

Exercises to Prepare for Your Students for their STARBASE Academy Experience

Knowledge or Skill	How to prepare the students.
Activate Prior Knowledge	Develop a KWL chart with students to activate their existing knowledge or experience with STEM education. Before STARBASE asks students to record “what they know” and “what they want to know.” Revisit the KWL chart after the STARBASE experience.
Measurements	Practice measuring distance, liquid volume, and mass with the Metric System.
Review the Pre-Test	Review content shown in the pretest. The pretest is optional and available to school staff via Google Forms.
Vocabulary	Review the list of Vocabulary Words students will encounter.

Vocabulary List

Absorbent—A substance that is capable of absorbing. [Chromatography]

Acceleration—The rate of change of the velocity of a moving body. An increase in the magnitude of the velocity of a moving body (an increase in speed) is called a positive acceleration; a decrease in speed is called a negative acceleration. [Introduction to Motion & Force]

Adhesive— A substance that unites or bonds surfaces together. [Fluid Characteristics]

Analytical Chemistry—A branch of chemistry that deals with the development and use of techniques for chemical measurement. These techniques are used in analyzing the chemical composition of substances. [Chromatography]

Atom—An atom is the smallest particle of an element that retains all the properties of that element.

Automated Fingerprint Identification System (AFIS)—A computer system that scans fingerprints from crime scenes and compares them with millions of others around the world [Fingerprint Analysis]

Biometrics— The measurement of physical characteristics, such as fingerprints, DNA, or retinal patterns, for use in verifying the identity of individuals. [Fingerprint Analysis]

Budget—The total sum of money allocated for a particular purpose or period of time. [Eggbert Extension Activities]

Capacity—The amount a container will hold. [Basic Measurement: Length]

Capillary Action—Capillary action is the tendency of a liquid to rise in narrow tubes or to be drawn into small openings such as those between grains of a rock. Capillary action, also known as capillarity, is a result of the intermolecular attraction within the liquid and solid materials. A familiar example of capillary action is the tendency of a dry paper towel to absorb a liquid by drawing it into the narrow openings between the fibers. [Chromatography]

Characteristic Properties—A characteristic property is a chemical or physical property that helps identify and classify substances. The characteristic properties of a substance are always the same whether the sample you are observing is large or small. Examples of characteristic properties include freezing/melting point, boiling/condensing point, density, magnetism, and solubility. [Characteristic Properties]

Chemical Change—A change resulting from a chemical reaction in which bonds are broken and new bonds are formed between different atoms in a substance. A chemical change produces one or more new substances with different chemical properties. [Warm Ups and Cool Downs, Physical and Chemical Change Experiments, Double Bubble Trouble]

Chemical Energy—That part of the energy in a substance that can be released by a chemical reaction. [Energy Explorations, Double Bubble Trouble]

Chemical Formula—A model that gives information about the atoms that makes up a particular chemical compound. They are used in chemical equations to represent how atoms are rearranged in a chemical reaction. [Creating and Building Molecular Models, Double Bubble Trouble]

Chemiluminescent Reaction—A reaction in which light is emitted but no heat is emitted. [Physical and Chemical Change Experiments]

Chromatography—Any of various processes of chemical analysis in which the constituents of a mixture are separated into distinct bands or spots on an adsorbent material. [Chromatography]

Chromatogram—The pattern of separated substances obtained by chromatography. [Chromatograph]

Closed Circuit—An electrical circuit providing an uninterrupted, endless path for the flow of current. [littleBits of Energy]

Cohesive—Of or pertaining to the molecular force within a body or substance acting to unite its parts. [Fluid Characteristics]

Compounds—Substances made of two or more types of atoms. Example: Water (H_2O). [Creating and Building Molecular Models, Introduction to Fluid Mechanics, Double Bubble Trouble]

Conductor—A material or an object that conducts heat, electricity, light, or sound. [littleBits of Energy]

Conservation of Energy—A principle stating that the total energy of an isolated system remains constant regardless of changes within the system. [Energy Explorations]

Constant—Parts of the trial that remain the same each time the trial is repeated. [Introduction to Motion & Force]

Cooling—The flow of heat away from an object, measured by a decrease in temperature. [Physical and Chemical Change Experiments]

Data—Individual facts, statistics, or items of information. [Basic Graphing]

Density of Air— Mass per unit volume of Earth’s atmosphere. [Introduction to Fluid Mechanics]

Dynamic Electricity—A flow of electrical charge. [littleBits of Energy]

Endothermic Reaction—A chemical reaction that absorbs energy in the form of heat. [Warm Ups and Cool Downs, Double Bubble Trouble, Physical and Chemical Change Experiments]

