Davorka Rujevčan

English for Food Technology Students – part I

VELEUČILIŠTE U KARLOVCU
KARLOVAC, 2014.

Autor: Davorka Rujevčan, mag.educ.philol.angl.

Recenzenti: Vesna Vyroubal, mag.educ.
Dubravka Vuljanić, prof.
Mr.sc.Vesna Cigan

Nakladnik: Veleučilište u Karlovcu

Za nakladnika: dr.sc. Branko Wasserbauer

ISBN 978-953-7343-73-6

Contents

Unit I Experiments and scientific methods

Pre-reading exercise:

Do you know who Barnett Rosenberg is?
What did he discover?
What is an experiment? How would you define and describe it?
Have you ever done any experiments?

Experiments – basic terms

An experiment is a test or a trial. It is mostly directed toward answering a specific question or series of questions. Experiment and explanation are the heart of chemical research. A chemist makes observations under circumstances in which variables, such as temperature and amounts of substances, can be controlled. One could define an **experiment** as *an observation of natural phenomena carried out in a controlled manner so that the results can be duplicated and rational conclusions obtained.* As an example, Rosenberg's experiment can be mentioned. Rosenberg studied the effects of electricity on bacterial growth. Temperature and amounts of nutrients in a given volume of bacterial medium are important variables in such experiments. Unless these variables are controlled, the work cannot be duplicated, nor can any reasonable conclusion be drawn.

After a series of experiments, perhaps a researcher sees some relationship or regularity in the results. For example, Rosenberg noted that in each experiment in which an electric current was passed through a bacterial culture by means of platinum electrodes, the bacteria ceased dividing. If the regularity or relationship is fundamental and we can state it simply, we call it a law. **Laws** *are observations or experimental results that have been confirmed time after time*. They are usually simple verbal statements or equations. An example is the law of conservation of mass, which says that the mass, or quantity of matter, remains constant during any chemical change. Boyle's Law (the pressure of a gas multiplied by its volume is a constant in a closed system at a constant temperature).

At some point in a research project, a scientist tries to make sense of the results by devising an explanation. Explanations help us organize knowledge and predict future events. A **hypothesis** *is an idea put forward for testing; it suggests an idea that hasn't been carefully examined yet*. Having seen that bacteria ceased to divide when an electric current from platinum electrodes passed through the culture, Rosenberg was eventually able to propose the hypothesis that certain platinum compounds were responsible. If a hypothesis is to be useful, it should suggest new experiments that become tests of the hypothesis. Rosenberg could test his hypothesis by looking for the platinum compound and testing for its ability to inhibit cell division.

If a hypothesis successfully passes many tests, it becomes known as a theory. **Theories** *are more general constructions, put forth to explain either laws or behaviour that seems to follow some law*. Generally laws tell what happens, and theories explain why. An example is the molecular theory of gases—the theory that all gases are composed of very small particles called molecules. However, we cannot prove a theory absolutely. It is always possible that further experiments will show the theory to be limited or that someone will develop a better theory.

The two aspects of science, experiment and explanation, are closely related. A scientist performs experiments and observes some regularity; someone explains this regularity and proposes more experiments; and so on. From his experiments, Rosenberg explained that certain platinum compounds inhibit cell division. This explanation led him to the new

experiments on the anticancer activity of these compounds. Scientists' interpretations very often lead to new ideas, new experiments, and refinements and changes in the original ideas.

Scientific method *is the general process of advancing scientific knowledge through observation, the framing of laws, hypotheses, or theories; and the conducting of more experiments.* It is not a method for carrying out a specific programme, because the design of experiments and the explanations of results draw on the creativity and individuality of a researcher. The scientific method, then, has three basic elements:

1. First, you come up with the idea
2. Next, you perform your experiments and make observations to test the idea.
3. Finally, you interpret your results, and discard or modify your original idea if it is in conflict with the results.

To describe the information they obtain from experiments, scientists use three terms – data, results, and conclusion.

