



Exploring STEM Digital Library

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Exploring STEM

Exploring STEM Digital Library: Courses

STEM INQUIRY

Scientific Investigation and Reasoning
Earth and Space Sciences
Physical Science
Life Science
Scientific Processes
Earth Systems
Matter
Forces and Motion
Energy
Electricity and Magnetism
Waves
Nuclear Physics
Chemical Structure and Bonding
Chemical Reactions
Anatomy
Evolution and Genetics
Biochemistry and Cell Biology
The Living World

STEM DESIGN

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STEM Inquiry

LIB 2: 01 Scientific Investigation and Reasoning

Scientific Method

- The Scientific Method
- Design and Problem Solving
- Planning Comparative Investigations (Mass of Metals and Non-metals)
- Planning a Descriptive Investigation (Transport Popularity)
- Implement a Comparative Investigation (Density of Metals and Non-metals)
- Designing Experimental Investigations (Energy in Food)
- Implement an Experimental Investigation (Energy in Food)
- Analyze, Evaluate, and Critique Scientific Explanations
- Planning Comparative Investigations (Cooking Potatoes and Pizzas)
- Planning Descriptive Investigations (School Yard Habitat)
- Implement a Comparative Investigation (Heating Oil and Water)
- Implement a Descriptive Investigation (School Yard Habitat)
- Designing Experimental Investigations
- Implement an Experimental Investigation (Photosynthesis)
- Analyze, Evaluate, and Critique Scientific Explanations (Photosynthesis)
- Planning Comparative Investigations (Moon Phases)
- Planning Descriptive Investigations (Navigable River Courses)
- Implement a Comparative Investigation (Planet Distance and Orbit Time)
- Implement a Descriptive Investigation (Rock Sample Features)
- Designing Experimental Investigations (Rock Erosion)
- Implement an Experimental Investigation (Plant Growth and Conditions)
- Analyze and Evaluate Scientific Explanations (Dinosaur Extinction)
- Critique Scientific Explanations

Safety

- Laboratory Safety 1
- Field Safety 1
- Safety Equipment 1
- Laboratory Safety 2
- Field Safety 2
- Laboratory Safety 3
- Field Safety 3
- Safety Equipment 2

Using Equipment

- Introduction to the Microscope
- Introduction to the Microscope (Movement of a Slide)
- Using a Microscope

Data and its Uses

- Viewing Osmosis in Onion Cells
- Collect, Organize, and Analyze Data

Science and Society

- History of Energy Use
- Scientific Thoughts on Evolution
- History of Astronomy

Sustainability

- Conservation, Disposal, and Recycling 1
- Conservation, Disposal, and Recycling 2
- Conservation, Disposal, and Recycling 3

LIB 2: 02 Earth and Space Sciences

Weather and Climate

- Weather and Air Masses
- Global Wind Patterns
- Climate Change
- Weather Systems
- Weather Maps
- Measuring Weather

Earth Systems

- Geological Time
- The Changing Earth
- Plate Tectonic Theory
- The Rock Cycle
- Distribution of Natural Resources
- Natural Hazards
- Humans and Ecosystems
- Rock Types
- Soil Composition
- Oil Pollution
- The Water Cycle
- Earth's Atmosphere
- Clouds
- Impact of the Sun's Energy
- Earth Model
- Rocks
- Plate Tectonics
- Natural Catastrophes
- Analyzing Landscapes
- Ground and Surface Water
- Surface Water Modeling
- Plate Tectonic Theory
- Formation of Crustal Features
- Analyzing Maps
- Weathering and Erosion

Sun, Earth and Moon Interaction

- Earth Cycles
- Seasons
- Lunar Cycles
- Moon and Tides

Solar System

- The Solar System
- Galilean Moons
- Asteroids, Comets, and Meteors
- Gravity
- Space Travel Equipment
- Space Exploration
- Life in the Solar System
- Living in Space

The Universe

- Stars
- Classifying Stars
- Wonders of the Universe
- Astronomy
- Origin of the Universe

LIB 2: 03 Physical Science

Changing Materials

- Chemical Change

Properties of Matter

- States of Matter
- Physical Properties of Matter
- Physical and Chemical Changes
- Mixtures
- Metals, Non-Metals and Metalloids
- Density
- Testing Minerals

Structure of Matter

- Elements
- Elements and Compounds
- Modeling Molecules
- Synthetic Materials
- Particle Model of Matter

Atomic Structure

- Structure of Atoms

Periodic Table

- Elements and the Periodic Table

Chemical Reactions

- Chemical Reactions
- Compounds
- Heat from Reactions

Structure, Bonding and Reactivity

- Properties of an Atom
- Investigating the Reactivity Series for Five Metals

Chemical Equations

- Formulas and Equations

Energy in Chemical Reactions

- Chemical Energy

Carbon and its Compounds

- Organics Compounds

Forces and Motion

- Effects of Force
- Friction
- Unbalanced Forces
- Speed and Velocity
- Speed, Velocity and Acceleration
- Newton's Laws of Motion
- Newton's First Law of Motion
- Force and Acceleration
- Collisions
- Velocity and Acceleration
- Simple Machines
- Force and Work

Energy

- Temperature and Heat
- Energy
- Energy Transformations
- Fossil Fuels
- Generating Energy
- Nuclear Power
- Solar Power
- Biomass Power
- Wind Power
- Hydroelectric Power
- Geothermal Power
- Generating Energy
- Alternative Energy Solution
- Potential and Kinetic Energy
- Transfer of Thermal Energy

Light

- Shadows
- Color

Waves and Vibrations

- Wave Properties
- Mechanical Waves

Digital Technology

- Digital Communication

LIB 2: 04 Life Science

Biological Systems

- Response to Stimuli
- Human Body Systems
- Human Circulatory System
- Organization of Biological Systems

