

MAJOR APPLIANCE TECHNOLOGY BLUEPRINT

This Blueprint contains the subject matter content of this Skill Connect Assessment. This Blueprint does **NOT** contain the information one would need to fully prepare for a SkillsUSA Championships contest. Please refer to the *SkillsUSA Championships Technical Standards* CD-ROM for the current year or purchase and download the relevant "Contest Singles." Both are available through www.skillsusa.org > Shop > Educational Materials Catalog.

Standards and Competencies

Diagnose and repair common failures on various types of domestic top-load and front-load washing machines according to the manufacturer's specifications

- Use diagnostic tools, equipment and technical literature
 - Display knowledge of a volt/ohm meter
 - Display knowledge of an amperage meter
 - Demonstrate correct use of basic hand tools
 - Demonstrate correct use of specialty tools
 - Read wiring schematic/diagrams and tech sheets
- Understand and operate electrical/mechanical components
 - Repair problems associated with systems: hoses, diverters, check valves, pumps, valves and seals
 - Repair problems associated with motors: single speed, multiple speed and multi-phase
 - Demonstrate knowledge of switches: all types
 - Demonstrate knowledge of mechanical timer controls
 - Demonstrate knowledge of electronic controls
 - Demonstrate knowledge of customer user interfaces
 - Demonstrate knowledge of drive systems: belts, transmissions, agitators, clutches, brakes, pulleys and multi-phase drive motors
 - Demonstrate knowledge of water heating systems: thermistors, heaters, relays
 - Demonstrate knowledge of mechanical systems: leveling legs, suspension systems, cabinet/base structure, door lock systems
 - Demonstrate knowledge of other electrical components: alternating current line filters, capacitors, relays, solenoids, transformers, fuses, light bulbs of all types

Diagnose and repair common failures on various types of domestic electric and gas dryers per manufacturer's specifications

- Use diagnostic tools, equipment and technical literature
 - Display knowledge of a volt/ohm meter
 - Display knowledge of an amperage meter
 - Demonstrate correct use of basic hand tools
 - Demonstrate correct use of specialty tools
 - Read wiring schematic/diagrams and tech sheets
- Possess the ability to service components related to domestic electrical and gas dryers
 - Demonstrate knowledge to service and repair heating systems: heating elements, operating thermostats, hi-limit thermostats, thermistors, thermal fuses and motor centrifugal switches
 - Demonstrate knowledge to service and repair gas heating systems: safety valves, igniters, flame sensors, operating thermostats, hi-limit thermostats, thermistors, thermal fuses and motor centrifugal switch, gas valves, gas tubing and orifices
 - Demonstrate knowledge to service and repair switches: all types
 - Demonstrate knowledge to service and repair mechanical timer controls
 - Demonstrate knowledge to service and repair electronic controls

- Perform customer user interfaces
- Demonstrate knowledge to service and repair drive system: belts, idler pulleys and motors of all types
- Demonstrate knowledge to service and repair drying systems: time dry, auto dry, sensor control dry and electronic control dry
- Demonstrate knowledge to service and repair mechanical systems: leveling legs, drum rollers, drum support bearings, blower wheel, drum glides, drum/door seals, door springs, door latches, lint filter and cabinet/base structure
- Demonstrate knowledge to service and repair other electrical components: relays, solenoids, transformers, fuses, light bulbs of all types

Diagnose and repair common failures on various types of domestic refrigerators per manufacturer's specifications

- Use diagnostic tools, equipment and technical literature
 - Display knowledge of a volt/ohm meter
 - Display knowledge of an amperage meter
 - Demonstrate correct use of basic hand tools
 - Demonstrate correct use of basic specialty tools
 - Read wiring schematic/diagrams and tech sheets
- Possess an understanding of the operation of mechanical/electrical components
 - Demonstrate knowledge of water systems: hoses, water valves, storage tank and filters
 - Demonstrate knowledge of motors and compressors: single speed, multiple speed and multi-phase
 - Demonstrate knowledge of switches: all types
 - Demonstrate knowledge of defrost systems: mechanical defrost timers, electronic controls, heaters, thermostat and thermistors
 - Demonstrate knowledge of electronic controls
 - Use customer user interfaces
 - Demonstrate knowledge of icemaker system; module, thermostat, thermistor, cube mould/tray and heater
 - Demonstrate knowledge of water dispenser systems; auger motor, crusher mechanism, ice bucket components, dispenser door mechanism, condensation heaters and ice-level sensing devices
 - Demonstrate knowledge of mechanical systems: leveling legs/rollers, door operation/alignment, door gasket replacement, freezer/fresh food compartment controls and air circulation fundamentals
 - Demonstrate knowledge of other electrical components: alternating current line filters, capacitors, relays, solenoids, fuses and light bulbs of all types
 - Demonstrate knowledge of basic refrigeration theory, identify/diagnose leaks and restrictions in condenser/post loop tubing/evaporator/heat exchanger/drier filter, compressor operation and diagnostics