Data are the raw information you get from experiments, e.g. a description of the appearance of a reaction mixture.

Results are data presented in organized form, typically to describe the more important outcomes of experiments. They can be presented as a table summarizing the appearance of several reaction mixtures, a list or a graph.

Conclusions are the deductions and inferences that you draw from the results, e.g. the melting points of compounds containing metals are higher than the melting points of compounds that do not contain metals.

A key criterion of the scientific method is that data (experimental information) and results (the presentation of the data) should be reproducible if experiments are done in the same way. However, conclusions are attempts to classify or interpret the results.

I Read the sentences and decide if they are true or false. Correct the information in the false ones.

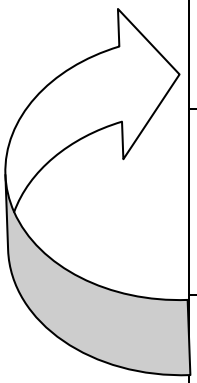
1) Rosenberg studied the effects of temperature on bacterial growth.
2) A theory means that a hypothesis has been confirmed several times.
3) An experiment is a test.
4) When performing an experiment, the conditions are usually controlled.
5) Results and data refer to the same thing.

II Vocabulary exercises - Match the words.

A	B
directed	**conditions**
bacterial	**information**
controlled	**medium / culture**
draw	**toward(s)**
obtain	**conclusions**

III Complete the diagram with the given words.

hypothesis / further experiments / results / negative / experiments / theory / positive



General steps	Rosenberg's work
_____ ⇩	Platinum electrodes are inserted into a live bacterial culture. Variables controlled: • Amount of nutrients in a given volume of bacterial medium • Temperature • Time
_____ ⇩	Bacteria ceased dividing
_____ ⇩	Certain platinum compounds inhibit cell division
_____ devised based on hypothesis ⇩	Look for platinum compounds in bacterial culture. Further test platinum compounds' ability to inhibit cell division.
_____ results lead to modification or rejection of hypothesis and formulation of new hypothesis.	_____ results support the hypothesis ⇩ Cisplatin, recovered from bacterial culture. When cisplatin is added to a new culture, the bacteria cease dividing.
	A theory follows after results consistently support a hypothesis ⇩ Certain platinum compounds inhibit cell division.
	_____ _____ Experiments to determine the anticancer activity of platinum compounds.

III Vocabulary: experiments - Complete the sentences.

Experiments can be _____, _____, _____ or _____.
A person who conducts the experiment is called an _____.
The adjective that is connected with the word experiment is _____.
A table used for conducting experiments is _____.
_____ is a name used for people or animals that have been tested on.
_____ or _____ are examples of a larger amount of something or a larger population of individuals.

IV Useful vocabulary: talking about scientific results. Complete the sentences.

findings / phenomena / isolated / widespread / long-term / random /scattered

1) We have so far discovered only several _____ cases.
2) The problem is more _____ than we originally thought.
3) Cases like this are _____ over a large area.
4) The distribution amongst the population appears to be _____.
5) We know very little about the _____ effects.
6) I'm sure you'll be very interested to read about our _____.
7) _____ like this are rarely seen outside the laboratory.

V Example of an experiment: complete the text with the given words.

Extracting iron from breakfast cereal

observe / hold / place / separate / reduce / move / spread / stick / crushing

_____ a few flakes of cereal on a table or bench surface. _____ the magnet close to the flakes and see if they stick to the magnet or are moved by it. _____ the friction on the flakes by floating four to six flakes on a beaker of water. Hold the magnet close to the flakes and see if they _____ to the magnet or are moved by it. Reduce the size of some dry flakes by _____ them to a fine powder using a pestle and mortar. _____ the resulting powder on a piece of paper. Place a magnet under the paper and _____ the paper over the magnet. _____ any effect the magnet may be having on the movement of the powder. Do NOT put the magnet in direct contact with or close to the powder without the paper in between. With careful manoeuvring, it should be possible to _____ out fine grey specks of iron from the rest of the powder.

a) Read the text and find the types of glassware and laboratory equipment mentioned in the text?