Organism Structure and Function

- The Human Body

Plant Biology

- Photosynthesis
- Testing Leaves for Starch
- Force in Plants

Cell Biology

- Types of Cells
- Structure and Function of Cells
- The Cell Theory

Basic Needs

- Characteristics of Living Things
- Characteristics of Living Things (Physiological Needs)
- Characteristics of Living Things (Life Processes)

Food and Diet

- Diet

Energy and Living Things

- Digestion
- Energy in Organisms

Reproductions

- Reproduction Strategies
- Nature and Nurture
- Reproduction
- Reproduction (Asexual Reproduction and Sexual Reproduction)

Genetics

- Hereditary Traits 1
- Hereditary Traits 2
- Hereditary Traits 3
- Inheritance
- Genetics
- Changes in Genes
- Genetic Engineering

Ecosystems

- Ecosystems
- Habitats and Ecosystems
- Biodiversity and Ecosystems
- Ecological Succession
- Cycling of Matter
- Energy Flow
- Food Webs
- Biotic and Abiotic Factors of Ecosystems
- Environmental Change
- Ocean Systems
- Changing Ecosystems
- Ecosystems and Habitats
- Producers, Consumers, and Decomposers
- Ecosystems and Populations

Population and Biodiversity

- Identifying Organisms
- Populations and Resources
- Maintaining Biodiversity
- Biological Diversity

Taxonomy

- Classification

Adaptation

- Biological Adaptations
- Biological Adaptation
- Looking at Adaptations
- Physiological Needs

Extinction

- Extinction

Health and Disease

- Exercise
- Health

Evolution

- Evidence from the Fossil Record
- Evidence for Evolution
- How Natural Selection Works
- Exploring how Organisms have Adapted
- How Species Develop

LIB 2: 05 Scientific Processes

Safety

- Laboratory Safety
- Laboratory Safety (Chemistry)
- Laboratory Safety (Physics)
- Field Safety
- Field Safety (Biology)
- Field Safety (Physics)
- Material Safety Data Sheets (MSDS)

Using Equipment

- Using a Microscope
- Clamps

Scientific Method

- Definition of Science
- Planning Descriptive Investigations
- Plan a Comparative Investigation (Photosynthesis)
- Implement a Descriptive Investigation (Abiotic and Biotic Features)
- Implement a Comparative Investigation (Photosynthesis)
- Plan an Experimental Investigation (Photosynthesis)
- Implement an Experimental Investigation (Photosynthesis)
- Analysis of Scientific Explanations 1
- Analysis of Scientific Explanations 2
- Evaluation of Scientific Explanations 1
- Evaluation of Scientific Explanations 2
- Scientific Theories
- Planning Investigations
- Implementing Investigative Procedures
- Communicate Valid Conclusions
- Critique Scientific Explanations

Data and its Uses

- Collect and Organize Data
- Making Measurements with Accuracy and Precision
- Exploring Scientific Data
- Accuracy and Precision
- Dimensional Analysis
- Scientific Notation 1
- Scientific Notation 2
- Significant Figures
- Analyzing Data
- Data Acquisition Probes
- Graphing
- Measuring with Calipers and Micrometers
- SI Units
- Uncertainties in Measured Data
- Organizing and Evaluating Scientific Data
- Communicate Valid Conclusions
- Express Relationships Among Physical Variables

Science and Society

- History of Science
- Models in Biology
- Contributions of Scientists
- Impact of Scientific Research on Society
- Impact of Scientific Research on the Environment
- Chemistry and Future Careers
- History of Chemistry
- Physics and Future Careers
- Communicating Scientific Information
- Inferences from Promotional Materials

LIB 2: 06 Earth Systems

Earth Systems

- Earth's Early History
- Earth Systems
- The Interior of the Earth
- Life and the Earth - Co-evolution
- Earth's Energy Balance
- Water and Earth

Weather and Climate

- Analyzing Climate Change Data
- Earth's Changing Climate

Human Sustainability

- Managing Energy and Mineral Resources
- Modeling Resource Relationships
- Reducing Impacts on Natural Systems
- Human Impacts on Earth System Relationships

Solar Systems

- The Sun
- Orbits and Gravity

LIB 2: 07 Matter

Properties of Matter

- Physical and Chemical Changes
- Properties of Matter
- Intensive and Extensive Properties
- States of Matter 1
- States of Matter 2
- Mixtures
- Physical Properties of Matter
- Forces of Attraction Between Particles
- Molecules and Chemical Properties
- Physical and Chemical Properties of Elements and Compounds
- Chemical Reactions and Valence Electrons

Matter and Change

- The Science of Chemistry

Fluids

- Surface Tension
- Viscosity in Fluids
- Pressure in Fluids
- Fluid Properties

Measurement Errors

- Measuring (Measurement Errors)
- Measuring (Manufacturing Tolerance of a Wooden Block)
- Measuring

Density

- Density (Solids)
- Density (Liquids)
- Density

Solubility

- Role of Water in Biology and Chemistry
- Solubility
- Factors Affecting Solubility and Rates of Dissolution
- Solutions
- Factors Affecting Solubility
- Solubility in Water (Soluble or Insoluble in Water)
- Solubility in Water (Effect of Temperature on the Solubility of a Solid)
- Solubility in Water

Gas Laws

- Boyle's Law
- Charles' Law
- Avogadro and the Gas Laws
- Dalton's Law of Partial Pressures
- Ideal Gas Equation
- Gas Laws Calculations
- Kinetic Molecular Theory

LIB 2: 08 Forces and Motion

Types of Forces

- Forces Acting at a Distance
- Magnetic and Electrical Forces
- History of Electromagnetic Forces
- Electric Forces
- Electric and Magnetic Forces in Everyday Life

Measurement of Force

- Triple Beam Balance
- Spring Scales

Force and Deformation

- Springs
- Elasticity

Describing Movement

- Describe and Calculate Motion
- Distance and Speed
- Forces and Motion
- Vectors
- Types of Motion
- Motion Charts and Graphs
- Speed and Velocity
- Relative Motion

