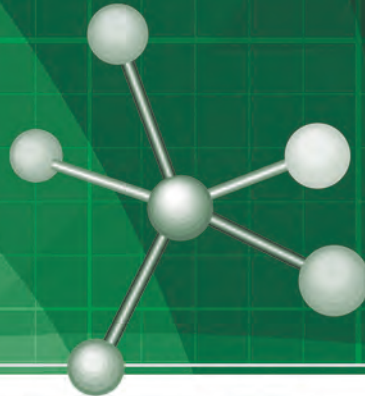
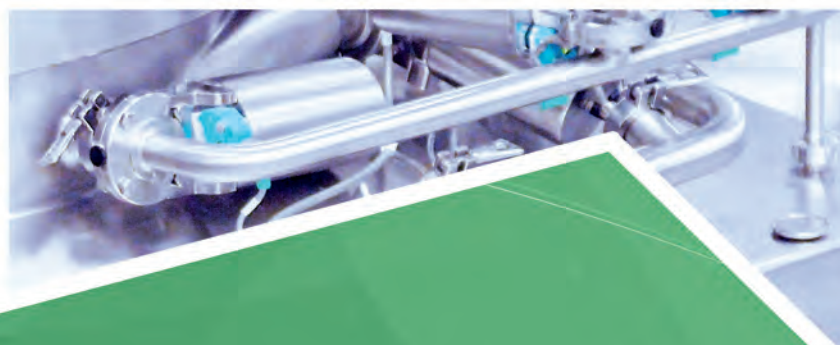
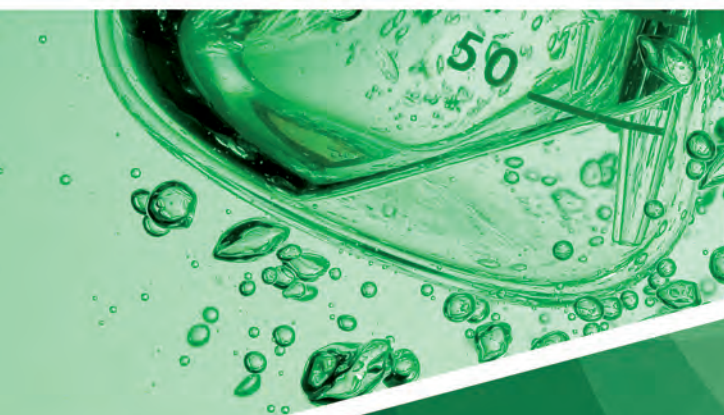


**CAREER
PATHS**

Elizabeth Norton, PhD
Jenny Dooley



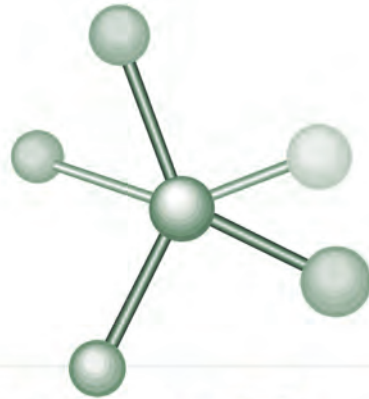
CHEMICAL ENGINEERING



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**CAREER
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Jenny Dooley



CHEMICAL ENGINEERING

Book
1



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Scope and Sequence

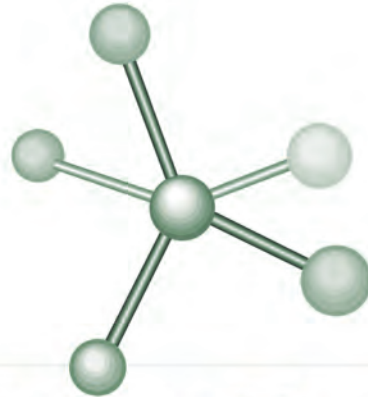
Unit	Topic	Reading context	Vocabulary	Function
1	The Chemical Engineer	Magazine article	alternative energy, chemical engineering, computer chip, controlled drug release, desalination, pharmaceuticals, rate process, research, synthesize, transform	Expressing an intention
2	Lab Containers	Email	beaker, buret, Erlenmeyer flask, funnel, graduated cylinder, lab, mortar and pestle, pipet, test tube, volumetric flask, wash bottle	Stating requirements
3	Lab Equipment	Product listing	balance, burner, desiccator, dropper, forceps, hot plate, spatula, stirring rod, thermometer, tongs	Asking about requirements
4	Lab Safety	Lab manual excerpt	coverall, eye wash station, flammable, fume hood, gloves, goggles, hazardous, respirator, safety can, toxic	Talking about obligation
5	Numbers and Basic Math	Chart	add, comes to, divided by, equals, hundred, less, minus, multiplied by, over, plus, subtract, times	Apologizing
6	Analyzing Quantities	Conversion guide	convert, decimal number, fraction, mixed number, -out of-, partial number, percent, point (.), quantity, reduce, whole number	Asking about a problem
7	The Scientific Method	Textbook excerpt	conclusion, control group, experiment, experimental group, hypothesis, independent variable, observation, problem, result, testable	Asking about intentions
8	Large Numbers	Lab manual excerpt	cubed, exponent, integer, leading zero, order of magnitude, rounding error, scientific notation, significant figure, squared, to the nth power, trailing zero	Giving a reminder
9	Describing Changes	Abstract	climb, decline, decrease, expand, fluctuate, increase, plummet, rise, shrink, stabilize	Delivering bad news
10	Tables and Graphs	Note	bar graph, column, legend, line graph, pie chart, row, scatter plot, table, x-axis, y-axis	Clarifying information
11	Measurements 1	Webpage	analytical balance, calibrate, gram, kilogram, mass, metric, milligram, ounce, pound, scales, weight	Asking for a favor
12	Measurements 2	Textbook passage	Celsius, convert, cubic centimeter, degree, Fahrenheit, Kelvin, liter, milliliter, scale, temperature, volume	Making a request
13	SI Units	Chart	amount, base unit, derived unit, energy, force, Joule, molar mass, mole, Newton, Pascal, pressure, SI	Making a suggestion
14	Problem-Solving	Blog entry	analysis, application, approach, iteration, iterative, method of attack, procedure, redefine, solution, synthesis	Asking for advice
15	Describing Matter	Textbook passage	compound, element, heterogenous, homogenous, matter, mixture, phase, separate, substance, uniform	Asking about difference