Energy—A measure of the capacity to do work, expressed as the work that it does, measured in joules. [Physical and Chemical Change Experiments, Energy Explorations, Contraption Action!, Introduction to Renewable Resources]

Energy Input—The form of energy powering a system; the energy being changed. [Energy Explorations] Energy Output—The form of energy generated by a system; what the energy is changed into. [Energy Explorations]

Energy Transfer or Transformation—The change of energy from one form to one or more different forms. [Energy Explorations]

Engineering Design Process—A cyclical method of problem solving used to create a system, a product, or a process that meets an identified need. [Intro to Engineering Design Process, Robo Loops]

Exothermic Reaction—A chemical reaction in which energy is released in the form of heat. [Warm Ups and Cool Downs, Double Bubble Trouble, Physical and Chemical Change Experiments]

Expand—To increase in volume.

Fingerprint—An impression of the markings of the inner surface of the finger. [Fingerprint Analysis]

Flow—To move with a continuous change in placement and position of particles. [Applied Fluid Dynamics]

Fluids—Fluids are substances that flow freely and tend to assume the shape of the container in which they are held. Liquids, gases, and plasmas are considered fluids. [Introduction to Fluid Mechanics, Applied Fluid Dynamics]

Fluid Dynamics— The branch of fluid mechanics that is concerned with the movement of liquids and gases. [Introduction to Fluid Mechanics]

Fluid Mechanics—The study of the mechanical and flow properties of fluids, especially as they apply to practical engineering. [Applied Fluid Dynamics]

Fluid Statics— The branch of fluid mechanics that is concerned with fluids at rest. [Introduction to Fluid Mechanics]

Force—A push or a pull that gives energy to an object, sometimes causing a change in the motion of the object. [Introduction to Motion & Force, Energy Explorations, Applied Fluid Dynamics]

Forensic Science—The application of science to criminal and civil laws, mainly—on the criminal side—during criminal investigation, as governed by the legal standards of admissible evidence and criminal procedure. [Fingerprint Analysis]

Gases—The molecules in gases are not bound to one another. Because of this, a gas does not have a fixed shape or volume. It will expand to fill any container in which it is placed. Example: Air [Introduction to Fluid Mechanics, Physical and Chemical Change Experiments, Applied Fluid Dynamics, Double Bubble Trouble]

Graduated Cylinder—A container used for measuring liquids marked with a graded scale. [Basic Measurement: Liquid Volume, Double Bubble Trouble]

Gram—Standard metric unit used to measure the mass of an object. [Introduction to Motion & Force, Basic Measurement: Mass, My Ratio Is Sinking]

Graph—A diagram showing the relationship of quantities, especially such a diagram in which lines, bars, or proportional areas represent how one quantity depends on or changes with another. [Basic Graphing]

Gravitational Energy—The potential energy in an object due to its height. [Energy Explorations]

Heating—The flow of heat to an object and measured by an increase in temperature. [Physical and Chemical Change Experiments]

Hodometer— A device for measuring the length of a path, consisting of a wheel of known circumference attached to a rod held in the hand, and pushed along a surface, which is usually the ground or a floor. [Straw Rockets]

Inertia—The tendency of an object to resist a change in motion. An object at rest will remain at rest unless an outside force acts on it. An object in motion will continue in the same direction at the same speed, unless an outside force acts on it. Newton's First Law of Motion pertains to inertia. [Introduction to Motion & Force]

Kinetic Energy—The energy of a body with respect to its motion. [Introduction to Motion & Force, Physical and Chemical Change Experiments, Energy Explorations]

Lattice—An array of objects or points in a periodic pattern in two or three dimensions, esp an array of atoms, ions, etc, in a crystal or an array of points indicating their positions in space. [States of Matter]

Law of Conservation of Energy—The principle that energy cannot be created or destroyed, but simply changes from one form to another. [Physical and Chemical Change Experiments]

Lift—The component of the total aerodynamic force acting on an airfoil or on an entire aircraft or winged missile perpendicular to the relative wind and normally exerted in an upward direction, opposing the pull of gravity. [Applied Fluid Dynamics]

Light (Radiant) Energy—Energy in a form that can radiate or travel in waves, generally electromagnetic energy such as energy from the sun. [Energy Explorations]

Liquids—The molecules in liquids are loosely bound and are in motion. Because its molecules are loosely bound, a liquid will take the shape of the contain in which it is placed. Example: water. [Introduction to Fluid Mechanics, Physical and Chemical Change Experiments, Applied Fluid Dynamics, Double Bubble Trouble]

Liter—Standard metric unit used to measure liquid volume. [Basic Measurement: Liquid Volume]

Magnitude —The greatness of size or amount. [Introduction to Motion & Force]