Diagnose and repair common failures on various types of domestic electric and gas ranges per manufacturer's specifications

- Use diagnostic tools, equipment and technical literature
 - Display knowledge of a volt/ohm meter
 - Display knowledge of an amperage meter
 - Demonstrate correct use of basic hand tools
 - Demonstrate correct use of basic specialty tools
 - Read wiring schematic/diagrams and tech sheets
- Possess a knowledge of cooking systems: surface cooking, standard/convection bake and broil
 - Demonstrate knowledge of gas fundamentals and theory
 - Demonstrate knowledge of electric cooking systems: heating elements, thermostats, hi limit thermostats, thermistors, thermal fuses, burner and selector switches

- Demonstrate knowledge of gas cooking systems: safety valve, spark igniter, igniter spuds, operating thermostats, hi limit thermostats, thermistors, thermal fuses, selector switches, gas valves, gas tubing, orifices and gas conversion
- Demonstrate knowledge of switches: all types
- Demonstrate knowledge of mechanical controls
- Demonstrate knowledge of electronic controls
- Demonstrate knowledge of customer user interfaces
- Demonstrate knowledge of self-clean system
- Demonstrate knowledge of motors: fan, servo/actuator
- Demonstrate knowledge of mechanical systems: leveling legs, door locks, door structure and seals, door springs/hinges, cabinet/base structure
- Demonstrate knowledge of other electrical components: relays, solenoids, transformers, fuses and light bulbs of all types

Diagnose and repair common failures on various types of domestic microwaves per manufacturer's specifications

- 5.1 Use diagnostic tools, equipment and technical literature
 - Display knowledge of a volt/ohmmeter
 - Display knowledge of an amperage meter
 - Demonstrate correct use of basic hand tools
 - Demonstrate correct use of specialty tools
 - Read wiring schematic/diagrams and tech sheets
 - Possess knowledge of microwave operations
 - Demonstrate knowledge of microwave cooking theory
 - Demonstrate knowledge of motors: fan, servo/actuator
 - Demonstrate knowledge of switches: all types
 - Demonstrate knowledge of mechanical controls
 - Demonstrate knowledge of electronic controls
 - Demonstrate knowledge of customer user interfaces
 - Demonstrate knowledge of door lock mechanisms
 - Demonstrate knowledge of high-voltage heating system: magnetron, transformer, capacitor and diode
 - Demonstrate knowledge of convection components
 - Demonstrate knowledge of mechanical systems: door structure and seals, door springs/hinges, wave guide and cabinet/base structure
 - Demonstrate knowledge of other electrical components: alternating current line filters, capacitors, relays, solenoids, transformers, fuses, light bulbs of all types

Diagnose and repair common failures on various types of domestic dishwashers per manufacturer's specifications

- Use diagnostic tools, equipment and technical literature
- Display knowledge of a volt/ohmmeter
- Display knowledge of an amperage meter
- Demonstrate correct use of basic hand tools
- Demonstrate correct use of basic specialty tools
- Read wiring schematic/diagrams and tech sheets
- Possess a knowledge of dishwasher operations
- Demonstrate knowledge of water circulation system: hoses, diverters, check valves, pumps, valves and seals
- Demonstrate knowledge of motors: single speed, multiple speed and multi-phase
- Demonstrate knowledge of switches: all types
- Demonstrate knowledge of mechanical timer controls
- Demonstrate knowledge of electronic controls
- Demonstrate knowledge of customer user interfaces

- Demonstrate knowledge of water heating and drying system: thermistors, heaters and relays
- Demonstrate knowledge of mechanical systems: leveling legs, cabinet/base structure, door lock mechanism, door structure and door/tub gasket
- Demonstrate knowledge of other electrical components: alternating current line filters, capacitors, relays, solenoids, transformers, fuses and all types of light bulbs

Assemble a standard brazing project that exhibits all techniques of brazing copper and steel tubing using brazing equipment, hand tools and specialty tools to precisely complete a domestic refrigeration sealed system repair per manufacturers' specifications