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**CAREER
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Jenny Dooley



CHEMICAL ENGINEERING

Book
2



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Scope and Sequence

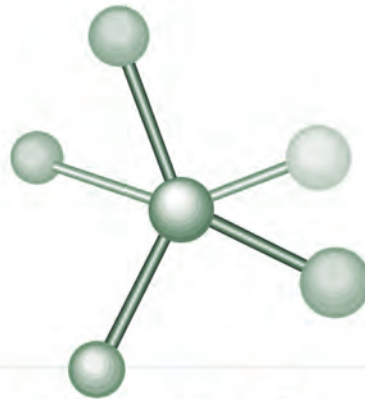
Unit	Topic	Reading context	Vocabulary	Function
1	Traits of a Chemical Engineer	Job posting	ability, commitment, critical thinking, curious, dedicated, expertise, focus, goal-oriented, innovative, logical, out-of-the box, team player	Discussing skills
2	Education	Webpage	bachelor's degree, biology, calculus, doctoral, engineering, fluid mechanics, master's degree, organic chemistry, PhD, physics, postgraduate, prerequisite, undergraduate	Describing requirements
3	Statistics	Textbook passage	central tendency, deviation, mean, mean absolute deviation, median, mode, population, range, raw data, sample, statistics, variance, variation	Asking for repetition
4	Accounting	Textbook entry	accumulation, closed system, consumption, extensive quantity, final, generation, initial, input, intensive quantity, open system, output, system, UAE (Universal Accounting Equation)	Agreeing and disagreeing
5	Rate Processes	Report	driving force, flow rate, flux, inlet, outlet, pressure, rate, rate process, resistance, viscosity	Asking about knowledge
6	Matter	Encyclopedia entry	atom, atomic number, compound, diatomic, electron, ion, isotope, mass number, molecule, neutron, nucleus, proton, subatomic particle	Interrupting
7	Energy	FAQs	chemical energy, conserve, electromagnetic, energy efficiency, energy quality, frame of reference, heat, kinetic energy, potential energy, radiation, thermal energy, transfer, work	Offering help
8	The Periodic Table 1	Syllabus	atomic radius, block, electron affinity, electron configuration, electron shell, element symbol, group, ionization energy, period, periodic table, valence electron, valence shell, VSEPR theory	Expressing a lack of understanding
9	The Periodic Table 2	Textbook entry	actinide, alkali metal, alkali-earth metal, chalcogen, halogen, inert gas, lanthanide, metalloid, noble gas, non-metal, post-transition metal, transition metal	Expressing uncertainty
10	Laws and Theories	Chart	Avogadro's law, Boyle's law, Charles's law, Dalton's law, Henry's law, Hess's law, law of chemical combination, law of combining volumes, law of conservation of mass, law of definite proportions, law of multiple proportions, laws of thermodynamics	Correcting oneself
11	Bonding	Textbook entry	bond energy, bond length, bond order, chemical bond, covalent bond, covalent compound, dipole moment, electronegativity, ionic bond, oxidation number, polar covalent bond, polarity	Showing understanding
12	Bonding in Organic Molecules 1	Journal article	alkane, alkene, alkyne, aromatic hydrocarbon, cis, cracking, fullerene, geometric isomer, hydrocarbon, nanotube, reforming reaction, saturated, trans, unsaturated	Giving an opinion
13	Bonding in Organic Molecules 2	Webpage	alcohol, aldehyde, alkyl halide, amide, amine, carboxylic acid, ester, ether, free radical, functional group, hydrogenation, ketone, phenol, triglyceride	Explaining a process
14	Bonding in Transition Metals	Chapter review	backbonding, coordination complex, crystal field splitting energy (Δ_0), crystal field theory, dative bond, high-spin complex, ligand, ligand-to-metal ($L \rightarrow M$) π donation, ligand-to-metal ($L \rightarrow M$) σ donation, low-spin complex, metal-to-ligand ($M \rightarrow L$) π donation, δ bond	Expressing confusion
15	Phase Transitions	Poster	boiling point, condensation, deposition, evaporation, freezing, gas, liquid, melting point, phase, phase diagram, phase transition, solid, sublimation, triple point	Checking information

