variety of tables, graphs ,and symbols and that different modes of representation often convey different messages.	
B. Collect data involving two variables and display on a scatter plot; interpret results using a linear model/equation and identify whether the model/equation is a line of best fit for the data (e.g., given a scatter plot and several linear equations, which one is the best fit?).	

C. Formulate and answer questions based on data shown on graphs, tables, charts; make valid inferences, predictions, and arguments.	
D. Solve problems involving the probability of an event and its complement.	

AIR CONDITIONING & REFRIGERATION Fundamentals

SCIENCE

PHYSICAL SCIENCE

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physical Science

PASS Content Standard Area I.
Observing and Measuring

Content Skill Knowledge	Matching Curriculum Objectives
A. Identify similar or different characteristics in a given set of objects, organisms, or events.	
B. Select qualitative (descriptive) or quantitative (numerical) observations in a given set of objects, organisms, or events.	
C. Identify qualitative (descriptive) or quantitative (numerical) observations in a given set of objects, organisms, or events.	
D. Use the appropriate Systems International (SI) units (grams, meters, liters, and degrees Celsius) to measure objects, organisms, or events.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physical Science

PASS Content Standard Area II.
Classifying

Content Skill Knowledge	Matching Curriculum Objectives
A. Use observable properties to classify a set of objects, organisms, or events.	
B. Identify the properties on which a given classification system is based.	
C. Place an object, organism or event into a classification system.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physical Science

PASS Content Standard Area III.
Experimenting

Content Skill Knowledge	Matching Curriculum Objectives
A. Arrange the steps of a scientific problem in logical order.	
B. Identify the independent variables, dependent variables, and control in an experimental set-up.	
C. Use mathematics to show relationships within a given set of observations.	
D. Identify a hypothesis for a given problem.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physical Science

PASS Content Standard Area IV.
Interpreting

Content Skill Knowledge	Matching Curriculum Objectives
A. Select appropriate predictions based on previously observed patterns of evidence.	
B. Report data in an appropriate manner.	
C. Predict data points not included on a given graph.	
D. Interpret line, bar, and circle graphs.	
E. Identify data that support or reject stated hypothesis.	
F. Accept or reject hypothesis when given results of an investigation.	

G. Identify discrepancies between stated hypothesis and actual results.	
H. Select the most logical conclusion for given experimental data.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physical Science

PASS Content Standard Area V.
Communicating

Content Skill Knowledge	Matching Curriculum Objectives
A. Prepare a written report describing the sequence, results, and interpretation of an investigation or event.	
B. Communicate and defend a scientific argument.	
C. Identify or create an appropriate graph or chart from collected data, table, or written description.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physical Science

PASS Content Standard Area VI.
Modeling

Content Skill Knowledge	Matching Curriculum Objectives
A. Select a model, which explains a given set of observations.	
B. Select predictions based on models.	
C. Compare a given model to the real world.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physical Science

PASS Content Standard Area VII.
Safety in the Science Classroom

Content Skill Knowledge	Matching Curriculum Objectives
A. Recognize potential hazards within a science activity.	
B. Practice safety procedures in all science activities.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physical Science

PASS Content Standard Area VIII.
Inquiry

Content Skill Knowledge	Matching Curriculum Objectives
A. Formulate a testable hypothesis and design an appropriate experiment relating to the world.	
B. Design and conduct scientific investigations in which variables are identified and controlled.	
C. Use a variety of technologies, such as hand tools, measuring instruments, and computers to collect, analyze, and display data.	

D. Inquiries should lead to the formation of explanations or models (physical, conceptual, and mathematical). In answering questions, students should engage in discussions (based on scientific knowledge, the use of logic, and evidence from the investigations) and arguments that encourage the revision of their explanations, leading to further inquiry.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physical Science

PASS Content Standard Area IX.
Structure and Properties of Matter

Content Skill Knowledge	Matching Curriculum Objectives
A. Matter is made up of minute particles called atoms, and atoms are composed of even smaller components.	
B. An element is composed of a single type of atoms. When elements are listed in order according to the number of protons (called the atomic number), repeating patterns of physical and chemical properties identify families of elements with similar properties.	
C. Matter has characteristic properties, such as boiling points, melting points, solubility, and density, which distinguish pure substances and can be used to separate one substance from another.	**14:4** Match traditional refrigerants with their characteristics.

	14:5 Complete statements about characteristics of blended refrigerants. **14:11** Solve problems about bubble point and dew point and what they mean. **14:12** Complete statements about ACR lubricants and their characteristics. **14:14** Solve problems about working with synthetic oils. **14:15** Complete statements about desiccants, their characteristics and uses. **15:1** Match terms related to refrigerant recovery, recycling, and reclaiming with their correct definitions. **15:2** Complete statements about general requirements for recovery, recycling, and reclaiming.

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physical Science

PASS Content Standard Area X.
Chemical Reactions

Content Skill Knowledge	Matching Curriculum Objectives
A. Substances react chemically in characteristic ways with other substances to form new substances (compounds) with different characteristic properties. In chemical reactions, the total mass is converted.	**14:5** Complete statements about characteristics of blended refrigerants. **14:6** Solve problems about how to avoid potential problems with new refrigerants. **14:9** Solve problems about charging a system with a blend.
B. The rate of chemical reactions is affected by the concentration and temperature of the reacting material.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physical Science

PASS Content Standard Area XI.
Motion and Forces

Content Skill Knowledge	Matching Curriculum Objectives
A. Objects change their motion only when a net force is applied. Laws of motion are used to determine the effects of forces on the motion of objects.	
B. Gravitation is a universal force that each mass exerts on any other mass.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physical Science

PASS Content Standard Area XII.
Interactions of Energy and Matter

Content Skill Knowledge	Matching Curriculum Objectives
A. All energy can be considered to be either kinetic energy, which is the energy of motion: potential energy, which depends on relative position: or energy contained by a field, such as electromagnetic waves.	
B. Waves, including sounds and seismic waves, waves on water, and light waves, have energy and can transfer energy when they interact with matter.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physical Science

PASS Content Standard Area XIII.
The Earth System

Content Skill Knowledge	Matching Curriculum Objectives
A. Geologic time can be estimated by observing rock sequences and using fossils to correlate the sequences at various locations.	
B. The solid crust of the earth consist of separate plates that move very slowly pressing against one another in some places and pulling apart in other places.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physical Science

PASS Content Standard Area XIV.
The Universe

Content Skill Knowledge	Matching Curriculum Objectives
A. The stars differ from each other in size, temperature, and age, but they appear to be made up of the same elements that are found on the earth.	
B. Stars condense by gravity out of clouds of molecules of the lightest elements until nuclear fusion of the light elements into heavier ones began to occur. Fusion released great amounts of energy over millions of years. Eventually, some stars exploded, producing clouds of heavy elements from which other stars and planets could later condense. The process of star formation and destruction continues.	

AIR CONDITIONING & REFRIGERATION Fundamentals

SCIENCE

BIOLOGY

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Biology

PASS Content Standard Area I.
Observing and Measuring

Content Skill Knowledge	Matching Curriculum Objectives
A. Identify similar or different characteristics in a given set of objects, organisms, or events.	
B. Select qualitative (descriptive) or quantitative (numerical) observations in a given set of objects, organisms, or events.	
C. Identify qualitative (descriptive) or quantitative (numerical) observations in a given set of objects, organisms, or events.	
D. Use the appropriate Systems International (SI) units (grams, meters, liters, and degrees Celsius) to measure objects, organisms, or events.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Biology

PASS Content Standard Area II.
Classifying

Content Skill Knowledge	Matching Curriculum Objectives
A. Use observable properties to classify a set of objects, organisms, or events.	
B. Identify the properties on which a given classification system is based.	
C. Place an object, organism or event into a classification system.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Biology

PASS Content Standard Area III.
Experimenting

Content Skill Knowledge	Matching Curriculum Objectives
A. Arrange the steps of a scientific problem in logical order.	
B. Identify the independent variables, dependent variables, and control in an experimental set-up.	
C. Use mathematics to show relationships within a given set of observations.	
D. Identify a hypothesis for a given problem.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Biology

PASS Content Standard Area IV.
Interpreting

Content Skill Knowledge	Matching Curriculum Objectives
A. Select appropriate predictions based on previously observed patterns of evidence.	
B. Report data in an appropriate manner.	
C. Predict data points not included on a given graph.	
D. Interpret line, bar, and circle graphs.	
E. Identify data that support or reject stated hypothesis.	
F. Accept or reject hypothesis when given results of an investigation.	

G. Identify discrepancies between stated hypothesis and actual results.	
H. Select the most logical conclusion for given experimental data.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Biology

PASS Content Standard Area V.
Communicating

Content Skill Knowledge	Matching Curriculum Objectives
A. Prepare a written report describing the sequence, results, and interpretation of an investigation or event.	
B. Communicate and defend a scientific argument.	
C. Identify or create an appropriate graph or chart from collected data, table, or written description.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Biology

PASS Content Standard Area VI.
Modeling

Content Skill Knowledge	Matching Curriculum Objectives
A. Select a model, which explains a given set of observations.	
B. Select predictions based on models.	
C. Compare a given model to the real world.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Biology

PASS Content Standard Area VII.
Safety in the Science Classroom

Content Skill Knowledge	Matching Curriculum Objectives
A. Recognize potential hazards within a science activity.	
B. Practice safety procedures in all science activities.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Biology

PASS Content Standard Area VIII.
Inquiry

Content Skill Knowledge	Matching Curriculum Objectives
A. Formulate a testable hypothesis and design an appropriate experiment relating to the world.	
B. Design and conduct scientific investigations in which variables are identified and controlled.	
C. Use a variety of technologies, such as hand tools, measuring instruments, and computers to collect, analyze, and display data.	

D. Inquiries should lead to the formation of explanations or models (physical, conceptual, and mathematical). In answering questions, students should engage in discussions (based on scientific knowledge, the use of logic, and evidence from the investigations) and arguments that encourage the revision of their explanations, leading to further inquiry.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Biology

PASS Content Standard Area IX.
The Cell

Content Skill Knowledge	Matching Curriculum Objectives
A. Cells are the fundamental unit of life, comprised of a variety of structures that perform functions, such as transport information and synthesis of molecules.	
B. Cells function according to the information contained in DNA.	
C. Cells can differentiate and may develop into complex multi-cellular organisms.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Biology

PASS Content Standard Area X.
The Molecular Basis of Heredity

Content Skill Knowledge	Matching Curriculum Objectives
A. In all organisms, the instructions for specifying the characteristics of the organism are carried in DNA, and changes in DNA (mutations) occur spontaneously at low rates.	
B. A sorting and recombination of genes in production results in a great variety of possible gene combinations from the offspring of any two parents.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Biology

PASS Content Standard Area XI.
Biological Diversity

Content Skill Knowledge	Matching Curriculum Objectives
A. Different species might look dissimilar, but the unity among organisms becomes apparent from an analysis of internal structures, the similarity of their chemical processes, and the evidence of common ancestry.	
B. Diversity of species is developed through gradual processes over many generations. Species acquire many of their unique characteristics through biological adaptation, which involves the selection of naturally occurring variations in populations. Biological adaptations include changes in structures, behaviors, or physiology, that enhance survival and reproductive success in a particular environment.	