Mass—The amount of matter in an object, independent of gravity. Mass is different from weight of an object. Weight is the gravitational effect on mass. [Introduction to Motion & Force, Basic Measurement: Mass, My Ratio Is Sinking]

Matter—Anything that has mass and occupies space. [Physical and Chemical Change Experiments]

Mean—The average value of a set of numbers. [Basic Graphing]

Mechanical Energy—The sum of potential energy and kinetic energy; the energy associated with the motion and position of an object. [Energy Explorations]

Medium—Intervening substance through which something else is transmitted or carried on. [Chromatography]

Meniscus—The convex or concave upper surface of a column of liquid; the curvature of which is caused by surface tension. [Basic Measurement: Liquid Volume, Physical and Chemical Change Experiments]

Meter—International standard unit of length, approximately equivalent to 39.37 inches. [Global Positioning Systems, Basic Measurement: Length, STEM Time Capsule, Does Your Robot Measure Up?]

Metric System—Universal system of measurement used by scientist all over the world; based on 10 and powers of 10. [Basic Measurement: Length, Basic Measurement: Liquid Volume, Basic Measurement: Mass, STEM Time Capsule, Does Your Robot Measure Up?]

Molecule—The smallest particle of an element or compound that retains the chemical and physical properties of the substance; composed of two or more atoms chemically bonded. [Creating and Building Molecular Models, Introduction to Fluid Mechanics, Physical and Chemical Change Experiments, Nanotechnology: Minuscule Matters, Double Bubble Trouble]

Neutron— A subatomic particle with roughly the mass of a proton and no electric charge. [Creating and Building Molecular Models]

Non-polar Molecules—A non-polar molecule is one that the electrons are distributed more symmetrically and thus does not have an abundance of charges at the opposite sides. The charges all cancel out each other. [Chromatography]

Nuclear Energy—Energy released by a nuclear reaction (either through nuclear fission or nuclear fusion) and used as a power source. [Energy Explorations]

Nucleus—The center or core of an atom. It is made up of protons and neutrons. [Creating and Building Molecular Models]

Open Circuit—An electrical circuit through which current cannot flow because the path is broken or interrupted by an opening. [littleBits of Energy]

Opposite Side—The side opposite the reference angle. The opposite side cannot be the hypotenuse. [What's My Angle?]

Periodic Table of Elements—A list of elements ordered in rows according to atomic number (number of protons in the nucleus of an atom of the element). The rows are arranged so that elements with similar chemical properties occur in the same column. [Creating and Building Molecular Models]

Physical Change—A change in physical properties that does not affect the chemical nature of a substance. Examples would include changes in texture, shape, size, color, odor, volume, mass, weight, and density. [Warm Ups and Cool Downs, Physical and Chemical Change Experiments, Double Bubble Trouble]

Pigment—Any material from which a dye, a paint, or the like, may be prepared. [Chromatography]

Plasma—The molecules in plasma are, like gases, not bound to one another, neither do they have a fixed shape or volume. The kinetic energy level of plasmas is so great it gives off light. Examples include most stars, neon signs, fluorescent lights, and lightning. [Physical and Chemical Change Experiments]

Polar Molecules—Chemical bonding is the result of either an atom sharing one or more outer orbit electrons with another atom or an atom taking outer orbit electrons from the atom with which it is bonding. Normally, an atom has an even distribution of electrons in the orbits or shells, but if more end up on one side than the other in a molecule, there can be a resulting electrical field in that area. Water is a polar molecule because of the way the atoms bind in the molecule such that there are excess electrons on the oxygen side and a lack or excess of positive charges on the hydrogen side of the molecule. [Chromatography]

Potential Energy— Energy that is stored within an object, not in motion but capable of becoming active. A raised weight, coiled spring, or charged battery has potential energy. [Introduction to Motion & Force, Physical and Chemical Change Experiments, Energy Explorations]

Pressure—The application of continuous force by one body on another that it is touching; compression. [Applied Fluid Dynamics]

Programming Language—An artificial language used to write instruction that can be translated into machine language and then executed by a computer. [Introduction to Robotics]

Protons—Subatomic particles with a positive electric charge found in the nucleus of an atom. [Creating and Building Molecular Models, littleBits of Energy]

Quotient—The number obtained by dividing one quantity by another. In $45 \div 3 = 15$, 15 is the quotient. [Eggbert Extension Activities]

Ridgeology—An evaluative method of friction ridge identification based on scientific principles and procedures, principles, and procedures that have been established and verified through years of research. [Fingerprint Analysis]

Robot—A machine that is programmed to do work on its own, automatically. [Introduction to Robotics, Robo Putt-Putt]