Force and Acceleration

- Force, Mass, and Acceleration
- Acceleration
- Design a Force-Mass-Acceleration Investigation
- Implement a Force-Mass-Acceleration Investigation
- Investigating the Relationship between Force and Acceleration
- Evaluate Data from a Force-Mass-Acceleration Investigation
- Circular Motion
- Forces and the Laws of Motion

Gravity

- Force Due to Gravity
- Theory of Gravity
- Measuring the Acceleration due to Gravity

Moment of a Force

- Moments and Levers

Momentum

- Conservation of Momentum
- Force and Momentum
- Momentum and Impulse 1
- Using a Ballistic Cart
- Momentum and Impulse 2

Pendulums

- Pendulums
- Pendulums (Mass and Period Time)
- Pendulums (Length and Period Time)

Components of Force

- Free-Body Force Diagrams
- Free-Body Force Diagrams (Force and Slope Angle)
- Free-Body Force Diagrams (Forces Acting at a Single Point)

Projectiles

- Projectiles
- Trajectory Apparatus

LIB 2: 09 Energy

Forms of Energy

- Forms of Energy
- Generating Energy
- Advantages and Disadvantages of Energy Sources
- Social and Environmental Impacts of Energy Sources

Electrical Energy

- Energy Transfer in Electrical Circuits
- Transfer of Electrical Energy in Conductors

Heat Energy

- Conduction of Thermal Energy
- Radiation of Thermal Energy
- Convection of Thermal Energy
- Temperature and Heat
- Heat Transfer
- Thermodynamic Laws
- Heat Transfer
- Heat from Reactions
- Heat Calculations

Work, Force and Energy

- Kinetic and Potential Energy 1
- Kinetic and Potential Energy 2
- Work-Energy Theorem
- Power and Mechanical Energy
- Efficiency of an Electro-mechanical System

Conservation of Energy

- Law of Conservation of Energy
- Conservation of Energy

LIB 2: 10 Electricity and Magnetism

Static Electricity

- Electrostatics
- Static Electricity

Magnetism

- Magnetism (Bar Magnets)
- Magnetism (Magnetic Field Around a Bar Magnet)
- Magnetism (Magnetic Field Around an Electromagnet)

Electromagnetism

- Electromagnetism
- Applications of Electromagnetism

Electrical Circuits

- Building and Testing Circuits
- Resistors
- Electrical Conductors and Insulators
- Series Circuits
- Parallel Circuits
- Series Circuit Calculations
- Parallel Circuit Calculations
- Electrical Conductivity
- Electrical Components
- Series and Parallel Circuits (Current)
- Series and Parallel Circuits (Potential Difference)
- Series and Parallel Circuits

LIB 2: 11 Waves

Waves and Vibrations

- Wave Motion
- Electromagnetic Spectrum Charts
- Polarization
- Oscillations
- Wave Properties
- Transverse and Longitudinal Wave Characteristics
- Resonance
- Doppler Effect
- Applications of Waves
- Sound Waves (Vibrating Air and Vibrating String)
- Sound Waves (Doppler Effect)
- Sound Waves
- Propagation of Sound (Speed of Sound in Air)
- Propagation of Sound (Transverse and Longitudinal Waves)
- Propagation of Sound
- Light Intensity on a Solar Panel
- Natural Frequency
- Light Levels
- Acoustic Waves
- Seismic Waves
- Light Waves
- Water Waves

Optics

- Laser Pointers
- Refraction - Prism
- Refraction - Convex Lens
- Diffraction
- Interference
- Reflection
- Light Rays (Refractive Index and Critical Angle of Internal Reflection)
- Light Rays (Law of Reflection)
- Light Rays (Convergence and Divergence)
- Light Rays

Electromagnetic Spectrum

- Electromagnetic Radiation

Digital Technology

- Digital Information

LIB 2: 12 Nuclear Physics

Atomic and Nuclear

- Emission Spectra
- Periodic Table
- Equipment Used in Atomic Physics Experiments
- History of Nuclear Force Concepts
- Nuclear Forces
- Origins of Quantum Theory
- Mass Energy Equivalence
- Applications of Nuclear Physics
- Applications of Quantum Physics
- Quantum Mechanical Model of the Atom

Radioactivity

- Discovery of Radioactivity
- Nuclear Equations
- Fission and Fusion

LIB 2: 13 Chemical Structure and Bonding

Periodic Table

- Periodic Table and Properties of Elements
- Development of the Periodic Table
- Chemical Families
- Noble Gases
- Alkali Metals
- Alkaline Earth Metals
- Halogens
- Transition Metals
- Identifying Trends in the Periodic Table
- Physical Trends in the Periodic Table

Atomic Structure

- Dalton's Atomic Theory
- Thomson and the Properties of the Electron
- Rutherford's Nuclear Atom
- Bohr's Nuclear Atom
- Waves and Spectra
- Isotopes and Atomic Mass
- Electron Configuration

Chemical Bonding

- Intermolecular Bonding
- Intra-molecular Bonding (RasMol Molecular Viewer)
- Intra-molecular Bonding (Ionic and Covalent Bonded Substances)
- Intermolecular and Intra-molecular Bonding
- Electron Dot Formulas
- Metallic Bonding
- Molecular Geometry

Carbon and its Compounds

- The Importance of Carbon
- Organic Compounds
- Origin and Properties of Oil
- Processing and Uses of Oil
- IUPAC Nomenclature Rules for Organic Compounds
- Writing Formulas from the Chemical Name
- Physical Properties of Organic Compounds
- Uses of Organic Compounds
- Synthetic Polymers
- Carbohydrates
- Proteins
- Combustion of Hydrocarbons
- Papermaking
- Fermentation

LIB 2: 14 Chemical Reactions

Changing Materials

- Separating Mixtures
- Evaporation
- Evaporation (Separating Sodium Chloride from a Sodium Chloride Solution)
- Evaporation (Evaporation Rate of a Liquid)
- Purification
- Distillation
- Chromatography
- Dispersive Liquids