C. Extension occurs when the environment changes and the adaptive characteristics of a species are insufficient to its survival.	**13:4** Complete statements about types of global warming and how it is measured.

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Biology

PASS Content Standard Area XII.
The Interdependence of Organisms

Content Skill Knowledge	Matching Curriculum Objectives
A. Matter on the earth cycles among the living and nonliving components of the biosphere.	
B. Energy flows through ecosystems in one direction.	
C. Organisms both cooperate and compete in ecosystems.	
D. Living organisms have the capacity to produce populations of infinite size, but environments and resources limit population size.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Biology

PASS Content Standard Area XIII.
Matter, Energy, and Organization in Living Systems

Content Skill Knowledge	Matching Curriculum Objectives
A. The complexity and organization of organisms accommodates the need for obtaining, transforming, transporting, releasing, and eliminating the matter and energy used to sustain the organism.	
B. As matter and energy flow through different levels of organizations of living systems—cells , organs, organisms, and communities—and between living systems and the physical environment, chemical elements are recombined in different ways by different structures. Each recombination results in storage, use, and dissipation of energy into the environment as heat. Matter and energy are conserved in each change.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Biology

PASS Content Standard Area XIV.
The Behavior of Organisms

Content Skill Knowledge	Matching Curriculum Objectives
A. Organisms have behavioral responses to internal changes and to external stimuli.	
B. Broad patterns of behavior exhibited by animals have adapted to ensure reproductive success.	

AIR CONDITIONING & REFRIGERATION Fundamentals

SCIENCE

CHEMISTRY

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Chemistry

PASS Content Standard Area I.
Observing and Measuring

Content Skill Knowledge	Matching Curriculum Objectives
A. Identify similar or different characteristics in a given set of objects, organisms, or events.	
B. Select qualitative (descriptive) or quantitative (numerical) observations in a given set of objects, organisms, or events.	
C. Identify qualitative (descriptive) or quantitative (numerical) observations in a given set of objects, organisms, or events.	
D. Use the appropriate Systems International (SI) units (grams, meters, liters, and degrees Celsius) to measure objects, organisms, or events.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Chemistry

PASS Content Standard Area II.
Classifying

Content Skill Knowledge	Matching Curriculum Objectives
A. Use observable properties to classify a set of objects, organisms, or events.	
B. Identify the properties on which a given classification system is based.	
C. Place an object, organism or event into a classification system.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Chemistry

PASS Content Standard Area III.
Experimenting

Content Skill Knowledge	Matching Curriculum Objectives
A. Arrange the steps of a scientific problem in logical order.	
B. Identify the independent variables, dependent variables, and control in an experimental set-up.	
C. Use mathematics to show relationships within a given set of observations.	
D. Identify a hypothesis for a given problem.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Chemistry

PASS Content Standard Area IV.
Interpreting

Content Skill Knowledge	Matching Curriculum Objectives
A. Select appropriate predictions based on previously observed patterns of evidence.	
B. Report data in an appropriate manner.	
C. Predict data points not included on a given graph.	
D. Interpret line, bar, and circle graphs.	
E. Identify data that support or reject stated hypothesis.	
F. Accept or reject hypothesis when given results of an investigation.	

G. Identify discrepancies between stated hypothesis and actual results.	
H. Select the most logical conclusion for given experimental data.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Chemistry

PASS Content Standard Area V.
Communicating

Content Skill Knowledge	Matching Curriculum Objectives
A. Prepare a written report describing the sequence, results, and interpretation of an investigation or event.	
B. Communicate and defend a scientific argument.	
C. Identify or create an appropriate graph or chart from collected data, table, or written description.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Chemistry

PASS Content Standard Area VI.
Modeling

Content Skill Knowledge	Matching Curriculum Objectives
A. Select a model, which explains a given set of observations.	
B. Select predictions based on models.	
C. Compare a given model to the real world.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Chemistry

PASS Content Standard Area VII.
Safety in the Science Classroom

Content Skill Knowledge	Matching Curriculum Objectives
A. Recognize potential hazards within a science activity.	
B. Practice safety procedures in all science activities.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals
PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Chemistry

PASS Content Standard Area VIII.
Inquiry

Content Skill Knowledge	Matching Curriculum Objectives
A. Formulate a testable hypothesis and design an appropriate experiment relating to the world.	
B. Design and conduct scientific investigations in which variables are identified and controlled.	
C. Use a variety of technologies, such as hand tools, measuring instruments, and computers to collect, analyze, and display data.	

D. Inquiries should lead to the formation of explanations or models (physical, conceptual, and mathematical). In answering questions, students should engage in discussions (based on scientific knowledge, the use of logic, and evidence from the investigations) and arguments that encourage the revision of their explanations, leading to further inquiry.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Chemistry

PASS Content Standard Area IX.
Structures and Properties of Matter

Content Skill Knowledge	Matching Curriculum Objectives
A. Matter is made of atoms and atoms are composed of even smaller components.	
B. Atoms interact with one another by transferring or sharing outer electrons that are farthest from the nucleus.	
C. An element is composed of a single type of atom. When elements are listed in order according to the number of protons, repeating patterns of physical and chemical properties identify families of elements with similar properties. This is the basis for the Periodic Table.	

D. A compound is formed when two or more kinds of atoms bind together chemically. Each compound has unique chemical and physical properties.	**12:7** Solve problems about monitoring moisture and liquid in a system. **13:3** Solve problems about the ozone depletion cycle and its causes. **13:5** Solve problems about ozone depletion and what it means.
E. Solids, liquids, and gases differ in the energy that binds them together.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Chemistry

PASS Content Standard Area X.
Chemical Reactions

Content Skill Knowledge	Matching Curriculum Objectives
A. Chemical reactions occur all around us. These reactions may release or consume energy but the total energy of the system remains constant.	
B. A large number of important reactions involve the transfer of either electrons (oxidation/reduction) or hydrogen ions (acid/base reactions).	
C. Reaction rates depend on the concentration and temperature of the reactants. Catalysts accelerate chemical reactions.	

AIR CONDITIONING & REFRIGERATION Fundamentals

SCIENCE

PHYSICS

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area I.
Observing and Measuring

Content Skill Knowledge	Matching Curriculum Objectives
A. Identify similar or different characteristics in a given set of objects, organisms, or events.	**5:1** Match terms related to tubing and tubing applications with their correct definitions. **5:2** Match kinds of tubing with their applications. **5:3** Complete statements about the advantages of copper tubing in ACR applications. **5:4** Complete statements about characteristics of type K copper tubing and its applications.

	5:5 Complete statements about characteristics of type L copper tubing and its applications. **5:6** Complete statements about characteristics of type M copper tubing and its applications. **5:7** Complete statements about characteristics of DVW tubing and its applications. **5:8** Match tubing fittings with their characteristics. **5:9** Identify flare fittings. **5:10** Identify flare-to-pipe fittings. **5:11** Identify compression fittings. **5:12** Identify sweat fittings. **5:13** Match quick connect fittings with their applications. **5:14** Select true statements about guidelines for cutting and reaming tubing.

	5:15 Select true statements about guidelines for flaring tubing. **5:16** Select true statements about guidelines for swaging tubing. **5:17** Select true statements about tools for bending tubing. **5:18** Identify selected fittings for copper tubing. **5:19** Make a single flare with a compression-type flaring block. **5:20** Make a single flare with a Rol-Air-type flaring block. **5:21** Make a swage joint in copper tubing. **5:22** Make a 90-degree bend in copper tubing. **5:23** Make a 180-degree bend in copper tubing. **5:24** Make a 45-degree offset bend in copper tubing.

	6:1 Match terms related to iron, plastic, and PVC pipe with their correct definitions. **6:2** Complete statements about black iron in HVAC applications. **6:3** Select true statements about galvanized pipe in HVAC applications. **6:4** Complete statements about polybutylene and polyethylene in HVAC applications. **6:5** Solve problems about guidelines for using iron pipe fittings. **6:6** Select true statements about guidelines for using brass fittings. **6:7** Select true statements about guidelines for using flexible plastic fittings. **6:8** Select true statements about guidelines for using PVC fittings. **6:9** Select true statements about guidelines for working with polybutylene and polyethylene.

	6:10 Complete statements about using PE dielectric unions in HVAC applications.
B. Select qualitative (descriptive) or quantitative (numerical) observations in a given set of objects, organisms, or events.	**5:1** Match terms related to tubing and tubing applications with their correct definitions. **5:2** Match kinds of tubing with their applications. **5:3** Complete statements about the advantages of copper tubing in ACR applications. **5:4** Complete statements about characteristics of type K copper tubing and its applications. **5:5** Complete statements about characteristics of type L copper tubing and its applications. **5:6** Complete statements about characteristics of type M copper tubing and its applications. **5:7** Complete statements about characteristics of DVW tubing and its applications.

	5:8 Match tubing fittings with their characteristics. **5:9** Identify flare fittings. **5:10** Identify flare-to-pipe fittings. **5:11** Identify compression fittings. **5:12** Identify sweat fittings. **5:13** Match quick connect fittings with their applications. **5:14** Select true statements about guidelines for cutting and reaming tubing. **5:15** Select true statements about guidelines for flaring tubing. **5:16** Select true statements about guidelines for swaging tubing. **5:17** Select true statements about tools for bending tubing. **5:18** Identify selected fittings for copper tubing.

	5:19 Make a single flare with a compression-type flaring block. **5:20** Make a single flare with a Rol-Air-type flaring block. **5:21** Make a swage joint in copper tubing. **5:22** Make a 90-degree bend in copper tubing. **5:23** Make a 180-degree bend in copper tubing. **5:24** Make a 45-degree offset bend in copper tubing. **6:1** Match terms related to iron, plastic, and PVC pipe with their correct definitions. **6:2** Complete statements about black iron in HVAC applications. **6:3** Select true statements about galvanized pipe in HVAC applications.

	6:4 Complete statements about polybutylene and polyethylene in HVAC applications. **6:5** Solve problems about guidelines for using iron pipe fittings. **6:6** Select true statements about guidelines for using brass fittings. **6:7** Select true statements about guidelines for using flexible plastic fittings. **6:8** Select true statements about guidelines for using PVC fittings. **6:9** Select true statements about guidelines for working with polybutylene and polyethylene. **6:10** Complete statements about using PE dielectric unions in HVAC applications. **6:11** Solve problems about guidelines for measuring pipe. **6:12** Select true statements about tools for cutting and threading iron pipe.