Scientific Law—A law generalizes a body of observations. At the time it is made, no exceptions have been found to a law. Scientific laws explain things, but they do not describe them. Also, a phenomenon of nature that has been proven to invariably occur whenever certain conditions exist or are met. [Introduction to Motion & Force]

Single and Double Bonds—A single bond is a chemical bond in which one pair of electrons is shared by two atoms in a molecule. A double bond is a chemical bond in which two pairs of electrons are shared by two atoms in a molecule. [Creating and Building Molecular Models]

Slope—In graphing, slope refers to the general direction in which a line points. It is usually referenced as a positive, negative, or zero slope. [Warm Ups and Cool Downs]

Solids—The molecules in solids are bound tightly and do not move much. This is why solids maintain their shape and volume. Example: rock. [Physical and Chemical Change Experiments, Applied Fluid Dynamics, Double Bubble Trouble]

Solubility—The ability of a substance to dissolve. The quantity of a substance that may be dissolved in a given amount of solvent. [Chromatography, Characteristic Properties, What's the Solution, Finding the Percentage of a Solute]

Solute—A substance dissolved in a solution. For solutions of fluids, the solvent is present in greater amount than the solute. [Chromatography, Characteristic Properties, What's the Solution, Finding the Percentage of a Solute]

Solution—A solution is a homogeneous mixture of two or more substances that can exist in any phase. An example of a solid solution is brass. An example of a liquid solution is aqueous hydrochloric acid. An example of a gaseous solution is air. [Chromatography, What's the Solution, Finding the Percentage of a Solute]

Solvent—The component of a solution that is present in the greatest amount. It is the substance in which the solute is dissolved. [Chromatography, Characteristic Properties, What's the Solution, Finding the Percentage of a Solute]

Sound Energy—Energy present in a sound wave. [Energy Explorations]

State of Matter— Distinct forms in which material can exist: solid, liquid, gas, and plasma. [Physical and Chemical Change Experiments, Energy Explorations]

Static—Having no motion; being at rest; quiescent. [Applied Fluid Dynamics]

Static Electricity—Electrical charge that accumulates on an object rather than flowing through it as a current. [littleBits of Energy]

Surface tension—A property of liquids arising from unbalanced molecular cohesive forces at or near the surface, as a result of which the surface tends to contract and has properties resembling those of a stretched elastic membrane. [Applied Fluid Dynamics]

System—A group of interacting, interrelated, or interdependent elements forming a complex whole. [Energy Explorations, Robo Loops, Coding the Road]

Table—An arrangement of words, numbers, or signs, or combinations of them, as in parallel columns, to exhibit a set of facts or relations in a definite, compact, and comprehensive form; a synopsis or scheme. [Basic Graphing]

Tangent—A tangent to a curve at a point is a straight line that touches the curve at that point. [What's My Angle?]

Temperature—The measurement of heat energy in a system or substance. [Warm Ups and Cool Downs, Physical and Chemical Change Experiments, Double Bubble Trouble]

Thermal Energy—Internal energy present in a system due to its temperature. [Energy Explorations, States of Matter]

Trend—The general course or prevailing tendency of a line of data. If one variable increases as the other increases, the trend is positive. If one variable decreases as the other increases, the trend is negative. If the data shows no relation then that set shows no trend. [Warm Ups and Cool Downs, Basic Graphing]

Trigonometry—The branch of mathematics concerned with the properties of trigonometric functions and their application to the determination of the angles and sides of triangles. Used in surveying, navigation, etc. [What's My Angle?]

Triple Beam Balance— An instrument that measures the mass of an object by using a set of three sliding weights to balance the mass on a pan. [Basic Measurement: Mass]

Unit Fraction—A unit fraction is a rational number written as a fraction where the numerator is one and the denominator is a positive integer. A unit fraction is therefore the reciprocal of a positive integer, $1/n$. Examples are $1/1$, $1/2$, $1/3$, $1/4$ etc. [Eggbert Extension Activities]

Velocity—The rate of motion in a particular direction. [Introduction to Motion & Force, Applied Fluid Dynamics]

Viscosity—The property of a fluid that resists the force tending to cause the fluid to flow. [Characteristic Properties, Applied Fluid Dynamics]

Volume—Amount of space an object occupies. [Basic Measurement: Length, Basic Measurement: Liquid Volume, Engineering Measurement Training, STEM Time Capsule, Buoyancy, Does Your Robot Measure Up?, My Ratio Is Sinking]

Weight—Measure of the pull of gravity on an object or substance. It is proportional to the mass. The greater the mass, the greater the weight. [Introduction to Motion & Force]

Work—Work is done upon an object when a force causes it to be moved or changed. [Energy Explorations]

X-Axis—The horizontal axis in a system of rectangular coordinates.

Y-Axis—The vertical axis in a system of rectangular coordinates.