VI Grammar

a) Find examples of Present Simple tense (active and passive) and underline them in the text.

1) What do we add to the verb in positive form of 3rd person singular?
2) How are negative sentences and questions formed?
3) How is Present Simple Passive formed?

b) Change the sentences from active to passive.

1) The mechanic is repairing the car right now.

2) The fire destroyed all the documents.

3) Our flight has been delayed.

4) Tolstoy wrote Anna Karenina.

5) Swiss speak Italian.

c) Complete the sentences with the correct form of the verb in Present Simple active or passive.

1) There is someone behind us. I think we _____ (follow).
2) My car has disappeared. It _____ (steal)!
3) People _____ (eat) a lot of bread in this country.
4) A letter _____ (arrive) yesterday.
5) Somebody _____ (accuse) me of stealing money.
6) The prize _____ (give) to her by the president.
7) The students _____ (not use) the new laboratory yet.
8) I can't talk to you right now, dinner _____ (serve).
9) How _____ glass _____ (make)?
10) Two hundred people _____ (employ) by the company.

d) Complete the text by using active or passive form of the verbs in brackets.

The Invention of Coca-Cola

John Pemberton

In 1886, Coca-Cola _____(invent) by a pharmacist named John Pemberton, otherwise known as "Doc." He fought in the Civil War, and at the end of the war he _____ (decide) he wanted to invent something that would bring him commercial success. Usually, everything he made failed in pharmacies. Many drugs _____ (invent) by him, but none of them ever _____ (make) any money. So, after a move to Atlanta, Pemberton decided to try his hand in the beverage market.

In his time, the soda fountain was rising in popularity as a social gathering spot. And this was when Coca-Cola _____ (bear). However, Pemberton had no idea how to advertise. This is where Frank Robinson came in. Being a bookkeeper, Frank Robinson also had excellent penmanship. It _____ (be) he who first scripted "Coca Cola" into the flowing letters which has become the famous logo of today. He registered Coca-Cola's formula with

the patent office, and also wrote the slogan, "The Pause That Refreshes." The soft drink _____ first _____(sell) to the public at the soda fountain in Jacob's Pharmacy in Atlanta on May 8, 1886. About nine servings of the soft drink _____ (sell) each day. Sales for that first year added up to a total of about $50. The funny thing was that it cost John Pemberton over $70 in expanses, so the first year of sales were a loss. Until 1905, the soft drink, which _____ (market) as a tonic, contained extracts of cocaine as well as the caffeine-rich kola nut.

Coke did not do so well in its first year. And to make matters worse, Doc Pemberton died in August 1888, meaning he would never see the commercial success he had been seeking.

After Pemberton's death, a man named Asa Griggs Candler, another Atlanta pharmacist and businessman, rescued the business. In 1891, he _____ (become) the sole owner of Coca-Cola. Asa Candler bought the formula for Coca Cola from inventor John Pemberton for $2,300.

It was when Candler took over that one of the most innovative marketing techniques _____ (invent). He hired travelling salesmen to pass out coupons for a free Coke. His goal was for people to try the drink, like it, and buy it later on. In addition to the coupons, Candler also _____ (decide) to spread the word of Coca-Cola by plastering logos on calendars, posters, notebooks and bookmarks to reach customers on a large stage. It was one step in making Coca-Cola a national brand, rather than just a regional brand. A controversial move on the part of Candler was to sell Coca-Cola syrup as a patent medicine, claiming it would get rid of fatigue and headaches. In 1898, however, Congress _____ (pass) a tax on all medicines, so Coca-Cola wanted to be sold only as a beverage. After a court battle, Coca-Cola _____ no longer _____(sell) as a drug. Today, products of the Coca Cola Company _____ (consume) at the rate of more than one billion drinks per day.

Speaking

1) How often do you drink Coca Cola?
2) Do you drink any other fizzy drinks?
3) Do you know what the ingredients of Coca Cola are?