	6:14 Select true statements about tools for working with PVC.
C. Identify qualitative (descriptive) or quantitative (numerical) observations in a given set of objects, organisms, or events.	**5:3** Complete statements about the advantages of copper tubing in ACR applications. **5:4** Complete statements about characteristics of type K copper tubing and its applications. **5:5** Complete statements about characteristics of type L copper tubing and its applications. **5:6** Complete statements about characteristics of type M copper tubing and its applications. **5:7** Complete statements about characteristics of DVW tubing and its applications. **5:8** Match tubing fittings with their characteristics. **5:13** Match quick connect fittings with their applications. **5:14** Select true statements about guidelines for cutting and reaming tubing.

	5:15 Select true statements about guidelines for flaring tubing. **5:16** Select true statements about guidelines for swaging tubing. **5:17** Select true statements about tools for bending tubing. **5:18** Identify selected fittings for copper tubing. **5:19** Make a single flare with a compression-type flaring block. **5:20** Make a single flare with a Rol-Air-type flaring block. **5:21** Make a swage joint in copper tubing. **5:22** Make a 90-degree bend in copper tubing. **5:23** Make a 180-degree bend in copper tubing. **5:24** Make a 45-degree offset bend in copper tubing.

	6:1 Match terms related to iron, plastic, and PVC pipe with their correct definitions. **6:2** Complete statements about black iron in HVAC applications. **6:3** Select true statements about galvanized pipe in HVAC applications. **6:4** Complete statements about polybutylene and polyethylene in HVAC applications. **6:5** Solve problems about guidelines for using iron pipe fittings. **6:6** Select true statements about guidelines for using brass fittings. **6:7** Select true statements about guidelines for using flexible plastic fittings. **6:8** Select true statements about guidelines for using PVC fittings. **6:9** Select true statements about guidelines for working with polybutylene and polyethylene.

	6:10 Complete statements about using PE dielectric unions in HVAC applications. **6:11** Solve problems about guidelines for measuring pipe. **6:15** Cut and ream PVC pipe and join it to a fitting. **6:16** Cut, ream, and thread iron pipe. **6:17** Join flexible plastic pipe with a butt fusion process.
D. Use the appropriate Systems International (SI) units (grams, meters, liters, and degrees Celsius) to measure objects, organisms, or events.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area II.
Classifying

Content Skill Knowledge	Matching Curriculum Objectives
A. Use observable properties to classify a set of objects, organisms, or events.	**5:4** Complete statements about characteristics of type K copper tubing and its applications. **5:5** Complete statements about characteristics of type L copper tubing and its applications. **5:6** Complete statements about characteristics of type M copper tubing and its applications. **5:7** Complete statements about characteristics of DVW tubing and its applications.

	5:8 Match tubing fittings with their characteristics. **5:13** Match quick connect fittings with their applications. **5:18** Identify selected fittings for copper tubing. **6:4** Complete statements about polybutylene and polyethylene in HVAC applications. **6:5** Solve problems about guidelines for using iron pipe fittings. **6:6** Select true statements about guidelines for using brass fittings. **6:7** Select true statements about guidelines for using flexible plastic fittings. **6:8** Select true statements about guidelines for using PVC fittings. **6:9** Select true statements about guidelines for working with polybutylene and polyethylene.

B. Identify the properties on which a given classification system is based.	**5:4** Complete statements about characteristics of type K copper tubing and its applications. **5:5** Complete statements about characteristics of type L copper tubing and its applications. **5:6** Complete statements about characteristics of type M copper tubing and its applications. **5:7** Complete statements about characteristics of DVW tubing and its applications. **5:8** Match tubing fittings with their characteristics. **5:13** Match quick connect fittings with their applications. **5:18** Identify selected fittings for copper tubing. **6:4** Complete statements about polybutylene and polyethylene in HVAC applications. **6:5** Solve problems about guidelines for using iron pipe fittings.

	6:6 Select true statements about guidelines for using brass fittings. **6:7** Select true statements about guidelines for using flexible plastic fittings. **6:8** Select true statements about guidelines for using PVC fittings. **6:9** Select true statements about guidelines for working with polybutylene and polyethylene.
C. Place an object, organism or event into a classification system.	**5:4** Complete statements about characteristics of type K copper tubing and its applications. **5:5** Complete statements about characteristics of type L copper tubing and its applications. **5:6** Complete statements about characteristics of type M copper tubing and its applications. **5:7** Complete statements about characteristics of DVW tubing and its applications.

	5:8 Match tubing fittings with their characteristics. **5:13** Match quick connect fittings with their applications. **5:18** Identify selected fittings for copper tubing. **6:4** Complete statements about polybutylene and polyethylene in HVAC applications. **6:5** Solve problems about guidelines for using iron pipe fittings. **6:6** Select true statements about guidelines for using brass fittings. **6:7** Select true statements about guidelines for using flexible plastic fittings. **6:8** Select true statements about guidelines for using PVC fittings. **6:9** Select true statements about guidelines for working with polybutylene and polyethylene.

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Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
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PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area III.
Experimenting

Content Skill Knowledge	Matching Curriculum Objectives
A. Arrange the steps of a scientific problem in logical order.	**5:19** Make a single flare with a compression-type flaring block. **5:20** Make a single flare with a Rol-Air-type flaring block. **5:21** Make a swage joint in copper tubing. **5:22** Make a 90-degree bend in copper tubing. **5:23** Make a 180-degree bend in copper tubing.

	5:24 Make a 45-degree offset bend in copper tubing. **6:15** Cut and ream PVC pipe and join it to a fitting. **6:16** Cut, ream, and thread iron pipe. **6:17** Join flexible plastic pipe with a butt fusion process.
B. Identify the independent variables, dependent variables, and control in an experimental set-up.	
C. Use mathematics to show relationships within a given set of observations.	**5:22** Make a 90-degree bend in copper tubing. **5:23** Make a 180-degree bend in copper tubing. **5:24** Make a 45-degree offset bend in copper tubing. **6:15** Cut and ream PVC pipe and join it to a fitting. **6:16** Cut, ream, and thread iron pipe. **6:17** Join flexible plastic pipe with a butt fusion process.

	14:17 Compute temperature/pressure relationships.
D. Identify a hypothesis for a given problem.	

Oklahoma Vocational Curriculum:
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Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area IV.
Interpreting

Content Skill Knowledge	Matching Curriculum Objectives
A. Select appropriate predictions based on previously observed patterns of evidence.	**5:19** Make a single flare with a compression-type flaring block. **5:20** Make a single flare with a Rol-Air-type flaring block. **5:21** Make a swage joint in copper tubing. **5:22** Make a 90-degree bend in copper tubing. **5:23** Make a 180-degree bend in copper tubing.

	5:24 Make a 45-degree offset bend in copper tubing. **6:15** Cut and ream PVC pipe and join it to a fitting. **6:16** Cut, ream, and thread iron pipe. **6:17** Join flexible plastic pipe with a butt fusion process.
B. Report data in an appropriate manner.	
C. Predict data points not included on a given graph.	
D. Interpret line, bar, and circle graphs.	
E. Identify data that support or reject stated hypothesis.	
F. Accept or reject hypothesis when given results of an investigation.	
G. Identify discrepancies between stated hypothesis and actual results.	**5:19** Make a single flare with a compression-type flaring block. **5:20** Make a single flare with a Rol-Air-type flaring block. **5:21** Make a swage joint in copper tubing.

	5:22 Make a 90-degree bend in copper tubing. **5:23** Make a 180-degree bend in copper tubing. **5:24** Make a 45-degree offset bend in copper tubing. **6:15** Cut and ream PVC pipe and join it to a fitting. **6:16** Cut, ream, and thread iron pipe. **6:17** Join flexible plastic pipe with a butt fusion process.
H. Select the most logical conclusion for given experimental data.	**5:19** Make a single flare with a compression-type flaring block. **5:20** Make a single flare with a Rol-Air-type flaring block. **5:21** Make a swage joint in copper tubing. **5:22** Make a 90-degree bend in copper tubing. **5:23** Make a 180-degree bend in copper tubing.

	5:24 Make a 45-degree offset bend in copper tubing. **6:15** Cut and ream PVC pipe and join it to a fitting. **6:16** Cut, ream, and thread iron pipe. **6:17** Join flexible plastic pipe with a butt fusion process.

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area V.
Communicating

Content Skill Knowledge	Matching Curriculum Objectives
A. Prepare a written report describing the sequence, results, and interpretation of an investigation or event.	**6:13** Explain in your own words what a pipe threading chart shows.
B. Communicate and defend a scientific argument.	
C. Identify or create an appropriate graph or chart from collected data, table, or written description.	

Oklahoma Vocational Curriculum:
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Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area VI.
Modeling

Content Skill Knowledge	Matching Curriculum Objectives
A. Select a model, which explains a given set of observations.	**5:9** Identify flare fittings. **5:10** Identify flare-to-pipe fittings. **5:11** Identify compression fittings. **5:12** Identify sweat fittings. **5:13** Match quick connect fittings with their applications. **5:14** Select true statements about guidelines for cutting and reaming tubing.

	5:15 Select true statements about guidelines for flaring tubing. **5:16** Select true statements about guidelines for swaging tubing. **5:17** Select true statements about tools for bending tubing. **5:18** Identify selected fittings for copper tubing. **5:19** Make a single flare with a compression-type flaring block. **5:20** Make a single flare with a Rol-Air-type flaring block. **5:21** Make a swage joint in copper tubing. **5:22** Make a 90-degree bend in copper tubing. **5:23** Make a 180-degree bend in copper tubing. **5:24** Make a 45-degree offset bend in copper tubing.

	6:15 Cut and ream PVC pipe and join it to a fitting. **6:16** Cut, ream, and thread iron pipe. **6:17** Join flexible plastic pipe with a butt fusion process.
B. Select predictions based on models.	**5:9** Identify flare fittings. **5:10** Identify flare-to-pipe fittings. **5:11** Identify compression fittings. **5:12** Identify sweat fittings. **5:13** Match quick connect fittings with their applications. **5:14** Select true statements about guidelines for cutting and reaming tubing. **5:15** Select true statements about guidelines for flaring tubing. **5:16** Select true statements about guidelines for swaging tubing.

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	6:17 Join flexible plastic pipe with a butt fusion process.
C. Compare a given model to the real world.	**5:9** Identify flare fittings. **5:10** Identify flare-to-pipe fittings. **5:11** Identify compression fittings. **5:12** Identify sweat fittings. **5:13** Match quick connect fittings with their applications. **5:14** Select true statements about guidelines for cutting and reaming tubing. **5:15** Select true statements about guidelines for flaring tubing. **5:16** Select true statements about guidelines for swaging tubing. **5:17** Select true statements about tools for bending tubing. **5:18** Identify selected fittings for copper tubing.