Types of Reaction

- Chemical Decomposition
- Decomposition (Catalytic Decomposition of Hydrogen Peroxide)
- Decomposition (Thermal Decomposition of Different Copper Salts)
- Redox 1
- Redox 2

Acids and Bases

- Acids and Bases
- pH Scale
- Types of Reaction
- Strong and Weak Acids and Bases
- pH Scale
- pH Scale (Universal Indicator Solution)
- pH Scale (Universal Indicator Paper)
- Acid Rain
- Acid Rain (Buffering Properties of Soil Samples)
- Acid Rain (Reaction of Metals Exposed to Acid Rain)

Ions

- Salts
- Atomic Structure and Ions

Chemical Formulas

- Nomenclature Rules
- Writing Chemical Formulas

Energy in Chemical Reactions

- Energy Changes in Chemical Reactions
- Enthalpy

Rates of Reaction

- Rates of Reaction
- Chemical Equilibrium
- Reactivity
- Reactivity (Metal Reactivity Series)
- Reactivity (Reactivity Series of Three Halogens)

Electro-chemistry

- Conductivity
- Electrolysis of Liquids
- Electro-chemistry
- Electro-chemistry (Electrolysis of Water)
- Electrolysis of Liquids (Copper(II) Sulphate Solution)
- Electrolysis of Liquids (Potassium Salt Solutions)
- Batteries and Cells

Stoichiometry

- Moles
- Empirical and Molecular Formulas
- Balancing Equations
- Stoichiometric Calculations 1
- Stoichiometric Calculations 2
- Perform Stoichiometric Calculations
- Conservation of Mass
- Titration
- Stoichiometry (Sodium Hydrogen Carbonate)
- Stoichiometry (Iron Powder and Copper(II) Sulphate Solution)
- Stoichiometry
- Advanced Stoichiometry
- Advanced Stoichiometry (Hydrated Copper(II) Sulphate Crystals)
- Advanced Stoichiometry (Calcium Carbonate and Hydrochloric Acid)
- Advanced Stoichiometry 1
- Advanced Stoichiometry 2

LIB 2: 15 Anatomy

Biological Systems

- Regulatory Systems in Animals
- Nutrient Absorption in Animals
- Reproductive Systems in Animals
- Defense Systems in Animals
- Organization of Biological Systems
- Body Feedback Mechanisms
- Organism Response

The Eye

- Lenses
- Structure of the Eye
- Defects of Vision

Anatomy and Health

- The Natural History of Disease
- The Digestive System and Health
- The Respiratory System and Health
- The Human Respiratory System
- The Circulatory System and Health
- The Human Circulatory System
- The Excretory System
- The Excretory System and Health
- The Nervous System and Health
- The Endocrine System
- The Endocrine System and Health
- The Reproductive System and Health
- Voluntary Muscles
- The Musculoskeletal System and Health
- Bones
- Joints
- Decalcified and Calcined Bones
- The Integumentary System
- The Integumentary System and Health

Exercise

- Effects of Exercise

Food and Diet

- Human Digestive System
- Diet
- Starch in Food
- Sugar in Food
- Sugar in Food (Reducing and Non-reducing Sugars)
- Sugar in Food (Identifying Sugars in Food)
- Protein in Food
- Fat in Food

LIB 2: 16 Evolution and Genetics

Reproduction

- Human Reproductive Systems
- The Process of Human Reproduction
- Hormonal Control of Human Reproduction
- Hormonal Control of Human Reproduction (Fertility)
- Hormonal Control of Human Reproduction (Harmful Substances)

Evolution

- Evidence from the Fossil Record
- Biogeography
- Homology
- Natural Selection
- Mechanisms of Evolution
- Origins of Life
- Evolution
- Evolution (Moth Populations and Industrial Melanism)
- Evolution (Hardy-Weinberg Equation)
- Fossils

Adaptation

- Variations and Adaptations of Organisms
- Adaptation
- Adaptations of Plants to Life on Land

Genetics

- Cell Differentiation
- The Structure and Function of DNA and RNA
- The Structure and Function of DNA and RNA (Building a DNA Model)
- The Structure and Function of DNA and RNA (Extracting DNA from Kiwi Fruit)
- Regulation of Gene Expression
- Changes in DNA
- Genetic Crosses
- Meiosis
- The Study of Genomes
- Determining Alleles
- Exploring Genetic Crosses

LIB 2: 17 Biochemistry and Cell Biology

Biomolecules

- Structure of Carbohydrates
- Structure of Lipids
- Structure of Proteins
- Structure of Nucleic Acids
- Structure and Function of Enzymes

Microbiology

- Development of the Microscope
- Microscope Slides
(Preparing and Viewing a Slide of Onion Cells)
- Microscope Slides
- Microscope Slides
(Preparing and Observing Microscope Slides)
- Microbiology

Cells and Cellular Processes

- Cells and the Brain
- Structure of Cells
- Structure of Cells (Neural Processing Times)
- Structure of Cells (Organelles)
- Prokaryotic and Eukaryotic Cells
- Homeostasis and Transport of Molecules
- Viruses
- The Cell Cycle
- Specialized Cells
- Cellular Energy Processes

LIB 2: 18 The Living World

Plant Biology

- Reproduction in Flowering Plants
- Reproduction in Flowering Plants (Pollen Tube Growth)
- Reproduction in Flowering Plants (Rate of Photosynthesis)
- Photosynthesis
- Nutrients
- Plant Growth
- Osmosis
- Osmosis (Living Plant Cells)
- Osmosis (Solute Potential)
- Transport Systems in Plants
- Reproductive Systems in Plants
- Response in Plants

Taxonomy

- Animal Classification
- Life Cycle of the Frog
- Classification of Organisms
- Taxonomic Groups

Food Chains, Webs, Pyramids and Resources

- Food Chains
- Food Webs
- Ecological Pyramids
- Populations, Resources, and the Environment