Unit II Laboratory Glassware

Pre-reading exercise:

1) How often do you work in the laboratory?
2) What procedures do you usually perform in the laboratory?
3) Can you name any laboratory glassware in English?

Laboratory Glassware

Laboratory glassware is necessary in any kind of chemical, biological or microbiological laboratory. The term refers to a variety of equipment, traditionally made of glass, used for scientific experiments and other work in science. Most glassware is made from a borosilicate glass, such as Pyrex or Kimax because it needs to resist chemical attack. Some glassware has to withstand sterilization; other glassware is used to measure specific volumes, so it can't change its size appreciably over room temperatures. Chemicals may be heated and cooled so the glass needs to resist shattering from thermal shock. Borosilicate glasses are often used because they are less subject to thermal stress and are common for reagent bottles. For some applications quartz glass is used for its ability to withstand high temperatures or its transparency in certain parts of the electromagnetic spectrum. In other uses, especially some storage bottles, darkened brown or amber (actinic) glass is used to keep out much of the UV and IR radiation so that the effect of light on the contents is minimized. Special-purpose materials are also used; for example, hydrofluoric acid is stored and used in polyethylene containers because it reacts with glass. For pressurized reaction, heavy-wall glass is used for pressure reactor.

Laboratory glassware is used for a wide variety of functions which include volumetric measuring, holding or storing chemicals or samples, mixing or preparing solutions or other mixtures, containing lab processes like chemical reactions, heating, cooling, distillation, separations including chromatography, synthesis, growing biological organisms, spectrophotometry, and containing a full or partial vacuum, and pressure, like pressure reactor. Some of the commonly used glassware is described in more detail below:

Test tubes are round-bottom cylinders that come in various sizes and are usually made of borosilicate glass so that they can withstand temperature changes and resist reaction with chemicals. In some cases, test tubes are made from plastic. Sometimes test tubes are called culture tubes. A culture tube is a test tube without a lip.

Beakers are used for routine measuring and mixing in the lab. They can be used to measure volumes to within 10% accuracy. The flat bottom and spout allow this piece of glassware to be stable on the lab bench or hot plate, plus it's easy to pour a liquid without making a mess. Beakers are also easy to clean.

A buret or burette is graduated tube of glassware that has a stopcock at its bottom end. They are used when it is necessary to dispense a small measured volume of a liquid, as for titration. It is used to dispense precise volumes of liquid reagents.

A funnel is a conical piece of glassware that terminates in a narrow tube. It is used to transfer substances into containers that have narrow mouths. Funnels may be made of any material. A graduated funnel may be called a conical measure.

Graduated cylinders are used to measure volumes accurately. They can be used to calculate the density of an object if its mass is known. Graduated cylinders are usually made from borosilicate glass, though there are plastic cylinders, too.

Petri dishes come as a set, with a flat bottom dish and a flat lid that rests loosely over the bottom. The contents of the dish are exposed to air and light, but the air is exchanged by

diffusion, preventing contamination of the contents by micro organisms. Petri dishes that are intended to be autoclaved are made from a borosilicate glass. Single-use sterile or non-sterile plastic Petri dishes are also available. Petri dishes are commonly used for culturing bacteria in a microbiology lab, containing small living specimens, and holding chemical samples.

Pipets (pipettes) are used to measure and transfer small volumes. There are many different types of pipets. Examples of pipet types include disposable, reusable, autoclavable, and manual. Pipets or pipettes are droppers calibrated to deliver a specific volume. Some pipets are marked like graduated cylinders. Other pipets are filled to a line to reliably deliver one volume again and again. Pipettes may be made of glass or plastic.

A retort is a piece of glassware that is used for distillation or dry distillation. A retort is a spherical glass vessel that has a downward-bending neck which acts as a condenser.