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Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area VII.
Safety in the Science Classroom

Content Skill Knowledge	Matching Curriculum Objectives
A. Recognize potential hazards within a science activity.	**5:1** Match terms related to tubing and tubing applications with their correct definitions. **5:2** Match kinds of tubing with their applications. **5:3** Complete statements about the advantages of copper tubing in ACR applications. **5:4** Complete statements about characteristics of type K copper tubing and its applications.

	5:5 Complete statements about characteristics of type L copper tubing and its applications. **5:6** Complete statements about characteristics of type M copper tubing and its applications. **5:7** Complete statements about characteristics of DVW tubing and its applications. **5:8** Match tubing fittings with their characteristics. **5:9** Identify flare fittings. **5:10** Identify flare-to-pipe fittings. **5:11** Identify compression fittings. **5:12** Identify sweat fittings. **5:13** Match quick connect fittings with their applications. **5:14** Select true statements about guidelines for cutting and reaming tubing.

	5:15 Select true statements about guidelines for flaring tubing. **5:16** Select true statements about guidelines for swaging tubing. **5:17** Select true statements about tools for bending tubing. **5:18** Identify selected fittings for copper tubing. **5:19** Make a single flare with a compression-type flaring block. **5:20** Make a single flare with a Rol-Air-type flaring block. **5:21** Make a swage joint in copper tubing. **5:22** Make a 90-degree bend in copper tubing. **5:23** Make a 180-degree bend in copper tubing. **5:24** Make a 45-degree offset bend in copper tubing.

	6:1 Match terms related to iron, plastic, and PVC pipe with their correct definitions. **6:2** Complete statements about black iron in HVAC applications. **6:3** Select true statements about galvanized pipe in HVAC applications. **6:4** Complete statements about polybutylene and polyethylene in HVAC applications. **6:5** Solve problems about guidelines for using iron pipe fittings. **6:6** Select true statements about guidelines for using brass fittings. **6:7** Select true statements about guidelines for using flexible plastic fittings. **6:8** Select true statements about guidelines for using PVC fittings. **6:9** Select true statements about guidelines for working with polybutylene and polyethylene.

	6:10 Complete statements about using PE dielectric unions in HVAC applications. **6:11** Solve problems about guidelines for measuring pipe. **6:12** Select true statements about tools for cutting and threading iron pipe. **6:13** Explain in your own words what a pipe threading chart shows. **6:14** Select true statements about tools for working with PVC. **6:15** Cut and ream PVC pipe and join it to a fitting. **6:16** Cut, ream, and thread iron pipe. **6:17** Join flexible plastic pipe with a butt fusion process.
B. Practice safety procedures in all science activities.	**5:1** Match terms related to tubing and tubing applications with their correct definitions. **5:2** Match kinds of tubing with their applications.

	5:3 Complete statements about the advantages of copper tubing in ACR applications. **5:4** Complete statements about characteristics of type K copper tubing and its applications. **5:5** Complete statements about characteristics of type L copper tubing and its applications. **5:6** Complete statements about characteristics of type M copper tubing and its applications. **5:7** Complete statements about characteristics of DVW tubing and its applications. **5:8** Match tubing fittings with their characteristics. **5:9** Identify flare fittings. **5:10** Identify flare-to-pipe fittings. **5:11** Identify compression fittings.

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	6:7 Select true statements about guidelines for using flexible plastic fittings. **6:8** Select true statements about guidelines for using PVC fittings. **6:9** Select true statements about guidelines for working with polybutylene and polyethylene. **6:10** Complete statements about using PE dielectric unions in HVAC applications. **6:11** Solve problems about guidelines for measuring pipe. **6:12** Select true statements about tools for cutting and threading iron pipe. **6:13** Explain in your own words what a pipe threading chart shows. **6:14** Select true statements about tools for working with PVC. **6:15** Cut and ream PVC pipe and join it to a fitting.

	6:16 Cut, ream, and thread iron pipe. **6:17** Join flexible plastic pipe with a butt fusion process.

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area VIII.
Inquiry

Content Skill Knowledge	Matching Curriculum Objectives
A. Formulate a testable hypothesis and design an appropriate experiment relating to the world.	**5:19** Make a single flare with a compression-type flaring block. **5:20** Make a single flare with a Rol-Air-type flaring block. **5:21** Make a swage joint in copper tubing. **5:22** Make a 90-degree bend in copper tubing. **5:23** Make a 180-degree bend in copper tubing.

	5:24 Make a 45-degree offset bend in copper tubing. **6:15** Cut and ream PVC pipe and join it to a fitting. **6:16** Cut, ream, and thread iron pipe. **6:17** Join flexible plastic pipe with a butt fusion process.
B. Design and conduct scientific investigations in which variables are identified and controlled.	
C. Use a variety of technologies, such as hand tools, measuring instruments, and computers to collect, analyze, and display data.	**5:19** Make a single flare with a compression-type flaring block. **5:20** Make a single flare with a Rol-Air-type flaring block. **5:21** Make a swage joint in copper tubing. **5:22** Make a 90-degree bend in copper tubing. **5:23** Make a 180-degree bend in copper tubing. **5:24** Make a 45-degree offset bend in copper tubing.

	6:15 Cut and ream PVC pipe and join it to a fitting. **6:16** Cut, ream, and thread iron pipe. **6:17** Join flexible plastic pipe with a butt fusion process.
D. Inquiries should lead to the formation of explanations or models (physical, conceptual, and mathematical). In answering questions, students should engage in discussions (based on scientific knowledge, the use of logic, and evidence from the investigations) and arguments that encourage the revision of their explanations, leading to further inquiry.	**5:19** Make a single flare with a compression-type flaring block. **5:20** Make a single flare with a Rol-Air-type flaring block. **5:21** Make a swage joint in copper tubing. **5:22** Make a 90-degree bend in copper tubing. **5:23** Make a 180-degree bend in copper tubing. **5:24** Make a 45-degree offset bend in copper tubing. **6:15** Cut and ream PVC pipe and join it to a fitting. **6:16** Cut, ream, and thread iron pipe.

	6:17 Join flexible plastic pipe with a butt fusion process.

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area IX.
Motions and Forces

Content Skill Knowledge	Matching Curriculum Objectives
A. Objects change their motion only when a net force is applied. Laws of motion are used to calculate precisely the effects of forces on the motion of objects.	
B. Gravitation is a universal force that each mass exerts on any other mass. The strength of the gravitational attractive force between two masses is proportional to the masses and inversely proportional to the square of the distance between them.	

C. The electric force is a universal force that exists between any two charged objects. The strength of the force is proportional to the charges and, as with gravitation, inversely proportional to the square of the distance between them.	
D. Electricity and magnetism are two aspects of a single electromagnetic force.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area X.
Conservation of Energy

Content Skill Knowledge	Matching Curriculum Objectives
A. The total energy of the universe is constant. Energy can be transferred but never destroyed.	
B. All energy can be considered to be kinetic energy, potential energy, or energy contained by a field.	
C. Heat consists of random motion and the vibrations of atoms, molecules, and ions. The higher the temperature, the greater the atomic or molecular motion.	**11:3** Complete statements about how laws for thermodynamics and gases work in a refrigeration cycle.

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Fundamentals: Science

CIMC Developed/
Recommended Curriculum: ACR—Fundamentals

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area XI.
Interactions of Energy and Matter

Content Skill Knowledge	Matching Curriculum Objectives
A. Waves have energy and can transfer energy when they interact with matter.	**12:5** Complete statements about noise and vibration control with large compressors.
B. Electromagnetic waves result when a charged object is accelerated or decelerated.	

AIR CONDITIONING & REFRIGERATION
Electrical Components & Systems

MATH

ALGEBRA

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Electrical Components & Systems: Math

CIMC Developed/
Recommended Curriculum: Electrical Components & Systems

PASS Skills
Core Curriculum Area: Math

PASS Skills Sub-Core: Algebra I

PASS Content Standard Area I.
Number Sense/Algebraic Operations

Content Skill Knowledge	Matching Curriculum Objectives
A. Translate word phrases and sentences into expressions and equations and vice versa.	**1:17** Write the three equations for using Ohm's Law. **3:9** Solve problems about Watt's Law. **3:12** Use Watt's Law to determine power. **11:7** Complete statements about grouping capacitors. **11:8** Calculate ratings of grouped capacitors.

B. Apply the laws of exponents to perform operations on expressions with integral exponents.	
C. Simplify and evaluate expressions	**1:18** Complete statements about using Ohm's Law to find unknown values. **1:19** Complete statements about using Ohm's Law to determine values in a series circuit. **1:20** Complete statements about using Ohm's Law to determine values in a parallel circuit. **1:21** Complete statements about using Ohm's Law to determine values in a series parallel circuit. **1:24** Use Ohm's Law to determine unknown values is resistive circuits. **3:9** Solve problems about Watt's Law. **3:12** Use Watt's Law to determine power. **11:7** Complete statements about grouping capacitors. **11:8** Calculate ratings of grouped capacitors.

D. Add, subtract, and multiply polynomials.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Electrical Components & Systems: Math

CIMC Developed/
Recommended Curriculum: Electrical Components & Systems

PASS Skills
Core Curriculum Area: Math

PASS Skills Sub-Core: Algebra I

PASS Content Standard Area II.
Functions and Relations

Content Skill Knowledge	Matching Curriculum Objectives
A. Define and distinguish between relations and functions, dependent and independent variables, and domain and range using function notation.	
B. Recognize the parent graph of the functions y=k, y=x, y=|x|, and predict the effects of transformations on the parent graph (e.g., y=|x| + 2, change slope, change intercepts, change slope and intercept).	
C. Evaluate a function using tables, verbal rules, equations, or graphs.	
D. Find the slope of a line.	

E. Write the equation of and graph linear relationships.	
F. Use slope to determine if lines are parallel, perpendicular, horizontal, or vertical.	
G. Collect and graph real data.	
H. Describe rates of constant change experienced within the context of everyday life as the slope of a linear relation (e.g., cost of hamburger meat based on weight, cost of gas based on cost per gallon, telephone charges based on base rate plus rate per minute).	
I. Solve linear equations by graphing or using properties of equality.	
J. Solve linear inequalities by graphing or using properties of inequalities.	
K. Match appropriate equations or inequalities (1 or 2 variables) to a graph, table, or situation and vice versa.	**11:7** Complete statements about grouping capacitors. **11:8** Calculate ratings of grouped capacitors.
L. Solve a system of linear equations.	
M. Solve routine two-step and three-step problems using concepts such as rate, distance, ratio, and proportion, average and percent.	**9:7** Apply the power factor for watt/amp, amp/watt conversion.