Energy and Living Things

- Aerobic and Anaerobic Respiration

Nutrient Cycles

- Carbon Cycle
- Nitrogen Cycle

Population and Biodiversity

- Investigating Populations and Biodiversity
- Impacts on Biodiversity
- Group Behavior
- Population Change and Structure
- Population and Community Responses

Sustainability

- Food Chains (Human Food Chain)
- Food Chains (DDT and Biomagnification)
- Food Chains
- Global Warming
- Environmental Impact of Chemical Products
- Economic Impact of Chemical Products
- Resources and Recycling

Ecosystems

- Carrying Capacity of Ecosystems
- Changing Ecosystems
- Ecology
- Microorganisms in Organisms and Ecosystems
- Ecological Succession
- Relationships

STEM Design

LIB 2: 19 Engineering Design

The Design Process

- Introduction to Engineering Design
- Introduction to Engineering Design - Task
- Engineering Problems
- Engineering Problems - Task
- Alternative Solutions
- Alternative Solutions - Task
- Models and Prototypes
- Models and Prototypes - Task
- Communicating Engineering Design
- Communicating Engineering Design - Task
- Design Project - A Railroad Crossing System
- Design Project - A Railroad Crossing System - Task

Programming

- Switching on a Light Automatically
- Starting a Motor with a Switch
- Using a Conditional Loop
- Stopping a Motor with a Magnetic Switch
- Using a Multiple Loop
- Using the EEPROM Function
- Using Subprograms
- Using Variables

Building and Testing

- Building a Helicopter
- Building a Conveyor
- Building a Turntable
- Building a Gearbox
- Building a Simple Vehicle
- Building a Screw Thread Mechanism
- Building a Rack and Pinion Mechanism
- Building a Pulley Mechanism
- Using a Magnet and a Magnetic Sensor
- Using a Counter
- Testing a Motor with the Controller
- Testing a Sensor with the Controller
- Using the IR Sensor and the Grayscale Sensor

LIB 2: 20 Green Technologies

Biomass

- Creating Power from Biomass
- Biomass Calculations

Efficiency of Power Generation

- Efficiency of Power Generation
- Turbine Efficiency

Energy in Buildings

- Energy in Buildings
- Energy and Power
- Energy of the Cloud
- Solar Tracking - Task
- Design Project - An Automatic Sunshade

Fuel Cells

- Hydrogen Fuel Cell

Geothermal

- Geothermal Energy
- Geothermal Survey
- Geothermal Challenge

Glass in Construction

- Glazing Systems
- Glazing Materials

Heat Pumps

- Cooling
- Heating
- Refrigerants
- Cooling a Large Space
- Passive Cooling

House Heating Systems

- Heating the Home

Insulation

- Insulating Buildings
- Insulation Materials

Hydropower

- Generating Power from Water
- Water Pressure and Depth
- The Hoover Dam
- Powering an Island

National Grid

- Power Transmission
- Energy Storage
- National Grid Challenge

Nuclear Energy

- Nuclear Energy
- Nuclear Power

Power Generation

- Generating Electricity
- Energy and Power
- Exploring Fossil Fuels
- Climate Change

Solar Electric Systems

- Solar Electricity for the Home
- Grid Connected

Solar Heating

- Solar Water Heating
- Grid Connected Water Heating

Solar Power

- Solar Power
- Harnessing Solar Power
- Stirling Engines
- Solar Furnace
- Thermoacoustic Engines

Wind Power

- Power from the Wind
- Wind Farm
- Harnessing Wind Power
- Wind Power Calculations

Wind Turbines

- Small Scale Wind Turbines
- Storing Electricity
- Power in the Wind

LIB 2: 21 Mechanical Systems

Machines

- Mechanical Systems
- Simple Machines - Task

Machine Design

- Designing a Slow Turntable - Task
- Design Project - An Elevator - Task
- Design Project - A Fairground Ride - Task
- Problem Solving - Designing an Engine Cam
- Designing a Winch - Task

Friction

- Friction
- Lubricants, Bushes, and Bearings

Inclined Planes

- Raising Loads using Inclined Planes

Levers

- First, Second, and Third Class Levers

Gears

- Gears and Simple Gear Trains
- Compound Gear Trains
- Special Gears

Pulleys

- Pulley Belt Drive
- Pulleys
- Fixed and Moveable Pulleys

Cams and Cranks

- Cams and Cranks
- Cams
- Cranks

LIB 2: 22 Electronics

Basic Electricity

- Basic Electrical Quantities in Circuits
- Measurement in Circuits
- Simple Lamp Circuit
- The Lamp Circuit
- Measuring Voltage in a Circuit
- Measuring Resistance of Components
- Experimenting with Voltage, Current, and Resistance
- Connecting Switches
- Generating Light

Building on Breadboard

- Breadboarding
- Planning an Automatic Light Circuit on Breadboard
- Building the Automatic Light Circuit on Breadboard

Building on Stripboard

- Building Circuits on Stripboard
- Planning an Anti-Theft Device
- Building and Testing the Anti-Theft Device

Building Circuits on Printed Circuit Boards

- Constructing the Continuity Tester on PCB
- Building Circuits on PCB

Electronic Problem Solving

- Problem Solving - Identify Electronic Components
- Problem Solving - Produce an Electronic Circuit Diagram (simulator)
- Problem Solving - Plan, Construct and Test an Electronic Circuit
- Problem Solving - Construct an Electronic Circuit
- Problem Solving - Recognize and Select Components
- Problem Solving - Testing and Fault Finding on Electronic Components (board)

LED Lamp Circuit

- Resistors
- Calculating the Resistor Value for an LED Lamp Circuit
- Building an LED Lamp Circuit (simulator)
- Building an LED Lamp Circuit
- Testing a Faulty LED Lamp Circuit (board)

Automatic Light Circuit

- Systems and Sub-Systems
- Building and Testing an Automatic Light Circuit (simulator)
- Building and Testing an Automatic Light Circuit
- The Voltage Divider Principle
- Building and Testing the Improved Automatic Light Circuit
- Building and Testing an Improved Automatic Light Circuit (board)
- Testing a Faulty Improved Automatic Light Circuit (board)