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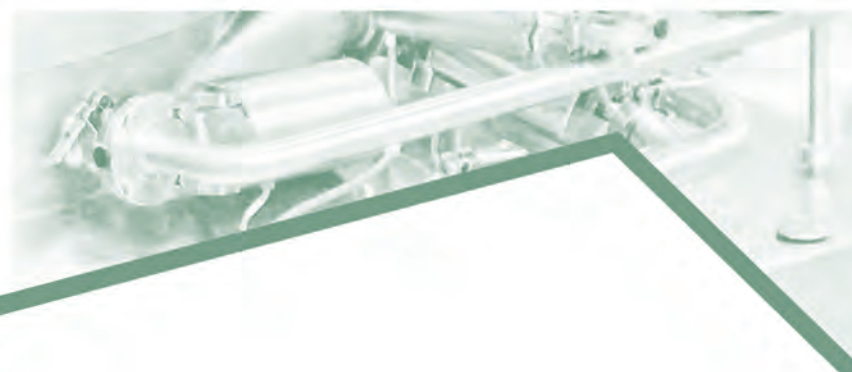
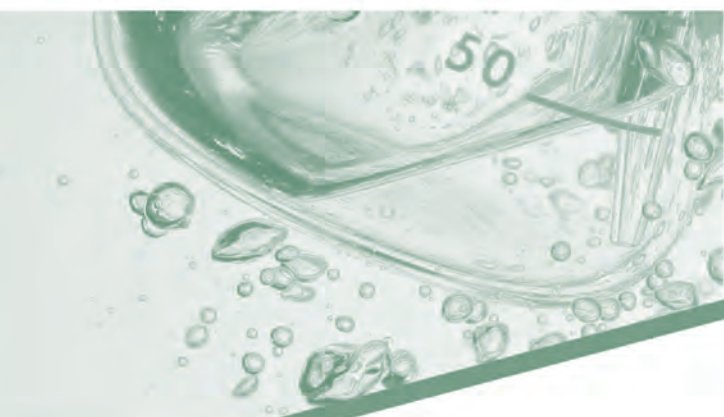
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**CAREER
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CHEMICAL ENGINEERING



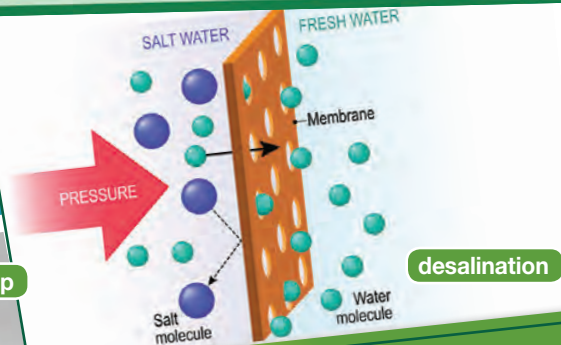
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Scope and Sequence