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Electrical Components & Systems: Math

CIMC Developed/
Recommended Curriculum: Electrical Components & Systems

PASS Skills
Core Curriculum Area: Math

PASS Skills Sub-Core: Algebra I

PASS Content Standard Area III.
Geometry/Measurement

Content Skill Knowledge	Matching Curriculum Objectives
A. Use the formulas from geometry (perimeter, circumference, area and volume), science, and statistics, to solve problems within an algebraic context.	**8:13** Complete statements about pulley selection. **8:16** Use a pulley selection chart.
B. Apply units of measure to interpret results (e.g., miles per gallon, cost per unit).	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Electrical Components & Systems: Math

CIMC Developed/
Recommended Curriculum: Electrical Components & Systems

PASS Skills
Core Curriculum Area: Math

PASS Skills Sub-Core: Algebra I

PASS Content Standard Area IV.
Data Analysis, Statistics, and Probability

Content Skill Knowledge	**Matching Curriculum Objectives**
A. Translate from one representation of data to another and understand the data can be represented using a variety of tables, graphs ,and symbols and that different modes of representation often convey different messages.	
B. Collect data involving two variables and display on a scatter plot; interpret results using a linear model/equation and identify whether the model/equation is a line of best fit for the data (e.g., given a scatter plot and several linear equations, which one is the best fit?).	

C. Formulate and answer questions based on data shown on graphs, tables, charts; make valid inferences, predictions, and arguments.	
D. Solve problems involving the probability of an event and its complement.	

AIR CONDITIONING & REFRIGERATION
Electrical Components & Systems

SCIENCE

PHYSICS

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Electrical Components & Systems: Science

CIMC Developed/
Recommended Curriculum: Electrical Components & Systems

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area I.
Observing and Measuring

Content Skill Knowledge	Matching Curriculum Objectives
A. Identify similar or different characteristics in a given set of objects, organisms, or events.	**4:10** Differentiate between symbols used in pictorials and schematics. **8:15** Solve problems about troubleshooting electric motors. **8:17** Solve electric motor problems. **11:9** Check capacitors with an analog ohmmeter. **11:10** Check capacitors with a capacitor analyzer.

	14:6 Solve problems about applying the hopscotch method for troubleshooting.
B. Select qualitative (descriptive) or quantitative (numerical) observations in a given set of objects, organisms, or events.	
C. Identify qualitative (descriptive) or quantitative (numerical) observations in a given set of objects, organisms, or events.	
D. Use the appropriate Systems International (SI) units (grams, meters, liters, and degrees Celsius) to measure objects, organisms, or events.	**1:23** Convert electrical measurements to basic units.

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Electrical Components & Systems: Science

CIMC Developed/
Recommended Curriculum: Electrical Components & Systems

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area II.
Classifying

Content Skill Knowledge	Matching Curriculum Objectives
A. Use observable properties to classify a set of objects, organisms, or events.	
B. Identify the properties on which a given classification system is based.	
C. Place an object, organism or event into a classification system.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Electrical Components & Systems: Science

CIMC Developed/
Recommended Curriculum: Electrical Components & Systems

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area III.
Experimenting

Content Skill Knowledge	Matching Curriculum Objectives
A. Arrange the steps of a scientific problem in logical order.	
B. Identify the independent variables, dependent variables, and control in an experimental set-up.	
C. Use mathematics to show relationships within a given set of observations.	
D. Identify a hypothesis for a given problem.	**1:10** Solve problems about electrical loads. **2:3** Solve problems about electrical wiring.

	2:8 Solve problems about reading test instruments. **2:10** Solve problems about using ohmmeters. **2:14** Complete statements about checking a hermetic motor with an ohmmeter. **3:9** Solve problems about Watt's Law. **4:6** Solve problems about pictorial wiring diagrams. **4:7** Solve problems about schematic wiring diagrams. **6:7** Solve problems about control relays and contactors. **8:4** Identify and solve problems about basic DC motor operation. **11:4** Solve problems about capacitor construction and operation. **11:8** Calculate ratings of grouped capacitors.

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Electrical Components & Systems: Science

CIMC Developed/
Recommended Curriculum: Electrical Components & Systems

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area IV.
Interpreting

Content Skill Knowledge	Matching Curriculum Objectives
A. Select appropriate predictions based on previously observed patterns of evidence.	
B. Report data in an appropriate manner.	
C. Predict data points not included on a given graph.	
D. Interpret line, bar, and circle graphs.	
E. Identify data that support or reject stated hypothesis.	
F. Accept or reject hypothesis when given results of an investigation.	

G. Identify discrepancies between stated hypothesis and actual results.	
H. Select the most logical conclusion for given experimental data.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Electrical Components & Systems: Science

CIMC Developed/
Recommended Curriculum: Electrical Components & Systems

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area V.
Communicating

Content Skill Knowledge	Matching Curriculum Objectives
A. Prepare a written report describing the sequence, results, and interpretation of an investigation or event.	
B. Communicate and defend a scientific argument.	
C. Identify or create an appropriate graph or chart from collected data, table, or written description.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Electrical Components & Systems: Science

CIMC Developed/
Recommended Curriculum: Electrical Components & Systems

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area VI.
Modeling

Content Skill Knowledge	Matching Curriculum Objectives
A. Select a model, which explains a given set of observations.	
B. Select predictions based on models.	
C. Compare a given model to the real world.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Electrical Components & Systems: Science

CIMC Developed/
Recommended Curriculum: Electrical Components & Systems

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area VII.
Safety in the Science Classroom

Content Skill Knowledge	Matching Curriculum Objectives
A. Recognize potential hazards within a science activity.	
B. Practice safety procedures in all science activities.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Electrical Components & Systems: Science

CIMC Developed/
Recommended Curriculum: Electrical Components & Systems

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area VIII.
Inquiry

Content Skill Knowledge	Matching Curriculum Objectives
A. Formulate a testable hypothesis and design an appropriate experiment relating to the world.	
B. Design and conduct scientific investigations in which variables are identified and controlled.	
C. Use a variety of technologies, such as hand tools, measuring instruments, and computers to collect, analyze, and display data.	**2:24** Use digital and analog voltmeters to check power sources. **2:25** Use an ohmmeter to check continuity of fuses. **2:26** Use an ohmmeter to determine the resistance of resistors.

	2:27 Use an ohmmeter to identify terminals and electrical condition of a hermetic compressor. **2:28** Use an ammeter to read start and run amperage of a motor. **3:13** Read an electric watt-our meter. **3:14** Use a wattmeter and an ammeter to determine watts. **6:17** Check current relays with an ohmmeter. **6:18** Check potential relays with an ohmmeter. **6:19** Check current relays with an ammeter and a voltmeter. **6:20** Check a potential relay with an ammeter and a voltmeter. **7:4** Solve problems about electrical contacts.

D. Inquiries should lead to the formation of explanations or models (physical, conceptual, and mathematical). In answering questions, students should engage in discussions (based on scientific knowledge, the use of logic, and evidence from the investigations) and arguments that encourage the revision of their explanations, leading to further inquiry.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Electrical Components & Systems: Science

CIMC Developed/
Recommended Curriculum: Electrical Components & Systems

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area IX.
Motions and Forces

Content Skill Knowledge	Matching Curriculum Objectives
A. Objects change their motion only when a net force is applied. Laws of motion are used to calculate precisely the effects of forces on the motion of objects.	
B. Gravitation is a universal force that each mass exerts on any other mass. The strength of the gravitational attractive force between two masses is proportional to the masses and inversely proportional to the square of the distance between them.	

C. The electric force is a universal force that exists between any two charged objects. The strength of the force is proportional to the charges and, as with gravitation, inversely proportional to the square of the distance between them.	
D. Electricity and magnetism are two aspects of a single electromagnetic force.	**1:3** Identify sources of electricity and their characteristics. **1:4** Select true statements about the electron theory. **1:5** Complete statements about the importance of electrical charges. **1:6** Complete statements about how current is caused to flow in a circuit. **1:7** Complete statements about insulators, semiconductors, and conductors. **1:8** Select true statements about direct current. **1:9** Complete statements about alternating current. **1:10** Solve problems about electrical loads.

	1:11 Sketch a basic electrical circuit. **1:12** Identify basic electrical symbols. **1:13** Identify the three types of circuits. **1:14** Select true statements about circuit grounding. **1:15** Complete statements about electrical measurements.

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Electrical Components & Systems: Science

CIMC Developed/
Recommended Curriculum: Electrical Components & Systems

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area X.
Conservation of Energy

Content Skill Knowledge	Matching Curriculum Objectives
A. The total energy of the universe is constant. Energy can be transferred but never destroyed.	
B. All energy can be considered to be kinetic energy, potential energy, or energy contained by a field.	
C. Heat consists of random motion and the vibrations of atoms, molecules, and ions. The higher the temperature, the greater the atomic or molecular motion.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Electrical Components & Systems: Science

CIMC Developed/
Recommended Curriculum: Electrical Components & Systems

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area XI.
Interactions of Energy and Matter

Content Skill Knowledge	Matching Curriculum Objectives
A. Waves have energy and can transfer energy when they interact with matter.	
B. Electromagnetic waves result when a charged object is accelerated or decelerated.	

AIR CONDITIONING & REFRIGERATION
Domestic Refrigeration

SCIENCE

PHYSICS

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Domestic Refrigeration: Science

CIMC Developed/
Recommended Curriculum: Domestic Refrigeration

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area I.
Observing and Measuring

Content Skill Knowledge	Matching Curriculum Objectives
A. Identify similar or different characteristics in a given set of objects, organisms, or events.	
B. Select qualitative (descriptive) or quantitative (numerical) observations in a given set of objects, organisms, or events.	
C. Identify qualitative (descriptive) or quantitative (numerical) observations in a given set of objects, organisms, or events.	
D. Use the appropriate Systems International (SI) units (grams, meters, liters, and degrees Celsius) to measure objects, organisms, or events.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Domestic Refrigeration: Science

CIMC Developed/
Recommended Curriculum: Domestic Refrigeration

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area II.
Classifying

Content Skill Knowledge	Matching Curriculum Objectives
A. Use observable properties to classify a set of objects, organisms, or events.	
B. Identify the properties on which a given classification system is based.	
C. Place an object, organism or event into a classification system.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Domestic Refrigeration: Science

CIMC Developed/
Recommended Curriculum: Domestic Refrigeration

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area III.
Experimenting

Content Skill Knowledge	Matching Curriculum Objectives
A. Arrange the steps of a scientific problem in logical order.	
B. Identify the independent variables, dependent variables, and control in an experimental set-up.	
C. Use mathematics to show relationships within a given set of observations.	
D. Identify a hypothesis for a given problem.	**1:8** Complete statements about troubleshooting common problems. **2:10** Solve problems about equipment and procedures for checking system temperatures.