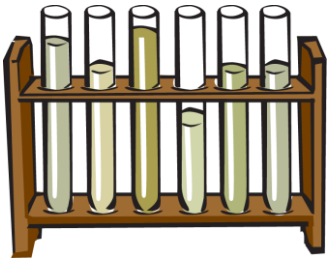
Round bottomed flasks can have different shapes. There is a round-bottomed flask, long-neck flask, two-neck flask, three-neck flask, radial three-neck flask, and two-neck flask with thermometer well. Because of the round bottom, cork rings are needed to keep the round bottom flasks upright. When in use, round-bottom flasks are commonly held at the neck by clamps on a stand. The round bottoms on these types of flasks allow more uniform heating and/or boiling of liquid. Thus, round-bottom flasks are used in a variety of applications where the contents are heated or boiled. Round-bottom flasks are used in distillation by chemists as distilling flasks and receiving flasks for the distillate.

Volumetric flasks are used to accurately prepare solutions for chemistry. This piece of glassware is characterized by a long neck with a line for measuring a specified volume. Volumetric flasks are usually made of borosilicate glass. They may have flat or round bottoms (usually flat). Typical sizes are 25, 50, 100, 250, 500, 1000 ml.

Watch glasses are concave dishes that have a variety of uses. They can serve as lids for flasks and beakers. Watch glasses are nice for holding small samples for observation under a low-power microscope. Watch glasses are used for evaporating liquid of samples, such as growing seed crystals.

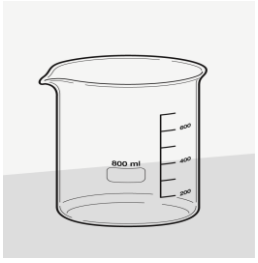
There is a lot more different laboratory glassware that is used for different laboratory purposes. You should always be careful and use the appropriate glassware depending on what kind of experiments you have to perform.

I Read the text and write the names of the glassware next to the pictures.

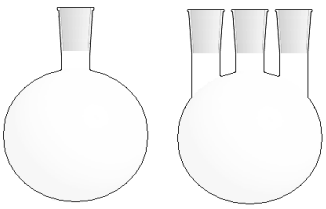


_____

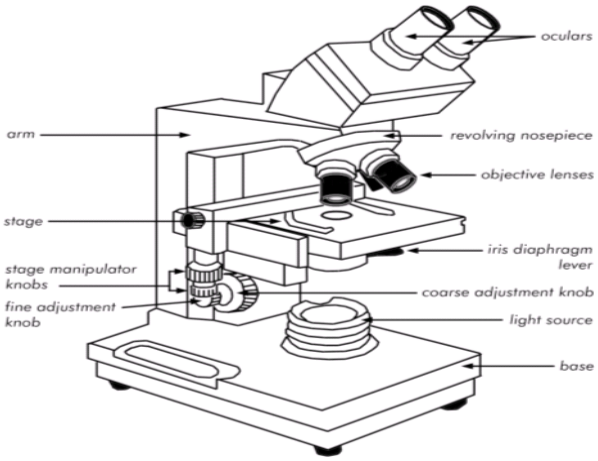
_____



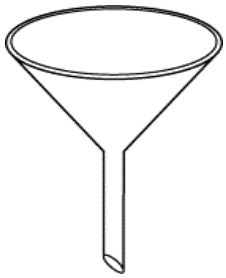
_____



_____



_____



_____ _____

II Find different laboratory procedures and techniques mentioned in the text.

III Find chemical reactions mentioned in the text and try to explain them in your own words.

IV Try to explain or transform the underlined words from the text (diposable, reusable, autoclavable, manual)

V Find synonyms in the text.
Accurately -
Usually -
Different -
Spherical -
Terminate -

VI Grammar - word formation – a) Complete the table with the missing words.

Verb	Noun
apply	
	distillation /distiller
	evaporation
	variety
sterilize	/ sterilizer
resist	
press	
react	reaction
titrate	
	condensation /condenser
observe	

b) Complete the sentences by using words from the chart.