Unit	Topic	Reading context	Vocabulary	Function
1	Parts of a Reaction	Report	actual yield, catalyst, concentration, in excess, limiting reactant, percentage yield, precipitate, product, reactant, reagent, solute, solution, solvent, theoretical yield	Citing information
2	Types of Reactions	Chart	acid-base reaction, addition, complexation, decomposition, double replacement, elimination, oxidation, photochemical reaction, precipitation, redox reaction, reduction, single replacement, solid-state, substitution, synthesis	Making a suggestion
3	Stoichiometry	Textbook entry	balance, coefficient, composition stoichiometry, consume, endothermic, equation, exothermic, gas stoichiometry, nomenclature, reaction stoichiometry, residue, shortfall, stoichiometric ratio, stoichiometry	Asking about certainty
4	Equilibrium	Encyclopedia entry	chemical equilibrium, dynamic equilibrium, entropy, equilibrium, equilibrium constant, Gibbs free energy, phase equilibrium, reaction rate, reverse reaction, spontaneous, thermodynamic equilibrium, water vapor	Expressing a misconception
5	Mass Balance	Article	cyclic, density, dispersion, dosage, granular material, Haber process, mass balance, mass feedback, mass flow, miscible, mixing assumption, nonreactive, perfectly mixed, toxic, ventilation	Stressing a point
6	Membrane Separation	Journal article	dialysis, filtration, hemodialysis, hollow fiber membrane, membrane, permeability, permeate, pore, raffinate, reverse osmosis, semipermeable, species, surface area, urea	Summarizing
7	Continuous Stirred-Tank Reactors	Email	capital cost, CSTR (Continuous Stirred-Tank Reactors), effluent, first-order reaction, impeller, isothermal, operating cost, product stream, recover, residence time, separator, slurry, tank, throughput, unconverted reactant	Describing ability
8	Plug Flow Reactors	FAQs	Arrhenius temperature dependence, catalytic reactor, distillation, efficiency, gradient, irreversible, packed bed, plug, plug flow, PFR (Plug Flow Reactor), pump, steady-state, tubular reactor, uniformity	Discussing pros and cons
9	Batch Reactors	Product listing	agitator, baffle, batch reactor, Coflux jacket, continuous, control, cooling jacket, fed batch reactor, half coil jacket, semi-batch reactor, single external jacket, stability, uniformity	Asking for a recommendation
10	Bioreactors	Letter	activated sludge, aeration basin, biomass, bioreactor, BOD, floc, fluidized bed, membrane bioreactor, microorganism, moving bed, oxidation ditch, rotating biodisk tank, submersible, trickling bed, wastewater treatment	Expressing concern
11	Interfacial Mass Transfer	Textbook entry	absorption, adsorption, continuous phase, crystallization, desorption, dispersed phase, homogenization, interfacial, liquid-gas system, liquid-liquid system, solid-gas system, solid-liquid system, solvent extraction, stripping, two-phase system, unit operation	Clarifying information
12	Equilibrium Staged Processes	Employ manual	cascade, cocurrent, countercurrent, crosscurrent, deplete, enrich, equilibrium stage, flash calculation, flash distillation, flash drum, knock-out pot, partition, stage efficiency	Expressing lack of knowledge
13	Energy Balance and Heat Exchange	Textbook entry	adiabatic, BTU, calorie, energy balance, enthalpy, expansion work, heat capacity, insulated system, internal energy, rigid, shaft work, specific heat	Expressing interest
14	Commercial Applications	Article	chemical sensor, colloid science, impurity, medication, nanotechnology, plastics, polymeric material, recyclable, regenerate, scaffold, tissue engineering, toxicity	Making predictions
15	Career Options	Webpage	advisor, bioscience, design engineer, environmental, investigation, manufacturing engineer, photovoltaic, professor, public policy, renewable energy, researcher, sales engineer, solar	Describing experience

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Chemical Engineers

Chemical engineers work on all sorts of jobs. **Chemical engineering** applies to nearly every field. Some engineers **research** new forms of **alternative energy**. Others improve **rate processes** for chemical plants. Many engineers **synthesize** new chemicals and **transform** existing ones.

Often, chemical engineers try to solve major problems. For instance, some engineers develop **desalination** methods. Desalination will create fresh water where it is needed.

A current chemical engineering project involves **pharmaceuticals**. Its engineers want to create a special **computer chip**. The pharmaceutical chip will provide a **controlled drug release**. As a result, people will not need to take medicine regularly.

Get ready!

1 Before you read the passage, talk about these questions.

- 1 What jobs do chemical engineers perform within the medical industry?
- 2 What kind of problems do chemical engineers try to solve?



Reading

2 Read the magazine article. Then, choose the correct answers.

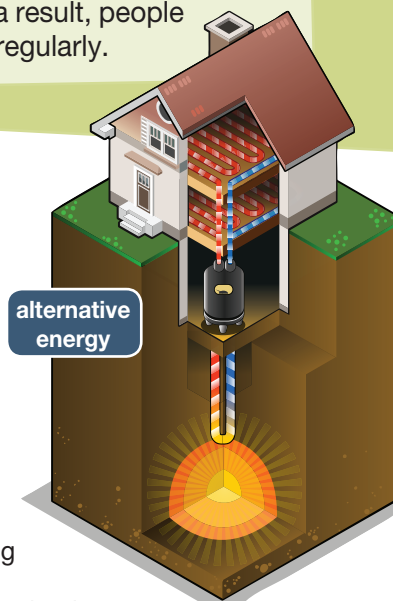
- 1 What is the main idea of the article?
 - A types of work chemical engineers perform
 - B how to become a chemical engineer
 - C the history of chemical engineering
 - D problems engineers currently face
- 2 Which of the following chemical engineering projects was NOT mentioned?
 - A developing alternative energy sources
 - B synthesizing new chemical compounds
 - C making faster medical computers
 - D creating new desalination methods
- 3 According to the passage, what is a potential benefit of chemical engineering in pharmaceuticals?
 - A new ways to eliminate salt
 - B devices that release medicines
 - C higher concentrations of chemicals
 - D computer chips that create energy

Vocabulary

3 Match the words or phrases (1-6) with the definitions (A-F).

- 1 ___ transform
- 2 ___ desalination
- 3 ___ pharmaceuticals
- 4 ___ computer chip
- 5 ___ alternative energy
- 6 ___ chemical engineering

- A a small circuit that transmits data
- B to cause something to change into something else
- C a source of power that doesn't consume fossil fuels
- D the process of removing salt from a substance
- E a branch of engineering that studies chemical manufacturing
- F compounds meant to be taken as medicine



4 Read the sentence pairs. Choose which word or phrase best fits each blank.

1 synthesize / research

- A Engineers must _____ a topic before working on it.
 B The engineer tried to develop a new way to _____ glue.

2 controlled drug release / rate process

- A With the _____, patients will no longer have to remember when to take pills.
 B The professor spent years trying to speed up the _____ of the production.

