

Vocabulary

Use the following activities to familiarize your students with words and terms they will hear and use at Jefferson Lab.

Travel Book Activities:

- Vocabulary List
- BEAMS BINGO sheets
- Element BINGO sheets
- Math Vocabulary BINGO sheets
- BEAMS Crossword Puzzle
- BEAMS Cryptograph
- BEAMS Word Search
- Element Word Search
- BEAMS Fractions
- Scrambled Science Words
- BEAMS Spelling Search

Virginia State Standards of Learning

English 6.3 Reading/Literature

- by learning the meanings of unfamiliar words

Science 6.5 Matter

- by understanding that atoms are made up of electrons, protons and neutrons
- by understanding that atoms of any element are alike but are different from atoms of other elements
- by learning historical development and significance of discoveries related to the atom

PS.4 Periodic Table of Elements

- by understanding symbols, atomic numbers and atomic mass

Vocabulary List

Accelerate - to speed up

Accelerator - a machine which accelerates charged particles to high energies

Antimatter - matter that is exactly the opposite in every way from its matter counterpart: antiquark/quark; positron/electron

Atom - the smallest unit of a chemical element, made up of a nucleus surrounded by electrons

Beam - a ray of light; a group of particles traveling together along a well-defined path

BEAMS - the acronym for Becoming Enthusiastic About Math and Science

CEBAF - former name of Jefferson Lab; stands for Continuous Electron Beam Accelerator Facility

Celsius - a temperature scale on which water freezes at 0° and boils at 100°

Charge - the amount of electricity carried by a body (A charge can be negative, like an electron, or positive, like a proton. Objects with opposite charges attract one another, while objects with like charges repel one another.)

Chemical Change - a change in the chemical composition of a substance to produce a new material with new properties (An example of a chemical change is wood turning to ash and smoke when it burns.)

Chemical Properties - characteristics of a substance that determine how it will react with other substances

Chemical Reaction - a chemical change in which one or more substances are changed into one or more new substances

Circuit - a closed path through which an electric current flows

Colloidal Suspension - a material that has properties of more than one state of matter, such as Jell-o

Compound - a substance composed of two or more elements, such as water (H₂O), carbon dioxide (CO₂), or table sugar (C₁₂H₂₂O₁₁)

Computer - a programmable machine that inputs, processes and outputs data

Coordinate - a set of numbers that determines the location of a point in space

Conduction - the transportation of heat or electricity from one place to another directly through an object (A frying pan is warmed by a hot stove due to conduction.)

Conductor - a material (like a metal) through which electricity and heat flow easily

Continuous - steady; uninterrupted

Convection - the transportation of heat from one place to another by the movement of a liquid or gas (A classroom is warmed by a hot air blower due to convection.)

Cryogenics - the science of very low temperatures, far below the freezing point of water

Data - a group of measurements, facts or statistics

Dependent Variable - the responding variable; the variable that may change as a result of a change in the independent variable

Electric Current - movement of electricity, measured in charges per second (just as river current is measured in liters per second)

Electromagnet - a wire coil around a metal core (usually iron) that acts like a magnet when an electric current flows through it

Electron - a tiny particle with a negative charge which orbits an atom's nucleus

Element - any substance that cannot be broken up into simpler substances by chemical means (Currently 115 elements have been observed and are displayed on the Periodic Table of Elements. Gold, silver, iodine, oxygen and nickel are examples of elements.)

Energy - the capacity to do work

Engineer - a person who uses science and math to design, build or operate equipment, structures and systems (A person who receives a college degree in engineering might be an electrical, mechanical, industrial, chemical, environmental, biochemical or aeronautical engineer.)

Experiment - a series of actions carried out to test a theory, demonstrate a fact or find out what happens

FEL - stands for Free Electron Laser; a tunable laser made by wiggling a beam of electrons (Jefferson Lab's FEL is the most powerful in the world.)

Fahrenheit - a temperature scale at which water freezes at 32° and boils at 212°

Force - a push or pull (There are four basic forces: gravitational, electromagnetic, strong nuclear and weak nuclear.)

Gas - a state of matter with no definite shape or volume, like air

Gluons - particles that hold quarks together

Graph - information represented in the form of a picture, diagram or drawing

Grid - a pattern of horizontal and vertical lines forming squares of uniform size on a map or chart

Helium - a colorless, odorless, tasteless gas (Helium becomes a liquid near absolute zero. Liquid helium is used to cool Jefferson Lab's accelerator components.)

HTML - an acronym for HyperText Markup Language; the programming language or code used for the creation of internet web pages

Hypothesis - an educated guess that can be tested or investigated

Independent Variable - the manipulated variable; the variable that is changed on purpose in an experiment

Injector - the first section of an accelerator, where electrons are torn away from atoms and accelerated to an energy sufficient for them to be injected into the cavities of the accelerator

Insulator - a material through which electricity or heat does not flow easily (like many plastics, glasses and ceramics)

Interact - act with each other

Internet - a worldwide network of computers linked together for the purpose of exchanging information (also sometimes called the Information Superhighway or Cyberspace)

Ion - an atom or molecule that has an electric charge because it has either gained or lost electrons

Jefferson Lab - a nuclear physics research facility built to explore quarks in the nucleus of the atom, located in Newport News, Virginia

Kelvin - a temperature scale that begins at absolute zero, where there is no molecular movement (Water freezes at 273 K and boils at 373 K.)

Laboratory - a place equipped for scientific research, experiments or testing

Lepton - one of the two basic building blocks of matter (An electron is a lepton.)