	3:8 Solve problems about controlling frost and ice accumulation. **4:8** Solve problems about servicing electrical components. **4:10** Solve problems about servicing refrigeration components. **4:13** Solve problems about servicing capillary tubes. **4:21** Troubleshoot selected problems with a refrigerator or freezer. **6:8** Solve problems about electrical requirements for window air conditioner installation. **6:13** Solve problems about determining actual causes of problems. **6:14** Solve problems about servicing electrical components. **6:16** Solve problems about servicing refrigeration components. **6:18** Solve problems about servicing capillary tubes.

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Domestic Refrigeration: Science

CIMC Developed/
Recommended Curriculum: Domestic Refrigeration

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area IV.
Interpreting

Content Skill Knowledge	Matching Curriculum Objectives
A. Select appropriate predictions based on previously observed patterns of evidence.	
B. Report data in an appropriate manner.	
C. Predict data points not included on a given graph.	
D. Interpret line, bar, and circle graphs.	
E. Identify data that support or reject stated hypothesis.	
F. Accept or reject hypothesis when given results of an investigation.	

G. Identify discrepancies between stated hypothesis and actual results.	
H. Select the most logical conclusion for given experimental data.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Domestic Refrigeration: Science

CIMC Developed/
Recommended Curriculum: Domestic Refrigeration

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area V.
Communicating

Content Skill Knowledge	Matching Curriculum Objectives
A. Prepare a written report describing the sequence, results, and interpretation of an investigation or event.	
B. Communicate and defend a scientific argument.	
C. Identify or create an appropriate graph or chart from collected data, table, or written description.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Domestic Refrigeration: Science

CIMC Developed/
Recommended Curriculum: Domestic Refrigeration

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area VI.
Modeling

Content Skill Knowledge	Matching Curriculum Objectives
A. Select a model, which explains a given set of observations.	
B. Select predictions based on models.	
C. Compare a given model to the real world.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Domestic Refrigeration: Science

CIMC Developed/
Recommended Curriculum: Domestic Refrigeration

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area VII.
Safety in the Science Classroom

Content Skill Knowledge	Matching Curriculum Objectives
A. Recognize potential hazards within a science activity.	
B. Practice safety procedures in all science activities.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Domestic Refrigeration: Science

CIMC Developed/
Recommended Curriculum: Domestic Refrigeration

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area VIII.
Inquiry

Content Skill Knowledge	Matching Curriculum Objectives
A. Formulate a testable hypothesis and design an appropriate experiment relating to the world.	
B. Design and conduct scientific investigations in which variables are identified and controlled.	
C. Use a variety of technologies, such as hand tools, measuring instruments, and computers to collect, analyze, and display data.	

D. Inquiries should lead to the formation of explanations or models (physical, conceptual, and mathematical). In answering questions, students should engage in discussions (based on scientific knowledge, the use of logic, and evidence from the investigations) and arguments that encourage the revision of their explanations, leading to further inquiry.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Domestic Refrigeration: Science

CIMC Developed/
Recommended Curriculum: Domestic Refrigeration

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area IX.
Motions and Forces

Content Skill Knowledge	Matching Curriculum Objectives
A. Objects change their motion only when a net force is applied. Laws of motion are used to calculate precisely the effects of forces on the motion of objects.	
B. Gravitation is a universal force that each mass exerts on any other mass. The strength of the gravitational attractive force between two masses is proportional to the masses and inversely proportional to the square of the distance between them.	

C. The electric force is a universal force that exists between any two charged objects. The strength of the force is proportional to the charges and, as with gravitation, inversely proportional to the square of the distance between them.	
D. Electricity and magnetism are two aspects of a single electromagnetic force.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Domestic Refrigeration: Science

CIMC Developed/
Recommended Curriculum: Domestic Refrigeration

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area X.
Conservation of Energy

Content Skill Knowledge	Matching Curriculum Objectives
A. The total energy of the universe is constant. Energy can be transferred but never destroyed.	
B. All energy can be considered to be kinetic energy, potential energy, or energy contained by a field.	
C. Heat consists of random motion and the vibrations of atoms, molecules, and ions. The higher the temperature, the greater the atomic or molecular motion.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Domestic Refrigeration: Science

CIMC Developed/
Recommended Curriculum: Domestic Refrigeration

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area XI.
Interactions of Energy and Matter

Content Skill Knowledge	Matching Curriculum Objectives
A. Waves have energy and can transfer energy when they interact with matter.	
B. Electromagnetic waves result when a charged object is accelerated or decelerated.	

AIR CONDITIONING & REFRIGERATION Residential & Light Commercial HVAC

MATH

ALGEBRA

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Residential & Light Commercial HVAC: Math

CIMC Developed/
Recommended Curriculum: Residential & Light Commercial HVAC

PASS Skills
Core Curriculum Area: Math

PASS Skills Sub-Core: Algebra I

PASS Content Standard Area I.
Number Sense/Algebraic Operations

Content Skill Knowledge	Matching Curriculum Objectives
A. Translate word phrases and sentences into expressions and equations and vice versa.	**3:4** Select true statements about steps in calculating heat transfer multipliers. **3:8** Calculate heat loss and heat gain for a residence using “entire house” for a quick calculation. **3:10** Calculate heat loss for a residence, room by room. **3:11** Calculate heat gain for a residence, room by room.

	6:8 Select true statements about U values. **6:9** Complete statements about equivalent temperature difference. **6:10** Calculate the heat gain for an office. **6:11** Calculate the heat loss for an office. **7:17** Determine velocity and volume of air flowing in a duct. **9:1** Student Supplement 1—Furnace categories. **10:2** Student Supplement 2—How to calculate CFM using the temperature rise method. **12:13** Use formulas for sizing electrical heating systems. **12:14** Install, start, and check an electrical heating unit. **15:3** Determine the COP of a heat pump at a given design temperature.

B. Apply the laws of exponents to perform operations on expressions with integral exponents.	
C. Simplify and evaluate expressions	
D. Add, subtract, and multiply polynomials.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Residential & Light Commercial HVAC: Math

CIMC Developed/
Recommended Curriculum: Residential & Light Commercial HVAC

PASS Skills
Core Curriculum Area: Math

PASS Skills Sub-Core: Algebra I

PASS Content Standard Area II.
Functions and Relations

Content Skill Knowledge	Matching Curriculum Objectives
A. Define and distinguish between relations and functions, dependent and independent variables, and domain and range using function notation.	
B. Recognize the parent graph of the functions y=k, y=x, y=|x|, and predict the effects of transformations on the parent graph (e.g., y=|x| + 2, change slope, change intercepts, change slope and intercept).	
C. Evaluate a function using tables, verbal rules, equations, or graphs.	
D. Find the slope of a line.	

E. Write the equation of and graph linear relationships.	
F. Use slope to determine if lines are parallel, perpendicular, horizontal, or vertical.	
G. Collect and graph real data.	**2:10** Plot a load triangle on a psychrometric chart when return and supply air dry-bulb and wet-bulb temperatures are known.
H. Describe rates of constant change experienced within the context of everyday life as the slope of a linear relation (e.g., cost of hamburger meat based on weight, cost of gas based on cost per gallon, telephone charges based on base rate plus rate per minute).	
I. Solve linear equations by graphing or using properties of equality.	**2:6** Select true statements about the load triangle. **2:10** Plot a load triangle on a psychrometric chart when return and supply air dry-bulb and wet-bulb temperatures are known. **15:7** Plot a heat pump performance curve from manufacturer's specifications. **15:8** Plot balance point #1 from given design conditions.

	15:9 Plot additional balance points from given design conditions. **15:13** Size a heat pump on the cooling load. **15:14** Plot balance points for a heat pump at given design conditions.
J. Solve linear inequalities by graphing or using properties of inequalities.	
K. Match appropriate equations or inequalities (1 or 2 variables) to a graph, table, or situation and vice versa.	
L. Solve a system of linear equations.	
M. Solve routine two-step and three-step problems using concepts such as rate, distance, ratio, and proportion, average and percent.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Residential & Light Commercial HVAC: Math

CIMC Developed/
Recommended Curriculum: Residential & Light Commercial HVAC

PASS Skills
Core Curriculum Area: Math

PASS Skills Sub-Core: Algebra I

PASS Content Standard Area III.
Geometry/Measurement

Content Skill Knowledge	Matching Curriculum Objectives
A. Use the formulas from geometry (perimeter, circumference, area and volume), science, and statistics, to solve problems within an algebraic context.	**3:4** Select true statements about steps in calculating heat transfer multipliers. **3:8** Calculate heat loss and heat gain for a residence using “entire house” for a quick calculation. **3:10** Calculate heat loss for a residence, room by room. **3:11** Calculate heat gain for a residence, room by room.

	4:18 Determine the pressure drop across an evaporator coil. **4:19** Determine the CMF being delivered by a selected forced air system. **7:17** Determine velocity and volume of air flowing in a duct.
B. Apply units of measure to interpret results (e.g., miles per gallon, cost per unit).	**3:4** Select true statements about steps in calculating heat transfer multipliers. **3:8** Calculate heat loss and heat gain for a residence using “entire house” for a quick calculation. **3:10** Calculate heat loss for a residence, room by room. **3:11** Calculate heat gain for a residence, room by room. **4:18** Determine the pressure drop across an evaporator coil. **4:19** Determine the CMF being delivered by a selected forced air system. **7:17** Determine velocity and volume of air flowing in a duct.

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Residential & Light Commercial HVAC: Math

CIMC Developed/
Recommended Curriculum: Residential & Light Commercial HVAC

PASS Skills
Core Curriculum Area: Math

PASS Skills Sub-Core: Algebra I

PASS Content Standard Area IV.
Data Analysis, Statistics, and Probability

Content Skill Knowledge	Matching Curriculum Objectives
A. Translate from one representation of data to another and understand the data can be represented using a variety of tables, graphs, and symbols and that different modes of representation often convey different messages.	**1:3** Complete a psychrometric chart showing the location of dry-bulb temperature readings. **1:4** Complete a psychrometric chart showing the location of wet-bulb temperature readings. **1:5** Complete a psychrometric chart showing the location of dew point temperature readings. **1:6** Complete a psychrometric chart showing the location of relative humidity readings.

	1:7 Complete statements about three basic cumulative psychrometric processes. **1:11** Determine relative humidity when only dry-bulb and wet-bulb temperatures are known. **1:12** Determine de point when only dry-bulb and wet-bulb temperatures are known. **1:13** Determine how outside air should be conditioned to provide a comfortable humidity and temperature combination in winter heating. **1:14** Determine how outside air should be conditioned to provide a comfortable humidity and temperature combination in summer cooling. **1:15** Determine the relative humidity of a conditioned space. **1:16** Determine the relative humidity of an outdoor space. **1:17** Determine the wet-bulb temperature of the air inside a duct.