- Demonstrate correct usage of the acetylene and turbo torch brazing equipment
- Braze materials utilizing heat trap paste, flux, 45-percent high silver alloy brazing material, 15-percent silver alloy brazing rod and saddle/access valves
- Use basic hand tools, a wedging tool, tubing bender, triangular file, burr remover, sanding cloth, valve core removal tool, process tube adaptor, pinch off tools and fitting/cleaning brush
- Practice leak detection methods
 - Follow proper safety practices: fire extinguisher at hand, gloves, safety glasses and flame retardant mat

Demonstrate professional development skills in a simulated customer-service or employment situation. Examples may include:

- Job interview
- Customer service scenario
- Communications
- Decision making, problem solving and/or critical thinking

Committee Identified Academic Skills

The SkillsUSA national technical committee has identified that the following academic skills are embedded in the major appliance technology training program and assessment:

Math Skills

- Use fractions to solve practical problems
- Solve practical problems involving percentages

Science Skills

- Describe and recognize elements, compounds, mixtures, acids, bases and salts
- Describe and recognize solids, liquids and gases
- Describe characteristics of types of matter based on physical and chemical properties
- Use knowledge of physical properties (shape, density, solubility, odor, melting point, boiling point, color)
- Use knowledge of chemical properties (acidity, basicity, combustibility, reactivity)
- Understand the modern model of atomic structure
- Use knowledge of classification of elements as metals, metalloids and nonmetals
- Understand Law of Conservation of Matter and Energy
- Describe phases of matter
- Describe and identify physical changes to matter
- Predict chemical changes to matter (types of reactions, reactants, products and balanced equations)
- Use knowledge of mechanical, chemical and electrical energy
- Use knowledge of heat, light and sound energy
- Use knowledge of temperature scales, heat and heat transfer
- Use knowledge of speed, velocity and acceleration
- Use knowledge of work, force, mechanical advantage, efficiency and power
- Use knowledge of principles of electricity and magnetism
- Use knowledge of static electricity, current electricity and circuits
- Use knowledge of magnetic fields and electromagnets

- Use knowledge of motors and generators

Language Arts Skills

- Provide information in conversations and in group discussions
- Provide information in oral presentations
- Demonstrate use of verbal communication skills, such as word choice, pitch, feeling, tone and voice
- Demonstrate use of nonverbal communication skills, such as eye contact, posture and gestures using interviewing techniques to gain information
- Analyze mass media messages
- Identify words and phrases that signal an author's organizational pattern to aid comprehension
- Understand source, viewpoint and purpose of texts
- Organize and synthesize information for use in written and oral presentations
- Demonstrate knowledge of appropriate reference materials
- Use print, electronic databases and online resources to access information in books and articles
- Demonstrate persuasive writing
- Demonstrate informational writing
- Edit writing for correct grammar, capitalization, punctuation, spelling, sentence structure and paragraphing

Connections to National Standards

State-level academic curriculum specialists identified the following connections to national academic standards.

Math Standards

- Numbers and operations
- Algebra
- Measurement
- Data analysis and probability
- Problem solving
- Reasoning and proof
- Communication
- Connections
- Representation

Source: NCTM Principles and Standards for School Mathematics. To view high school standards, visit: standards.nctm.org/document/chapter7/index.htm. Select "Standards" from menu.

Science Standards

- Understands the structure and properties of matter
- Understands the sources and properties of energy
- Understands forces and motion
- Understands the nature of scientific inquiry
- Understands the scientific enterprise

Source: McREL compendium of national science standards. To view and search the compendium, visit: www.mcrel.org/standards-benchmarks/.

Language Arts Standards

- Students read a wide range of print and nonprint texts to build an understanding of texts, of themselves, and of the cultures of the United States and the world; to acquire new information; to respond to the needs and demands of society and the workplace; and for personal fulfillment. Among these texts are fiction and nonfiction, classic and contemporary works
- Students apply a wide range of strategies to comprehend, interpret, evaluate and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge

- of word meaning and of other texts, their word identification strategies, and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, graphics)
- Students adjust their use of spoken, written and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes
 - Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
 - Students conduct research on issues and interests by generating ideas and questions and by posing problems. They gather, evaluate and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience
 - Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge
 - Students use spoken, written and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion and the exchange of information)

Source: IRA/NCTE Standards for the English Language Arts. To view the standards, visit: www.readwritethink.org/standards/index.html.