Power Supplies

- AC to DC Concepts and Principles
- A Simple AC to DC Converter
- Circuit Breakers and Fuses

Baby Alarm

- Building a Baby Alarm
- Building a Baby Alarm (board)

Flashing Doorbell Circuit

- Flashing Doorbell Circuit
- Building a Flashing Doorbell Circuit (simulator)
- Building a Flashing Doorbell Circuit

Freezer Temperature Warning Circuit

- Building the Freezer Temperature Warning Circuit on Breadboard

Intruder Alarm

- Intruder Alarm Circuit
- Intruder Alarm Circuit (Simulator)
- Latched Buzzer Circuit
- Simulated Latched Buzzer Circuit (simulator)

Polarity Tester

- Building and Testing a Polarity Tester
- Building and Testing a Polarity Tester (simulator)

Elevator Door Controller

- The Elevator Door Controller
- The Elevator Door Controller (simulator)

Road Crossing Controller

- Road Crossing Controller

LIB 2: 23 Fluid Power

Principles of Pneumatics

- Fundamental Principles of Pneumatics
- Making use of Pneumatics
- Compressing Air

Pneumatic Components, Symbols and Circuits

- Pneumatic Circuit Symbols and Conventions
- Building a Simple Circuit
- Double-Acting Cylinder Circuit
- Control Valves
- Shuttle Valves
- Speed Control and Flow Regulators

Pneumatic Logic

- Logical Control of Cylinders
- Boolean Logic

Pneumatic Problem Solving

- Problem Solving - Sorting Parts
- Problem Solving - Dump Truck Design

Sequential and Automatic Control Circuits

- Automated Control Systems
- Manual and Automatics
- Sequence and Repetition

Pneumatic Circuit Time Delays

- Time Delay Fundamentals

Electro-pneumatics

- Combining Pneumatics and Electronics

Levers and Movement

- Lever Principles

Principles of Hydraulics

- Hydraulic Applications
- Compressing Fluids!
- Building a Hydraulic Circuit
- Hydraulic Laws
- Lifting Force
- Basic Fluid Power Engineering

Hydraulic Components, Symbols and Circuits

- Symbols and Components
- Hydraulic Components
- Constructing from a Circuit Diagram

Hydraulic Cylinders

- Controlling Cylinders
- Cylinder Speed
- Hydraulic Cylinder Design
- Design a Cylinder
- Fluid Power Cylinders

Valves and Flow Control

- Hydraulic Control and Check Valves
- Danger - High Pressure
- Basic Control Valves

Actuators

- Hydraulic Actuators
- Hydraulics in Operation
- Hydraulic Motor Control

Creating Pressure with Pumps

- Hydraulic Pumps

LIB 2: 24 Construction

Forces on Structures

- Forces
- Skyscrapers

Concrete

- Using Concrete for Building

Beams

- Beams

Building Bridges

- Bridge Design

Green Materials in Construction

- Construction with Green Materials

LIB 2: 25 Telecommunications

Communication Methods

- Early Communication
- Electronic Communications in Everyday Life

Broadcasting

- Broadcast Communication
- Digital TV and Radio

Telephones

- Telephone Communication

Cell Phones

- Cell Phones

Networks

- Cell Phone Networks
- Networks
- Communication on the Internet

LIB 2: 26 Manufacturing

Design

- Design Loop
- Design Choices
- Design and Make a Door Knob
- Manufacturing Technology - Task
- Design Project - Manufacturing Technology - Task

Materials

- Plastic Materials
- Metals
- Smart Materials
- Physical Properties of Materials
- Mechanical Properties of Materials
- Testing Materials
- Materials Selection: Electric Cables
- Materials Selection: Strength to Weight Ratio

Manufacturing Engineering

- Injection Machine Controls
- Hand Tools
- Machine Tools and Fabrication

Waste Management

- Manufacturing Processes and Waste
- Recycling Waste
- Reducing Waste and Cost

LIB 2: 27 Transportation

Research and Design

- An Introduction to Research and Design
- Research and Design Approach
- The Design Loop
- Transit System

Transportation Systems

- Transportation Systems
- Transportation Technologies
- Transportation in Practice

Propulsion Systems

- Types of Propulsion
- Propulsion Systems and the Environment
- Fuels
- Power and Control - Task
- Torque - Task

Transportation Logistics

- Modes of Operation

Moving the Maglev

- Magnets and Electromagnets
- Systems that use Magnetism
- Electrical Power Supply

Force and Momentum

- Forces
- Momentum

Passenger Safety

- Passenger Safety
- Passenger Safety (Buffer Design)
- Passenger Safety (Buffer Evaluation)

Manufacturing Engineering

- Introduction to Transportation
- Power and Control
- Torque

Manufacturing Waste

- Intelligent Vehicles
- Freight Transport

Problem Solving Design

- Introduction to Transportation - Task

Intelligent Vehicles

- Intelligent Vehicles - Task

Freight Transport

- Freight Transport - Task

Dump Truck

- Design Project - A Dump Truck - Task

Program Control

- Programming
- Controlling the Service

Costs

- Operating Costs
- Lowering Passenger Ticket Prices

LIB 2: 28 Agriculture

Farming Technology

- Irrigation
- Irrigation - Task
- Artificial Environments
- Artificial Environments - Task
- Design Project - Vertical Farming System - Task

Machinery

- Agricultural Machines 1
- Agricultural Machines 1 - Task
- Agricultural Machines 2
- Agricultural Machines 2 - Task

LIB 2: 29 Biomedical Technology

Hygiene

- Sanitation
- Sanitation - Task

Diagnostic Equipment

- Medical Scanning
- Medical Scanning - Task
- Design Project - Model Scanner Improvements - Task

Treatment and Prevention

- Vaccination and Immunization
- Vaccination and Immunization - Task
- Pharmaceuticals
- Pharmaceuticals - Task