Graduated cylinders can _____ in size, from 10ml to 1000ml.
If you heat water for a long time it will _____.
A process in which you clean by destroying micro organisms, parasites, etc., usually by bringing to a high temperature is called a _____.
A change from gaseous state to a liquid state is called _____.
Bendable material bends when you use _____ on it.

VII Complete the text with the given words. There are some extra words.

solution / paper towel / detergent / glassware / gloves / milk / tap water / rinse / impurities / evaporate / condense / fumes / solvent / brush / solute / stoppers / soak

Cleaning laboratory glassware

Cleaning laboratory glassware isn't as simple as washing the dishes. Here are some tips on how to wash your glassware so that you won't ruin your chemical solution or laboratory experiment. Usually, the _____ which is designed for lab glassware is used. You can _____ the glassware with the proper _____, then finish up with a couple of rinses with distilled water, followed by final rinses with deionised water. Remove _____ and stopcocks when they are not in use. Otherwise they may 'freeze' in place. Wear _____ and avoid breathing the _____. If the glassware requires scrubbing, scrub with a _____ using hot soapy water, rinse thoroughly with _____, followed by rinses with deionised water. In some cases, you may need to _____ the glassware overnight in soapy water. It is inadvisable to dry glassware with a _____ or forced air since this can introduce fibres or _____ that can contaminate the solution. Normally you can allow glassware to air dry on the shelf. Otherwise, if you are adding water to the glassware, it is fine to leave it wet (unless it will affect the concentration of the final _____**)**. If the solvent will be ether, you can rinse the glassware with ethanol or acetone to remove the water, and then rinse with the final solution to remove the alcohol or acetone. If _____ is to be used immediately after washing and must be dry, rinse it 2-3 times with acetone. This will remove any water and will _____ quickly. While it's not a great idea to blow air into glassware to dry it, sometimes you can apply a vacuum to evaporate the solvent.

VIII Match the words to the definitions.

fumes / solvent / stopcock / fibres (B.A. fiber) / inadvisable / soak / contaminate / impurity / sample / cork / clamps

1) smoke, vapour, or gas especially when irritating or offensive _____
2) usually a liquid substance capable of dissolving or dispersing one or more other substances _____
3) a device used for controlling or stopping the flow of a liquid or gas through a pipe _____
4) plant material that cannot be digested but that helps you to digest other food _____
5) not advisable, not wise _____
6) to put (something) in a liquid for a period of time _____
7) to soil, stain, corrupt, or infect by contact or association _____
8) an unwanted substance that is found in something else and that prevents it from being pure _____
9) a group of people or things that are taken from a larger group and studied, tested, or questioned to get information _____
10) a material that is made from the soft bark of a kind of oak tree / stopper for a bottle or jug _____
11) a device designed to bind or constrict or to press two or more parts together so as to hold them firmly _____

IX Speaking

1) What precautions are taken when you work in the laboratory?
2) What kind of experiments do you prefer doing in the laboratory? Why?
3) Describe an experiment that you can perform to test the following statements:
    a) Table salt is more soluble in water than sugar is.
    b) Vinegar dissolves in water and not in cooking oil.
    c) Diamonds are harder than sugar cubes.

Unit III Elements, periodic table of elements and states of matter

Pre-reading exercise:

1) What do you know about the periodic table of elements? Can you use it?
2) What are elements? Define them in your own words.