5 Listen and read the magazine article again. How can developing new desalination methods be helpful?

Listening

6 Listen to a conversation between a student and an advisor. Mark the following statements as true (T) or false (F).

- 1 ___ The woman worries about her future career.
 2 ___ The man recommends a career in research.
 3 ___ The woman agrees to follow the man's suggestion.

7 Listen again and complete the conversation.

Advisor: Jane, you wanted to see me.
Student: Yes, I'd like to change my **1** _____ .
Advisor: Really? Why's that?
Student: Well, I think **2** _____ is interesting. But I'm worried about finding a career after graduation.
Advisor: Hmm. Actually, there are lots **3** _____ for chemical engineers. I'd stay if I were you.
Student: **4** _____, but it really doesn't appeal to me.
Advisor: Oh, there's much more than that. Some **5** _____. Others develop alternative energy.
Student: Yeah, I guess so. Maybe **6** _____ change my major after all.

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

*You wanted to ...
 I'd like to ...
 There's more than ...*

Student A: You are an advisor. Talk to Student B about:

- the student's concerns
- career opportunities
- work chemical engineers perform

Student B: You are a student. Talk to Student A about your concerns for the chemical engineer's career.

Writing

9 Use the conversation from Task 8 to complete the student's notes.

Career Options

Chemical Engineer Work

Type of Work	Product

Glossary

- add** [V-T-U5] To **add** a number to another number is to increase it by that amount.
- alternative energy** [N-UNCOUNT-U1] **Alternative energy** is energy that comes from natural resources that do not use up fossil fuels.
- amount** [N-COUNT-U13] An **amount** is a total number of items grouped together.
- analysis** [N-COUNT-U14] **Analysis** is the act of closely examining something.
- analytical balance** [N-COUNT-U11] An **analytical balance** is a type of scale that can precisely measure mass in units as small as milligrams.
- application** [N-COUNT-U14] An **application** is the act of putting an idea into practice.
- approach** [N-COUNT-U14] An **approach** is a specific method someone uses to accomplish something.
- balance** [N-COUNT-U3] A **balance** is a device that lets someone measure the mass of an object.
- bar graph** [N-COUNT-U10] A **bar graph** is a graph in which the heights of different bars represent differing frequencies of particular variables.
- base unit** [N-COUNT-U13] A **base unit** is a unit that is not based on combinations of other units.
- beaker** [N-COUNT-U2] A **beaker** is a cylindrical, lipped container with a flat bottom that is commonly used in labs.
- buret** [N-COUNT-U2] A **buret** is a tall, cylindrical glass tube used in labs to accurately measure volume.
- burner** [N-COUNT-U3] A **burner** is a device that is used to heat or burn something.
- calibrate** [V-T-U11] To **calibrate** a measuring instrument is to check its measurements against a standard to make sure it is measuring accurately.
- Celsius** [N-UNCOUNT-U12] **Celsius** is a temperature measurement, estimated in a scale in which water boils at 100 degrees and freezes at 0 degrees.
- chemical engineering** [N-UNCOUNT-U1] **Chemical engineering** is a branch of engineering that is concerned with solving problems and producing products using chemistry. It is often involved with the design and operation of chemical plants.
- climb** [V-I-U9] To **climb** is to move to a higher amount or level.
- column** [N-COUNT-U10] A **column** is a vertical section of data in a table.
- comes to** [V-T-U5] When a mathematical operation **comes to** a number, it is the equivalent of that number.
- compound** [N-COUNT-U15] A **compound** is combination of two or more elements.
- computer chip** [N-COUNT-U1] A **computer chip** is a small circuit that transmits data. It is used in most electronic devices, especially computers.
- conclusion** [N-COUNT-U7] A **conclusion** is a decision or determination that is made after an experiment.
- control group** [N-COUNT-U7] A **control group** is a part of an experiment that does not receive the substance or treatment that is being tested.
- controlled drug release** [N-COUNT-U1] A **controlled drug release** is a system of delivering drugs into a body at controlled rates for an extended amount of time.
- convert** [V-T-U6] To **convert** something is to change it into a different form or system of measurement.
- coverall** [N-COUNT-U4] A **coverall** is a protective garment that is worn over clothes and protects all of the wearer's body except the hands, feet, and head.
- cubed** [ADJ-U8] If a number is **cubed**, it is multiplied by itself twice. For instance, 2 cubed (2^3) is 8 because $2 \times 2 \times 2 = 8$.
- cubic centimeter** [N-COUNT-U12] A **cubic centimeter** is a metric unit of volume equal to one centimeter in width, height, and depth.
- decimal number** [N-COUNT-U6] A **decimal number** is a number that contains a decimal point.
- decline** [V-I-U9] To **decline** is to become worse or smaller in amount.
- decrease** [V-T-U9] To **decrease** is to grow smaller in amount or numbers.
- degree** [N-COUNT-U12] A **degree** is a unit in a system of measuring temperature.

derived unit [N-COUNT-U13] A **derived unit** is a unit based on combinations of other units.

desalination [N-UNCOUNT-U1] **Desalination** is the process of removing salt from a substance, especially water.

desiccator [N-COUNT-U3] A **desiccator** is a sealable container used to preserve items that are sensitive to moisture.

divided by [V-T-U5] When number (A) **is divided by** another number (B), number A is split evenly into B number of parts.

dropper [N-COUNT-U3] A **dropper** is a small glass tube with a hole on one end and a squeezable bulb on the other.
Droppers are used to measure and move drops of liquid.

element [N-COUNT-U15] An **element** is a basic material that is made up of one particular type of atom.

energy [N-UNCOUNT-U13] **Energy** is the power that is present in everything in the universe and can be expressed as heat, light, or movement.

equals [V-T-U5] When a mathematical operation **equals** a number, it has the same value as that number.