LIB 2: 30 Robotics

Controlling Robots

- Manual Control of a Robot
- Programming a Robot
- Open and Closed Loop Control

Industrial Robotics

- Industrial Machines
- Industrial Machines - Task
- Controlling Machines
- Controlling Machines - Task
- The Control Loop
- Sensors
- Sensors - Task
- Actuators
- Actuators - Task
- Industrial Robots
- Industrial Robots - Task
- Computers and Manufacturing
- Design Project - An Industrial Robotic System - Task

Mobile Robotics

- Introduction to Mobile Robots
- Introduction to Mobile Robots - Task
- Powering Mobile Robots
- Powering Mobile Robots - Task
- Controlling Mobile Robots
- Controlling Mobile Robots - Task
- Sensors for Mobile Robots
- Sensors for Mobile Robots - Task
- Space Robots
- Space Robots - Task
- Design Project - An Automated Guided Vehicle - Task

Robots in Action

- Transportation Around the Work-Cell
- Manipulating Parts
- Industrial Robots
- Computer Integrated Manufacture
- Pre-programmed Sequences
- Problem Solving - Nuclear Work-Cell

Support

LIB 2: 31 English Language

Language

- Learning Language
- Language Acquisition

Reading

- Citing Evidence to Support Analysis
- Identifying Ideas and Analyzing their Development
- Analyzing Connections in a Text
- Identifying Key Words and their Meanings
- Understanding the Role of Structure
- Determining the Author's Purpose and Point of View
- Understanding and Using Information in Different Mediums
- Considering Whether Arguments are Credible and Accurate
- Writing a Comparative Essay
- Citing Strong and Thorough Evidence
- Identifying and Analyzing Ideas in a Text
- Understanding and Interpreting a Text
- Understanding the Different Meanings of Language
- Understanding the Structure of a Text
- Determining a Writer's Perspective
- Understanding Multiple Sources of Information
- Evaluating Arguments and Specific Claims Made in a Text

Speaking and Listening

- Listening and Responding to Different Perspectives
- Debating an Issue
- Thinking About the Reliability of a Speaker
- Selling to an Audience
- Presenting a Persuasive Speech
- Planning, Writing, Presenting, and Evaluating
- Discussing Different Perspectives
- Justifying Decisions with Reasoning
- Engaging in Group Discussions
- Presenting a Perspective to an Audience

Writing

- Planning and Writing an Argument
- Planning and Writing a Persuasive Article
- Writing a Formal Letter
- Writing an Informative Text
- Presenting Information to an Audience
- Writing a Newspaper Article
- Writing a Narrative
- Writing From Another Person's Perspective
- Writing a Poem
- Arguing a Perspective
- Presenting a Persuasive Perspective
- Formal Letters with a Perspective
- Creating an Informative Text
- Informing an Audience
- Writing an Informative Article
- Understanding and Using Perspective in a Narrative
- Writing Reality as a Narrative
- Writing History

LIB 2: 32 Mathematics

Units of Measure

- Units of Measurement

Approximation

- Approximations

Arithmetic

- Adding and Subtracting
- Multiplication and Division of Decimal Numbers
- Multiply Sums

Fractions

- Fractions - Addition and Subtraction
- Fractions - Multiplication and Division
- Use Fractions
- Simplify Fractions
- Expand Fractions
- Convert Mixed Numbers into Improper Fractions
- Convert Improper Fractions into Mixed Numbers
- Add and Subtract Fractions with the Same Denominator
- Add and Subtract Fractions with Different Denominators
- Convert Fractions to Decimal Numbers
- Convert Decimal Numbers to Fractions

Percentages

- Percentages
- Calculate Percentages of Values
- Parts per Thousand
- Calculate Percentage Increases
- Calculate Percentage Reductions

Length, Area and Volume

- Lengths, Surface Area, and Volume
- Lengths, Units and Prefixes
- Calculate the Perimeter of a Rectangle
- Calculate the Area of a Rectangle
- Calculate the Area of a Complex Shape
- Calculate Volume

Angles

- Angular Measure

Graphs and Charts

- Graphs - Straight Line Graphs
- Graphs - Square Law
- Graphs - Pie Chart

Equations

- Transposing Equations
- Performing Calculations
- Sign Rules for Mathematical Operations
- Distributive Law
- Multiply Out Brackets
- Structure Equations
- Transform Equations by Addition and Subtraction
- Transform Equations by Multiplication and Division
- Transpose Equations
- Calculate the Unknown Variable in an Equation
- Equating Method for Solving Simultaneous Equations
- Addition Method for Solving Simultaneous Equations

Algebra

- Algebra - Simple Formula
- First, Second, and Third Order Brackets
- Rule of Three (Direct Proportion)
- Rule of Three (Inverse Proportion)

Factorization

- Simple Factorization

Indices

- Indices - Powers of 10
- Indices - Addition and Subtraction
- Indices - Multiplication and Division
- Indices - Letter Notation
- Powers
- Indices
- Square Roots

Trigonometry

- Pythagoras' Theorem
- Basic Trigonometry

Phasors

- Phase Angles
- Phasor Diagrams

LIB 2: 33 Information Technology

Introduction to IT

- Types of Computers
- Anatomy of a Computer
- Computer Performance, Speed, and Storage
- PC Unit Components
- Input Devices
- Output Devices
- Storage Devices
- Software Terms
- Operating Systems and Applications
- Shareware, Freeware, and Firmware
- Network Components and Terminology
- Basic Internet Concepts
- Uses of Computers in the Workplace
- Email, Messaging, and eCommerce
- Safety and Security
- User Passwords and Backups
- Malware
- IT Review Task

Accessing the Internet

- Browser Basics
- Accessing a Website
- Tabs
- Electronic Communications Review Task 1
- Web Searching and Printing
- Working with Data
- Using Favorites
- Electronic Communications Review Task 2
- Web Accelerators
- Security and Web Safety
- Security Features
- Electronic Communications Review Task 3
- Managing Information
- Managing History
- RSS Feeds
- Additional Components
- Electronic Communications Review Task 4
- Electronic Communications Review Task 5