LINAC - an abbreviation for Linear Accelerator

Linear Accelerator - a machine used in physics experiments that makes particles go faster in a straight line

Liquid - a state of matter with definite volume but no definite shape, like water

Magnet - a piece of iron or other material that attracts other pieces of iron or steel

Magnification - the process of making something look bigger

Mass - the measure of the amount of matter an object has in it; measured in grams or kilograms

Matter - something that has mass which can exist in the form of a solid, liquid, gas or plasma

Mean - the sum of the items in a set of data divided by the number of items in the set; the average (The mean of {1,1,1,2,4,6,6} is 3 since $(1 + 1 + 1 + 2 + 4 + 6 + 6) \div 7 = 3$.)

Median - the middle number in a set of ordered data (The median of {1,1,1,2,4,6,6} is 2 since 2 is the middle number when all of the numbers are placed in order. If there are an even number of numbers, the median is the mean of the two middle numbers.)

Meson - particle made of a quark and an antiquark that is thought to bind protons and neutrons together inside the nucleus of an atom

Microscope - an optical instrument that uses a combination of lenses to produce magnified images of very small objects

Mixture - a substance composed of two or more components, each of which retain its own properties (A salad is a mixture of vegetables.)

Mode - the data item that occurs the most often in a set of data (The mode of {1,1,1,2,4,6,6} is 1 since 1 is the number that appears most often.)

Molecule - two or more elements that are chemically joined (Water is a molecule made from two atoms of Hydrogen and one atom of Oxygen.)

Negative - having a minus charge (Negative charges are attracted to positive charges and are repelled by other negative charges.)

Neutral - having no charge

Neutron - a neutral particle made of three quarks found in the nucleus of an atom

Nitrogen - a colorless, odorless, tasteless gas which makes up 78% of the air (Nitrogen is a gas at room temperature and becomes a liquid at about 77 K, -196°C or -321°F.)

Nuclear Physics - the science of studying the nucleus of the atom

Nucleon - a proton or a neutron

Nucleus - the central part of an atom, which makes up 99.9% of the atom's mass

Observation - the use of one's senses to learn something new

Orbit - the path an object follows as it travels around another object

Particle - a very small piece or part; an indivisible object

Physical Change - a change that affects the size, shape or color of a substance but does not affect its composition

Physics - the study of matter, energy and force

Plasma - a very hot, gas-like state of matter

Pole - the place on a magnet where the magnetic field is strongest

Positive - having a plus charge (Positive charges are attracted to negative charges and are repelled by other positive charges.)

Probe - an object or device used to investigate the unknown

Property - any characteristic or attribute of an object or substance

Proton - a positively charged particle found in the nucleus of an atom

Prototype - an original type that serves as a model for later examples

Quadrant - one quarter of the coordinate plane (The x- and y-axes divide the coordinate plane into four quadrants.)

Qualitative - observations that do not involve measurements and numbers (“My brother is shorter than my sister,” is a qualitative observation.)

Quantitative - observations that involve measurements and numbers (“My brother is 30cm shorter than my sister,” is a quantitative observation.)

Quark - one of the two basic building blocks of matter (Scientists have discovered six different kinds of quarks: Top, Bottom, Up, Down, Strange and Charm.)

Radiation - the transportation of heat from one place to another by waves or particles (The Earth is warmed by the Sun due to radiation.)

Resistance - a measurement of how much a material opposes the flow of electricity (Wood has high resistance so it is a poor conductor of electricity. Copper has low resistance, so it is a good conductor of electricity.)

Scatter - to go in many directions

Science - the study of the natural world

Scientific Method - the ‘tool’ that scientists use to find the answer to questions (The Scientific Method allows scientists to solve complicated problems by taking a series of smaller steps:

- **identify the problem** - a scientific problem to be solved
- **research** - the process of collecting information and data about a topic being studied
- **hypothesis** - an idea about the solution to a problem, based on knowledge and research
- **experimentation** - the process of testing a hypothesis by collecting data under controlled, repeatable conditions
- **data analysis** - organizing and examining the collected data using narratives, charts, graphs or tables

- **conclusion** - a summary of the results of the experimentation and a statement of how the results relate to the hypothesis

Scientist - a person who uses observation, experimentation and theory to learn about a subject (Biologists, physicists, chemists, geologists and astronomers are all scientists.)

Solid - a state of matter with definite shape and volume, like ice

Speed - a measurement of distance traveled over time (example: 100 kilometers per hour)

Spreadsheet - a computer program used for organizing and analyzing data (Spreadsheets are arranged in **rows** and **columns**. A **cell** is a box in a spreadsheet where a row and column meet. The names of the row and column determine the name of the cell. For example, in the spreadsheet shown below, column C and row 2 meet at cell C2, the shaded box. The value in C2 is 1.23.)

	A	B	C	D	E
1	0.71	0.70	0.52	1.12	4.01
2	0.02	4.45	1.23	0.74	3.11
3	9.58	1.87	6.19	3.13	0.93

Superconductivity - the flow of electric current without any resistance in certain metals at temperatures near absolute zero (The superconductors used at Jefferson Lab are cavities made of niobium that are cooled to 2 K by liquid Helium.)

SURA - the acronym for Southeastern Universities Research Association (Jefferson Lab is managed by SURA.)

Teamwork - joint action by a group to complete a given task

Technician - a person who is an expert in doing certain technical jobs

Temperature - a measure of heat energy in an object, body or environment (Temperature can be measured using Fahrenheit, Celsius or Kelvin scales.)

Theory - a general principle that explains or predicts facts or events

Velocity - an object's speed and direction of motion

Voltage - electrical force or pressure (measured in volts)

Weight - a measure of the gravitational force pulling objects to the earth, moon or other celestial body (The more mass a planet has, the greater the gravitational pull of that planet will be. An object weighs more on the earth than it does on the moon because the earth has more mass than the moon.)