Erlenmeyer flask [N-COUNT-U2] An **Erlenmeyer flask** is a cone-shaped container with a flat bottom and a narrow neck commonly used in labs.

expand [V-I-U9] To **expand** is to become larger in size.

experiment [N-COUNT-U7] An **experiment** is a scientific process that is designed to reveal the effect of something.

experimental group [N-COUNT-U7] An **experimental group** is a part of an experiment that receives the substance or treatment that is being tested.

exponent [N-COUNT-U8] An **exponent** is a number written in superscript above another number to identify how many times it should be multiplied by itself.

eye wash station [N-COUNT-U4] **An eye wash station** is a device that spouts water upwards and which is used in emergency situations when the eyes need to be rinsed quickly.

Fahrenheit [N-UNCOUNT-U12] **Fahrenheit** is a temperature measurement, estimated in a scale in which water boils at 212 degrees and freezes at 32 degrees.

flammable [ADJ-U4] If a substance is **flammable**, it burns quickly and easily.

fluctuate [V-I-U9] To **fluctuate** is to change regularly.

force [N-COUNT-U13] A **force** is an influence that causes something to move, or changes its movement.

forceps [N-PLURAL-U3] **Forceps** is a small hinged tool used to grasp objects that are too small for fingers to hold.

fraction [N-COUNT-U6] A **fraction** is a part of the whole. In mathematics, it is usually represented as two numbers divided by a line or bar.

fume hood [N-COUNT-U4] A **fume hood** is an enclosure in a lab that is well-ventilated so that volatile chemicals can be used or kept inside of it.

funnel [N-COUNT-U2] A **funnel** is a tube that is wide on one end and narrow on the other. Funnels are commonly used to guide a powder or liquid into a small opening.

gloves [N-PLURAL-U4] **Gloves** cover and protect the hands.

goggles [N-PLURAL-U4] **Goggles** are special glasses that protect a person's eyes.

graduated cylinder [N-COUNT-U2] A **graduated cylinder** is a tall cylindrical container used in labs to accurately measure the volumes of liquids.

gram [N-COUNT-U11] A **gram** is a metric unit of weight equal to 1/1000 kilogram or about 0.035 ounces.

hazardous [ADJ-U4] If something is **hazardous**, it is dangerous to a person's health or safety.

homogenous [ADJ-U15] If a material is **homogenous**, its properties are uniform throughout it.

heterogenous [ADJ-U15] If a material is **heterogenous**, it has different properties in its various regions.

hot plate [N-COUNT-U3] A **hot plate** is a device that includes a burner for heating something, which can be placed on a table.

-hundred [NUMBER-U5] **Hundred** is combined with another number to abbreviate numbers in the thousands. For example, the number 1,400 could be said "fourteen hundred".

hypothesis [N-COUNT-U7] A **hypothesis** is an idea or statement that explains something, but which has not been tested or proven correct.