Using MS Windows

- Windows Desktop
- Text Editors
- Wordpad
- Folders
- Folder Trees
- Moving and Copying
- Help and Applications
- MS Sticky Notes
- Media Player
- MS Paint
- Capturing Images and Changing Colors
- Drawing in MS Paint
- Internet Explorer 1
- Internet Explorer 2
- Using MS Windows Review Task 1
- Using MS Windows Review Task 2

Word Processing

- Introduction to Word Processing
- Editing Text 1
- Editing Text 2
- Formatting Text 1
- Formatting Text 2
- Formatting Text 3
- Lists and Tables 1
- Lists and Tables 2
- Lists and Tables 3
- Lists and Tables 4
- Page Layout, Pictures, and Printing 1
- Page Layout, Pictures, and Printing 2
- Page Layout, Pictures, and Printing 3
- Page Layout, Pictures, and Printing 4
- Introduction to Mail Merge
- Word Processing Review Task 1
- Word Processing Review Task 2

Spreadsheet

- Introduction to Spreadsheets
- Working with Cells
- Working with Rows and Columns
- Working with Text
- Formatting Text
- Sorting and Filtering 1
- Sorting and Filtering 2
- Working with Formulae
- Formatting Numbers
- Numbers and Formulae
- Working with Tables 2
- Working with Charts 2
- Working with Graphs 1
- Working with Graphs 2
- Spreadsheets Review Task 1
- Spreadsheets Review Task 2

LIB 2: 34 Employability Skills

Social Skills

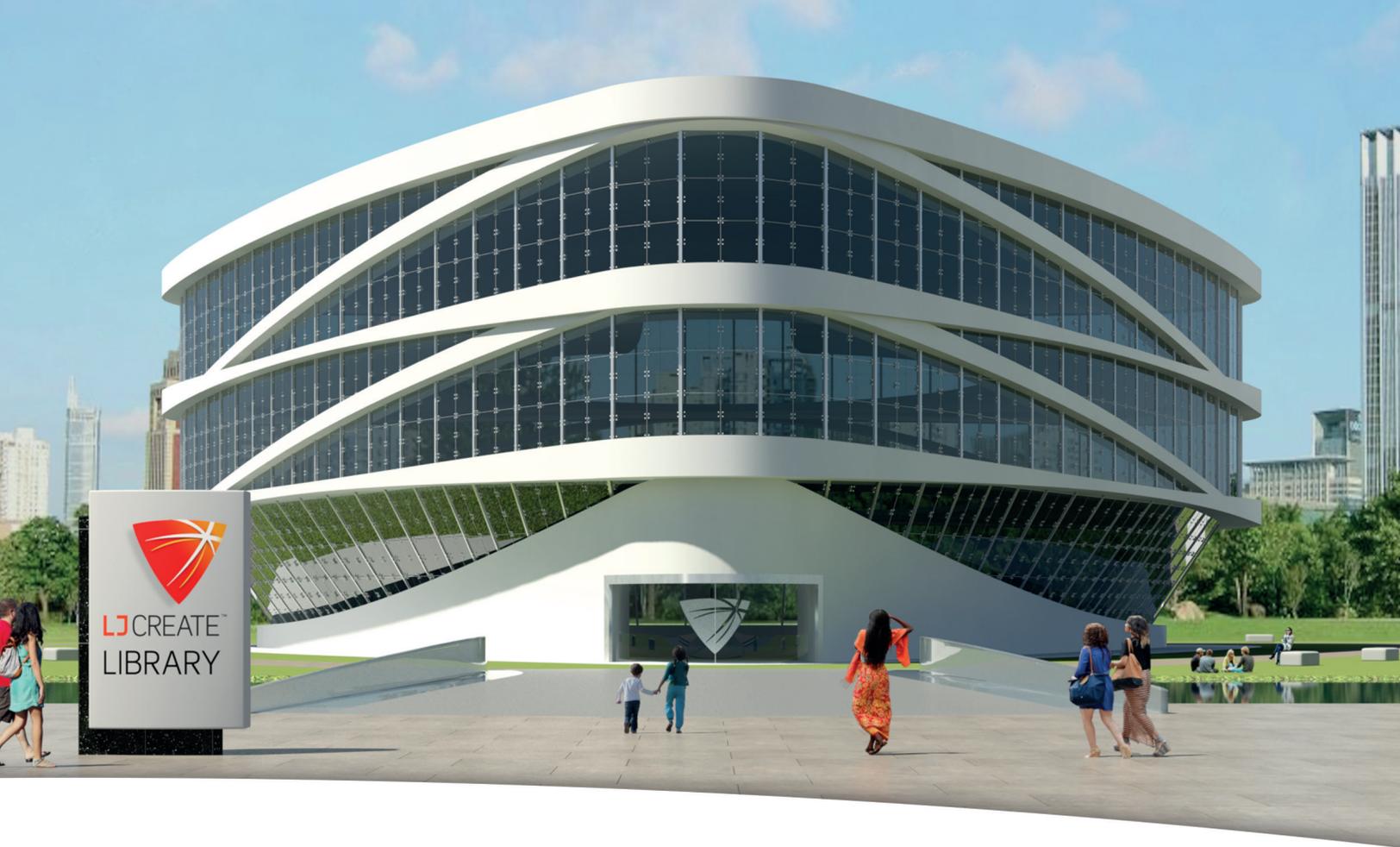
- Punctuality
- Dress Code
- Personal Space
- Attending a Meeting
- Handle Collective Property
- Common Courtesy

Language Skills

- Speak on the Telephone
- How to Introduce Yourself
- Listening and Understanding
- Engage in a Two-Way Conversation

Customer Service

- Handling a Telephone Call



For more information on our range of learning resources, please contact:

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