	2:4 Complete statements about enthalpy. **2:5** Complete statements about specific volume. **2:6** Select true statements about the load triangle. **2:7** Determine relative humidity when dry-bulb and wet-bulb temperatures are known. **2:8** Determine dew point and enthalpy when dry-bulb and wet-bulb temperatures are known. **2:9** Determine the condition of air presented to an evaporator coil when outside air for ventilation is mixed with room return air. **2:10** Plot a load triangle on a psychrometric chart when return and supply air dry-bulb/wet-bulb temperatures are known. **4:14** Solve problems using the friction chart for sheet metal duct. **4:15** Solve problems using the friction chart for flex duct.

	5:6 Complete a chart showing features of common types of residential filtering equipment. **9:40** Size a gas piping system.
B. Collect data involving two variables and display on a scatter plot; interpret results using a linear model/equation and identify whether the model/equation is a line of best fit for the data (e.g., given a scatter plot and several linear equations, which one is the best fit?).	
C. Formulate and answer questions based on data shown on graphs, tables, charts; make valid inferences, predictions, and arguments.	**1:3** Complete a psychrometric chart showing the location of dry-bulb temperature readings. **1:4** Complete a psychrometric chart showing the location of wet-bulb temperature readings. **1:5** Complete a psychrometric chart showing the location of dew point temperature readings. **1:6** Complete a psychrometric chart showing the location of relative humidity readings.

	1:7 Complete statements about three basic cumulative psychrometric processes. **1:11** Determine relative humidity when only dry-bulb and wet-bulb temperatures are known. **1:12** Determine de point when only dry-bulb and wet-bulb temperatures are known. **1:13** Determine how outside air should be conditioned to provide a comfortable humidity and temperature combination in winter heating. **1:14** Determine how outside air should be conditioned to provide a comfortable humidity and temperature combination in summer cooling. **1:15** Determine the relative humidity of a conditioned space. **1:16** Determine the relative humidity of an outdoor space. **1:17** Determine the wet-bulb temperature of the air inside a duct.

	2:4 Complete statements about enthalpy. **2:5** Complete statements about specific volume. **2:6** Select true statements about the load triangle. **2:7** Determine relative humidity when dry-bulb and wet-bulb temperatures are known. **2:8** Determine dew point and enthalpy when dry-bulb and wet-bulb temperatures are known. **2:9** Determine the condition of air presented to an evaporator coil when outside air for ventilation is mixed with room return air. **2:10** Plot a load triangle on a psychrometric chart when return and supply air dry-bulb/wet-bulb temperatures are known. **4:14** Solve problems using the friction chart for sheet metal duct. **4:15** Solve problems using the friction chart for flex duct.

	5:6 Complete a chart showing features of common types of residential filtering equipment. **9:40** Size a gas piping system. **16:29** Make a trial selection of a pump and select pipe size for series loop system.
D. Solve problems involving the probability of an event and its complement.	

AIR CONDITIONING & REFRIGERATION Residential & Light Commercial HVAC

SCIENCE

PHYSICS

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Residential & Light Commercial HVAC: Science

CIMC Developed/
Recommended Curriculum: Residential & Light Commercial HVAC

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area I.
Observing and Measuring

Content Skill Knowledge	Matching Curriculum Objectives
A. Identify similar or different characteristics in a given set of objects, organisms, or events.	
B. Select qualitative (descriptive) or quantitative (numerical) observations in a given set of objects, organisms, or events.	
C. Identify qualitative (descriptive) or quantitative (numerical) observations in a given set of objects, organisms, or events.	
D. Use the appropriate Systems International (SI) units (grams, meters, liters, and degrees Celsius) to measure objects, organisms, or events.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Residential & Light Commercial HVAC: Science

CIMC Developed/
Recommended Curriculum: Residential & Light Commercial HVAC

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area II.
Classifying

Content Skill Knowledge	Matching Curriculum Objectives
A. Use observable properties to classify a set of objects, organisms, or events.	
B. Identify the properties on which a given classification system is based.	
C. Place an object, organism or event into a classification system.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Residential & Light Commercial HVAC: Science

CIMC Developed/
Recommended Curriculum: Residential & Light Commercial HVAC

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area III.
Experimenting

Content Skill Knowledge	Matching Curriculum Objectives
A. Arrange the steps of a scientific problem in logical order.	
B. Identify the independent variables, dependent variables, and control in an experimental set-up.	
C. Use mathematics to show relationships within a given set of observations.	
D. Identify a hypothesis for a given problem.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Residential & Light Commercial HVAC: Science

CIMC Developed/
Recommended Curriculum: Residential & Light Commercial HVAC

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area IV.
Interpreting

Content Skill Knowledge	Matching Curriculum Objectives
A. Select appropriate predictions based on previously observed patterns of evidence.	
B. Report data in an appropriate manner.	
C. Predict data points not included on a given graph.	**1:3** Complete a psychometric chart showing the location of dry-bulb temperature readings. **1:4** Complete a psychometric chart showing the location of wet-bulb temperature readings.

	1:5 Complete a psychometric chart showing the location of dew point temperature readings. **1:6** Complete a psychometric chart showing the location of relative humidity readings. **1:13** Determine how outside air should be conditioned to provide a comfortable humidity and temperature combination in winter heating. **1:14** Determine how outside air should be conditioned to provide a comfortable humidity and temperature combination in summer cooling. **1:15** Determine the relative humidity of a conditioned space. **1:16** Determine the relative humidity of a outdoor space. **1:17** Determine the wet-bulb temperature of the air inside a duct. **2:7** Determine relative humidity when dry-bulb and wet-bulb temperatures are known.

	2:8 Determine dew point and enthalpy when dry-bulb and wet-bulb temperatures are known. **2:9** Determine the condition of air presented to an evaporator coil when outside air for ventilation is mixed with room return air. **2:10** Plot a load triangle on a psychrometric chart when return and supply air dry-bulb/wet-bulb temperatures are known. **15:7** Plot a heat pump performance curve from manufacturer's specifications. **15:8** Plot balance point #1 from given design conditions. **15:9** Plot additional balance points from given design conditions. **15:14** Plot balance points for a heat pump at given design conditions.
D. Interpret line, bar, and circle graphs.	
E. Identify data that support or reject stated hypothesis.	
F. Accept or reject hypothesis when given results of an investigation.	

G. Identify discrepancies between stated hypothesis and actual results.	
H. Select the most logical conclusion for given experimental data.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Residential & Light Commercial HVAC: Science

CIMC Developed/
Recommended Curriculum: Residential & Light Commercial HVAC

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area V.
Communicating

Content Skill Knowledge	Matching Curriculum Objectives
A. Prepare a written report describing the sequence, results, and interpretation of an investigation or event.	
B. Communicate and defend a scientific argument.	
C. Identify or create an appropriate graph or chart from collected data, table, or written description.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Residential & Light Commercial HVAC: Science

CIMC Developed/
Recommended Curriculum: Residential & Light Commercial HVAC

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area VI.
Modeling

Content Skill Knowledge	Matching Curriculum Objectives
A. Select a model, which explains a given set of observations.	
B. Select predictions based on models.	
C. Compare a given model to the real world.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Residential & Light Commercial HVAC: Science

CIMC Developed/
Recommended Curriculum: Residential & Light Commercial HVAC

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area VII.
Safety in the Science Classroom

Content Skill Knowledge	Matching Curriculum Objectives
A. Recognize potential hazards within a science activity.	
B. Practice safety procedures in all science activities.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Residential & Light Commercial HVAC: Science

CIMC Developed/
Recommended Curriculum: Residential & Light Commercial HVAC

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area VIII.
Inquiry

Content Skill Knowledge	Matching Curriculum Objectives
A. Formulate a testable hypothesis and design an appropriate experiment relating to the world.	
B. Design and conduct scientific investigations in which variables are identified and controlled.	
C. Use a variety of technologies, such as hand tools, measuring instruments, and computers to collect, analyze, and display data.	**1:10** Solve problems about operating a sling psychrometer. **1:11** Determine relative humidity when only dry-bulb and wet-bulb temperatures are known.

	1:12 Determine dew point when only dry-bulb and wet-bulb temperatures are known. **9:45** Troubleshoot a gas furnace on a “no heat” complaint. **10:10** Troubleshoot an induced draft furnace on a “no heat” complaint. **10:11** Troubleshoot a condensing furnace on a “no heat” complaint. **12:16** Troubleshoot an electric furnace. **13:19** Trace cooling circuits on single-phase and three-phase cooling systems. **13:20** Troubleshoot an air conditioning condenser section on a “no cooling” complaint. **14:20** Trace circuits for a heat pump in the cooling mode. **14:21** Trace circuits for first-stage heating in a heat pump.

	14:22 Trace circuits for a heat pump in the defrost mode. **14:23** Trace circuits for second-stage supplement heat in a heat pump. **14:24** Trace circuits for a fossil fuel heat pump system in first-stage heat mode above 45-degree F outdoor ambient. **14:25** Trace circuits for a fossil fuel heat pump system in first-stage heat mode above 40-degree F outdoor ambient. **14:32** Troubleshoot supplement heat on a heat pump.
D. Inquiries should lead to the formation of explanations or models (physical, conceptual, and mathematical). In answering questions, students should engage in discussions (based on scientific knowledge, the use of logic, and evidence from the investigations) and arguments that encourage the revision of their explanations, leading to further inquiry.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Residential & Light Commercial HVAC: Science

CIMC Developed/
Recommended Curriculum: Residential & Light Commercial HVAC

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area IX.
Motions and Forces

Content Skill Knowledge	Matching Curriculum Objectives
A. Objects change their motion only when a net force is applied. Laws of motion are used to calculate precisely the effects of forces on the motion of objects.	**4:12** Match outlet placement with recommended velocities.
B. Gravitation is a universal force that each mass exerts on any other mass. The strength of the gravitational attractive force between two masses is proportional to the masses and inversely proportional to the square of the distance between them.	

C. The electric force is a universal force that exists between any two charged objects. The strength of the force is proportional to the charges and, as with gravitation, inversely proportional to the square of the distance between them.	
D. Electricity and magnetism are two aspects of a single electromagnetic force.	**9:21** Describe thermocouple operation.

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Residential & Light Commercial HVAC: Science

CIMC Developed/
Recommended Curriculum: Residential & Light Commercial HVAC

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area X.
Conservation of Energy

Content Skill Knowledge	Matching Curriculum Objectives
A. The total energy of the universe is constant. Energy can be transferred but never destroyed.	
B. All energy can be considered to be kinetic energy, potential energy, or energy contained by a field.	
C. Heat consists of random motion and the vibrations of atoms, molecules, and ions. The higher the temperature, the greater the atomic or molecular motion.	