Glossary

- increase** [V-T-U9] If you **increase** something, it grows larger in amount or numbers.
- independent variable** [N-COUNT-U7] An **independent variable** is the factor that changes from one group to another.
- integer** [N-COUNT-U8] An **integer** is a whole number, with no decimals or fractions.
- iteration** [N-COUNT-U14] An **iteration** is a single instance of doing something that is repeated.
- iterative** [ADJ-U14] If a procedure is **iterative**, it involves performing the same set of steps repeatedly.
- Joule** [N-COUNT-U13] A **Joule** is a derived unit that measures work or energy. It is equal to the amount of energy required to apply one Newton of force through the distance of one meter.
- Kelvin** [N-COUNT-U12] A **Kelvin** is an SI Unit for measuring temperature, equal to one degree Celsius. Its scale begins at absolute zero.
- kilogram** [N-COUNT-U11] A **kilogram** is a metric unit of weight equal to 1000 grams or about 2.2 pounds.
- lab** [N-COUNT-U2] A **lab**, or laboratory, is a workplace where scientists conduct research.
- leading zero** [N-COUNT-U8] A **leading zero** is a zero that leads a number string.
- legend** [N-COUNT-U10] A **legend** is a part of a chart or graph that gives instructions on how to read the chart or graph.
- less** [PREP-U5] If one number is **less** another number, it is reduced by that amount.
- line graph** [N-COUNT-U10] A **line graph** is a graph that connects data points on x and y-axis with a straight line.
- liter** [N-COUNT-U12] A **liter** is a metric unit of volume equal to 1000 milliliters.
- mass** [N-UNCOUNT-U11] **Mass** is the amount of matter that something contains.
- matter** [N-UNCOUNT-U15] **Matter** is anything that contains material and takes up space.
- method of attack** [PHRASE-U14] A **method of attack** is a way of tackling a problem.
- metric** [ADJ-U11] If a measurement is **metric**, it uses the system that is based on the kilogram and the liter.
- milligram** [N-COUNT-U11] A **milligram** is a metric unit of weight equal to 1/1000 gram.
- milliliter** [N-COUNT-U12] A **milliliter** is a metric unit of volume equal to 1/1000 liter.
- minus** [PREP-U5] If one number is **minus** a second number, the second number is subtracted from the first.
- mixed number** [N-COUNT-U6] A **mixed number** is a number consisting of a whole integer and a fraction.
- mixture** [N-COUNT-U15] A **mixture** is a collection of matter that can be separated into different substances using only physical means.
- molar mass** [N-COUNT-U13] A **molar mass** is a unit that measures the mass per mole of a substance. It is measured in kilograms per mole.
- mole** [N-COUNT-U13] A **mole** is a base unit that measures the amount of a substance. It is equal to the number of atoms in twelve grams of pure carbon-12.
- mortar and pestle** [N-COUNT-U2] A **mortar and pestle** is a combination of tools used to crush, grind and mix solid substances. The mortar is a bowl that holds the object being crushed. The pestle is a short hard object with a round end, which presses objects against the inside of the mortar.
- multiplied by** [V-T-U5] When number (A) **is multiplied by** another (B), then number A is added to itself B number of times.
- Newton** [N-COUNT-U13] A **Newton** is a derived unit that measures force. It is equal to the amount of force required to give one kilogram of matter an acceleration of one meter per second.
- observation** [N-COUNT-U7] An **observation** is a fact that is discovered by watching something closely.
- ounce** [N-COUNT-U11] An **ounce** is an imperial unit of weight equal to 1/16 pound or about 28.35 grams.
- **out of** - [PREP-U6] To describe an amount as one number **out of** another is to express a fraction in words. For instance, the fraction 5/6 can also be expressed as five out of 6.
- over** [PREP-U5] If a number is **over** another number, it is divided by that number.
- Pascal** [N-COUNT-U13] A **Pascal** is a derived unit that measures pressure. It is equal to one Newton per square meter.
- partial number** [N-COUNT-U6] A **partial number** is a number which is not a whole number.

percent [N-COUNT-U6] A **percent** is one part out of a hundred.

pharmaceuticals [N-PLURAL-U1] **Pharmaceuticals** are compounds manufactured for use as medicine.

phase [N-COUNT-U15] A **phase** is a collection of matter that is both chemically uniform and the same state of matter throughout.

pie chart [N-COUNT-U10] A **pie chart** is a chart that shows percentages of a whole by shading corresponding fractions of a circle.

pipet [N-COUNT-U2] A **pipet** is an instrument made from a glass tube that is used in labs to measure and transport small volumes of liquids.

plummet [V-I-U9] To **plummet** is to suddenly become much lower in amount or level.

plus [PREP-U5] If one number is **plus** another number, the two numbers are added together.

point [N-COUNT-U6] A **point** is a dot or period used to separate decimals from whole numbers.

pound [N-COUNT-U11] A **pound** is an imperial unit of weight equal to 16 ounces or about 0.45 kilograms.

pressure [N-UNCOUNT-U13] **Pressure** is the effect of force applied to an area of a surface.

problem [N-COUNT-U7] A **problem** is a question or situation that needs to be answered or resolved.

procedure [N-COUNT-U14] A **procedure** is a method of doing something.

quantity [N-COUNT-U6] A **quantity** is an amount of something. It can be either precise or indefinite.

rate process [N-COUNT-U1] A **rate process** is a process with results that depend on variables at a given time.

redefine [V-T-U14] To **redefine** something is to state it again in a different manner.

reduce [V-T-U6] To **reduce** a fraction is to simplify it by dividing both the numerator and denominator by their shared factors. For instance, if one reduces the fraction $\frac{4}{8}$, it becomes $\frac{1}{2}$ because each number can be divided by 2.

research [V-T-U1] To **research** something is to investigate it in a systematic way.

respirator [N-COUNT-U4] A **respirator** is a mask that is worn over the mouth and nose or the entire face, and which keeps a person from inhaling harmful substances.

result [N-COUNT-U7] A **result** is something that occurs because of something else.

rise [V-I-U9] To **rise** is to increase in quality or amount.

rounding error [N-COUNT-U8] A **rounding error** is a miscalculation that results from improperly rounding a number to a convenient number of decimals.

row [N-COUNT-U10] A **row** is a horizontal section of data in a table.

safety can [N-COUNT-U4] A **safety can** is a self-closing metal container that is designed to release vapor to relieve pressure when it is heated.

scales [N-PLURAL-U11] **Scales** refer to an instrument that calculates the weight of objects.

scale [N-COUNT-U12] A **scale** is the range of measurements in a specific system.

scatter plot [N-COUNT-U10] A **scatter plot** is a graph that shows data points on an x and y-axis, but not connected by any lines.

scientific notation [N-COUNT-U8] **Scientific notation** is a way of easily expressing very large or very small quantities. It incorporates the use of superscript digits. 3×10^6 , for example, is 3,000,000 written in scientific notation.

separate [V-T-U15] To **separate** something is to cause it to divide into two or more individual parts.

shrink [V-I-U9] To **shrink** is to become smaller in value or amount.

SI [ABBREV-U13] The **SI** (International System of Units) is a widely used system of units for measurement. It features seven base units and uses the metric system's prefixes.

significant figure [N-COUNT-U8] A **significant figure** is a digit that helps identify a number's precision. All numbers are significant except for leading and trailing zeros when they serve as placeholders, or digits that are introduced as a result of calculations that are carried out to more decimal places than the original numbers.

solution [N-COUNT-U14] A **solution** to a problem is the act, the state or the fact of solving a problem.

spatula [N-COUNT-U3] A **spatula** is a tool with a blade that is wide, flat and blunt. Spatulas are used to mix and spread substances.

Glossary

squared [ADJ-U8] If a number is **squared**, it is multiplied by itself. For instance, 2 squared (2^2) is 4 because $2 \times 2 = 4$.

stabilize [V-I-U9] To **stabilize** is to reach a state where changes are infrequent.

stirring rod [N-COUNT-U3] A **stirring rod** is a rod that is used to stir liquids in a laboratory. Stirring rods are usually made out of glass.

substance [N-COUNT-U15] A **substance** is a material that cannot be separated into two or more different materials using physical means.

subtract [V-T-U5] To **subtract** one number from another number is to reduce it by that amount.

synthesis [N-COUNT-U14] A **synthesis** is a combination of ideas into a whole.

synthesize [V-T-U1] To **synthesize** a compound is to create it from its chemical components.

table [N-COUNT-U10] A **table** is a visual representation of data made up of rows and columns.

temperature [N-UNCOUNT-U12] **Temperature** is the measurement of how hot or cold something is.

test tube [N-COUNT-U2] A **test tube** is a tube that is closed on one end and that is used for holding small amounts of material in labs.

testable [ADJ-U7] If something is **testable**, it can be proven or disproven by performing an experiment.

thermometer [N-COUNT-U3] A **thermometer** is a tool used to measure temperature. Traditional thermometers are graduated glass tubes with a chemical that expands in response to heat on the inside.

times [PREP-U5] If a number is **times** another number, it is multiplied by that number.

to the nth power [EXPRESSION-U8] If a number is multiplied **to the nth power**, it is multiplied by that exponent. For example, 2 to the fifth power has an exponent of five and, thus, is multiplied by itself five times to equal 64.

tongs [N-PLURAL-U3] **Tongs** are a hinged tool used to grasp objects because grasping them by hand would cause problems.

toxic [ADJ-U4] If something is **toxic**, it is poisonous to people and the environment.

trailing zero [N-COUNT-U8] A **trailing zero** is a zero that occurs in the decimal representation of a number. No other digits follow a trailing zero (or a series of trailing zeros), and they are always considered significant.

transform [V-T-U1] To **transform** something is to change it into something else.

uniform [ADJ-U15] If a material is **uniform**, it is the same throughout it.

volume [N-UNCOUNT-U12] **Volume** is the measurement of the amount of space something occupies.

volumetric flask [N-COUNT-U2] A **volumetric flask** is a container that is specifically designed to contain a specific amount of a substance at a certain temperature. Volumetric flasks are usually flat-bottomed and pear-shaped, with a thin, cylindrical neck.


wash bottle [N-COUNT-U2] A **wash bottle** is a bottle with a nozzle that can be squeezed to discharge liquids. They are commonly used in labs to clean other containers in laboratories.

weight [N-COUNT-U11] **Weight** is the measurement of how heavy something is.

whole number [N-COUNT-U6] A **whole number** is an integer with no fraction or decimal.

x-axis [N-COUNT-U10] The **x-axis** is the horizontal axis on a traditional graph.

y-axis [N-COUNT-U10] The **y-axis** is the vertical axis on a traditional graph.

The logo for 'Career Paths' is located in the top left corner. It features the words 'CAREER' and 'PATHS' in a stylized, bold, sans-serif font. 'CAREER' is positioned above 'PATHS', and both are set against a dark red background with a white outline. The background of the entire page is green with a white and yellow graphic element resembling a house or a roofline.A molecular structure icon consisting of a central grey sphere connected to five other spheres (one grey, four white) in a star-like arrangement.

CHEMICAL

ENGINEERING

Career Paths: Chemical Engineering is a new educational resource for chemical engineering professionals who want to improve their English communication in a work environment. Incorporating career-specific vocabulary and contexts, each unit offers step-by-step instruction that immerses students in the four key language components: reading, listening, speaking, and writing. **Career Paths: Chemical Engineering** addresses topics including laboratory equipment, safety procedures, chemical interactions, commercial applications, and career options.

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ISBN 978-1-4715-8647-7