Oklahoma Vocational Curriculum:
Embedded PASS Skills

Air Conditioning & Refrigeration
Residential & Light Commercial HVAC: Science

CIMC Developed/
Recommended Curriculum: Residential & Light Commercial HVAC

PASS Skills
Core Curriculum Area: Science

PASS Skills Sub-Core: Physics

PASS Content Standard Area XI.
Interactions of Energy and Matter

Content Skill Knowledge	Matching Curriculum Objectives
A. Waves have energy and can transfer energy when they interact with matter.	
B. Electromagnetic waves result when a charged object is accelerated or decelerated.	

AIR CONDITIONING & REFRIGERATION

Fundamentals
Electrical Components & Systems
Domestic Refrigeration
Residential & Light Commercial HVAC

SUMMARY

SUMMARY
PASS Skills in this particular analysis of Vocational Curriculum

Curriculum: Air Conditioning & Refrigeration:
--Fundamentals
--Electrical Components & Systems
--Domestic Refrigeration
--Residential & Light Commercial HVAC

PASS: Math—Algebra I

PASS Summary and Strengths

The individual components of the core curriculum for Air Conditioning & Refrigeration (Fundamentals, Electrical Components & Systems, Domestic Refrigeration, and Residential & Light Commercial HVAC) meet minimal to moderate PASS standard requirements. In an effort to meet the majority of PASS standards requirements the core curriculum components were combined.

PASS Standards/Skills Not Addressed

The core curriculum area met a minimal to moderate amount of PASS standard requirements. Of the four PASS content standards four were addressed. Of the twenty-three content skills within the PASS content standards ten were addressed. It is questionable as to whether or not PASS items need to be added to this curriculum to meet all PASS requirements, as it may not be relevant to the course of study.

SUMMARY
PASS Skills in this particular analysis of Vocational Curriculum

Curriculum: Air Conditioning & Refrigeration:
--Fundamentals
--Electrical Components & Systems
--Domestic Refrigeration
--Residential & Light Commercial HVAC

PASS: Science—Physical Science

PASS Summary and Strengths

The individual components of the core curriculum for Air Conditioning & Refrigeration (Fundamentals, Electrical Components & Systems, Domestic Refrigeration, and Residential & Light Commercial HVAC) meet minimal to moderate PASS standard requirements. In an effort to meet the majority of PASS standards requirements the core curriculum components were combined.

The core curriculum area met a minimal amount of PASS standard requirements. Of the fourteen PASS content standards two were addressed. Of the forty-four content skills within the PASS content standards two were addressed. It is questionable as to whether or not PASS items need to be added to this curriculum to meet all PASS requirements, as it may not be relevant to the course of study.

SUMMARY
PASS Skills in this particular analysis of Vocational Curriculum

Curriculum: Air Conditioning & Refrigeration:
--Fundamentals
--Electrical Components & Systems
--Domestic Refrigeration
--Residential & Light Commercial HVAC

PASS: Science—Biology

PASS Summary and Strengths

The individual components of the core curriculum for Air Conditioning & Refrigeration (Fundamentals, Electrical Components & Systems, Domestic Refrigeration, and Residential & Light Commercial HVAC) meet minimal to moderate PASS standard requirements. In an effort to meet the majority of PASS standards requirements the core curriculum components were combined.

PASS Standards/Skills Not Addressed

The core curriculum area met a minimal amount of PASS standard requirements. Of the fourteen PASS content standards one was addressed. Of the forty-seven content skills within the PASS content standards one was addressed. It is questionable as to whether or not PASS items need to be added to this curriculum to meet all PASS requirements, as it may not be relevant to the course of study.

SUMMARY
PASS Skills in this particular analysis of Vocational Curriculum

Curriculum: Air Conditioning & Refrigeration:
--Fundamentals
--Electrical Components & Systems
--Domestic Refrigeration
--Residential & Light Commercial HVAC

PASS: Science—Chemistry

PASS Summary and Strengths

The individual components of the core curriculum for Air Conditioning & Refrigeration (Fundamentals, Electrical Components & Systems, Domestic Refrigeration, and Residential & Light Commercial HVAC) meet minimal to moderate PASS standard requirements. In an effort to meet the majority of PASS standards requirements the core curriculum components were combined.

PASS Standards/Skills Not Addressed

The core curriculum area met a minimal amount of PASS standard requirements. Of the ten PASS content standards one was addressed. Of the thirty-nine content skills within the PASS content standards one was addressed. It is questionable as to whether or not PASS items need to be added to this curriculum to meet all PASS requirements, as it may not be relevant to the course of study.

SUMMARY
PASS Skills in this particular analysis of Vocational Curriculum

Curriculum: Air Conditioning & Refrigeration:
--Fundamentals
--Electrical Components & Systems
--Domestic Refrigeration
--Residential & Light Commercial HVAC

PASS: Science—Physics

PASS Summary and Strengths

The individual components of the core curriculum for Air Conditioning & Refrigeration (Fundamentals, Electrical Components & Systems, Domestic Refrigeration, and Residential & Light Commercial HVAC) meet minimal to moderate PASS standard requirements. In an effort to meet the majority of PASS standards requirements the core curriculum components were combined.

The core curriculum area met the majority of PASS standard requirements. Of the eleven PASS content standards eleven were addressed. Of the forty content skills within the PASS content standards twenty-seven were addressed.

PASS Standards/Skills Not Addressed

NOTE: It is questionable as to whether or not the missing PASS requirements are relevant to the course of study.

AREA III—Experimenting

B. Identify the independent variables, dependent variables, and control in an experimental set-up.

AREA IV—Interpreting

B. Report data in an appropriate manner.

D. Interpret line, bar, and circle graphs.

E. Identify data that support or reject stated hypothesis.

F. Accept or reject hypothesis when given results of an investigation.

AREA V—Communicating

B. Communicate and defend a scientific argument.

C. Identify or create an appropriate graph or chart from collected data, table, or written description.

AREA VIII—Inquiry

B. Design and conduct scientific investigations in which variables are identified and controlled.

AREA IX—Motions and Forces

B. Gravitation is a universal force that each mass exerts on any other mass. The strength of the gravitational attractive force between two masses is proportional to the masses and inversely proportional to the square of the distance between them.

C. The electric force is a universal force that exists between any two charged objects. The strength of the force is proportional to the charges and, as with gravitation, inversely proportional to the square of the distance between them.

AREA X—Conservation of Energy

A. The total energy of the universe is constant. Energy can be transferred but never destroyed.

B. All energy can be considered to be kinetic energy, potential energy, or energy contained by a field.

AREA XI—Interactions of Energy and Matter

B. Electromagnetic waves result when a charged object is accelerated or decelerated.

AIR CONDITIONING & REFRIGERATION

Fundamentals
Electrical Components & Systems
Domestic Refrigeration
Residential & Light Commercial HVAC

ADDENDUM

ADDENDUM

PASS Skills Analysis of Vocational Curriculum
Air Conditioning & Refrigeration

PASS Standards/Skills Not Addressed
Date of Meeting: ____/____/____

Proposal to Meet PASS Requirements

NOTE: retrieve ideas in order to design a supplement sheet that will meet PASS requirements.

Existing Information or Suggestions to Meet Requirements

****Identify if information is existing or suggested****

Science—Physics	Area III—Experimenting
❑ **Existing**	B.
❑ **Suggested**	
	Area IV—Interpreting
❑ **Existing**	B.
❑ **Suggested**	
❑ **Existing**	D.
❑ **Suggested**	

❑ **Existing**	E.
❑ **Suggested**	
❑ **Existing**	F.
❑ **Suggested**	
	Area V—Communicating
❑ **Existing**	B.
❑ **Suggested**	
❑ **Existing**	C.
❑ **Suggested**	
	Area VIII—Inquiry
❑ **Existing**	B.
❑ **Suggested**	
	Area IX—Motions and Forces
❑ **Existing**	B.
❑ **Suggested**	
❑ **Existing**	C.
❑ **Suggested**	
	Area X—Conservation of Energy
❑ **Existing**	A.
❑ **Suggested**	
❑ **Existing**	B.
❑ **Suggested**	
	Area XI—Interactions of Energy and Matter
❑ **Existing**	B.
❑ **Suggested**	

NOTE: supplement information to meet PASS requirements using assignment sheets, job sheets, etc.

AIR CONDITIONING & REFRIGERATION

Fundamentals
Electrical Components & Systems
Domestic Refrigeration
Residential & Light Commercial HVAC

SUPPLEMENT SAMPLE

ASSIGNMENT SHEET	*AIR CONDITIONING & REFRIGERATION*	**PASS-1**

Name _____Score_____

OBJECTIVE

Communicate data graphically.

BASIC SKILLS

Reading | Writing | Mathematics | Science | Critical Thinking | Social Studies | Technology

PASS Information

Core: Science
Sub-Core: Physics
Area V — Communicating
C — Identify or create an appropriate graph or chart from collected data, table, or written description

INTRODUCTION

One of the reasons the EPA has introduced strict regulations regarding the emission of refrigerant into the Earth's atmosphere is that they contribute to the dangers of *global warming.*

Two of the dangers usually associated with global warming are:

- Increase in outbreaks of infectious diseases, especially diseases carried and transmitted to humans by mosquitoes and rodents
- More frequent and more violent storms

You are going to research these two items, gather data, present your data graphically, and report on your findings.

INSTRUCTIONS

1. Many experts believe that the number of outbreaks of infectious diseases carried or transmitted by mosquitoes and rodents are on the increase as the Earth's temperature rises. As climate warms, these creatures tend to enter newly "warmed" areas and carry with them dangerous tropical diseases previously not found locally.

   A. Research each of these diseases. Learn what each disease's symptoms are and how it is spread.

      - Malaria
      - Dengue fever

- Hantavirus
- Encephalitis

B. Next, research the number of outbreaks, illnesses, or deaths for each of these diseases in the United States since 1990. Include the Internet as one of your sources of information.

C. Create at least 2 charts or graphs presenting your data. If possible, use computer software to produce your charts/graphs.

D. Write a short report to accompany your graphs/charts. Your reports should tell:

- Where you got your data
- How you produced your charts/graphs
- What your conclusions are about global warming, based on the data you have collected

2. Some experts believe another dangerous result of global warming, produced by refrigerants and other contaminants released into the atmosphere, is an increase in the number and violence of storms and weather systems.

A. Research the number, strength, deaths/injuries, and damage tolls from hurricanes, tornadoes, floods, and other weather phenomena since 1985 in the U.S., Mexico, South America, and the Carribean.

B. Work with the team or partner assigned to you by your instructor. Your team should prepare a presentation for class to explain the findings of your research. If possible, make your presentation with PowerPoint® or similar presentation software on the computer.

Be sure your team presentation:

- Tells where you obtained your data
- Contains at least 2 graphs/charts presenting your data
- Explains your conclusions regarding global warming, based on your data