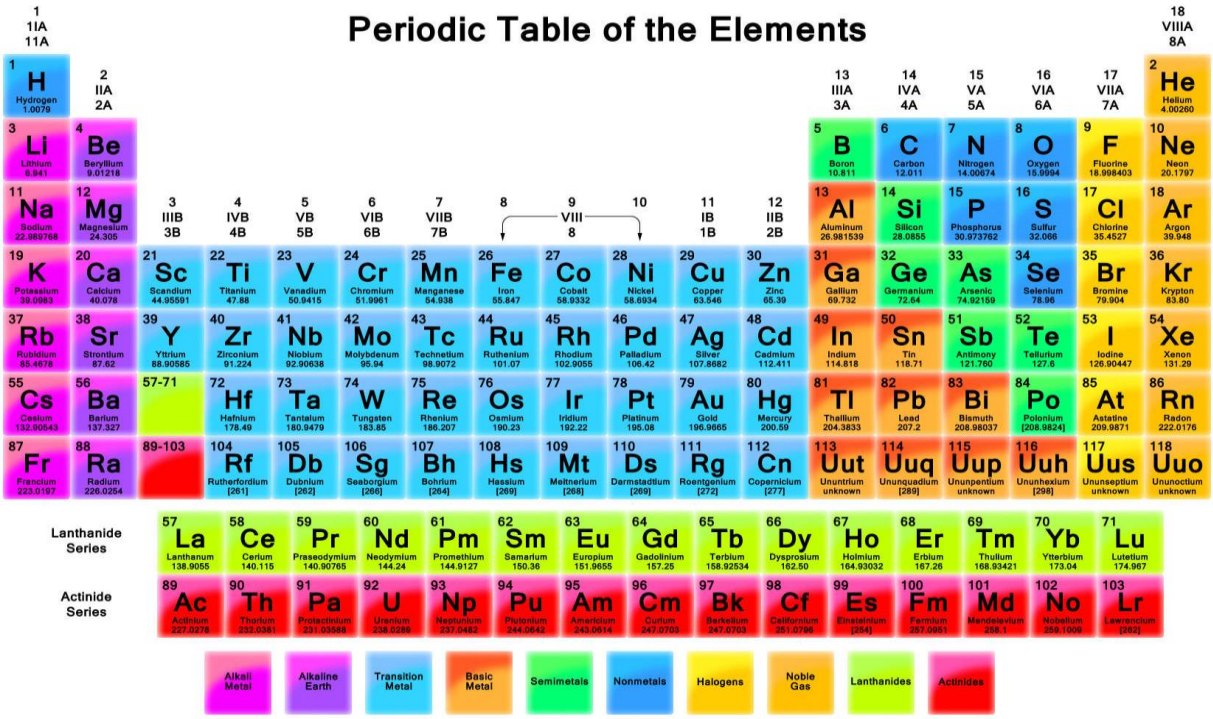
Elements and the periodic table of elements

In 1869, although working independently, the Russian chemist Dmitri Mendeleev (1834-1907) and the German chemist J. Lothar Meyer (1830-1895), made similar discoveries. They found that if elements are arranged in order of atomic weight, they could be placed in rows and they would share similar within a column. This tabular arrangement of elements in rows and columns, highlighting the regular repetition of properties of the elements, is called a periodic table. Later, some discrepancies were noticed, so in the early part of the twentieth century the elements were categorized and ordered by atomic number.

The basic structure of the periodic table is its division into rows or periods and columns or groups. Each period indicates the highest energy level the electrons of that element occupy at its ground state. The vertical columns are called groups. Each element in a group has the same number of valence electrons and typically behaves in a similar manner when bonding with other elements. Based on the modern definition of elements – substances that cannot be broken down into simpler substances by chemical means, there are currently 112 elements known. Of those, 91 are naturally occurring and 21 have been made in the laboratory. Chemists use symbols to mark an element; it is usually the first letter of the name. In some cases the symbol comes from Latin names for the elements. They are always written in capital letters. If two or more elements have the same first letter then another letter is added to the symbol. Many periodic tables identify element types using different colours for different element types. These include the alkali metals, alkaline earths, basic metals, semimetals, transition metals, non-metals, lanthanides, actinides, halogens and noble gases.

Most substances are compounds which means that they are composed of two or more elements chemically combined. Chemists use formulas to express compounds. Compounds always contain a definite or constant proportion of elements by mass.

Unlike compounds, mixtures are materials that can be separated by physical means into two or more substances. Their compositions are variable.



Downloaded from: http://terminator.wikia.com/wiki/File:Periodic-Table-of-Elements-10pfkm6.png

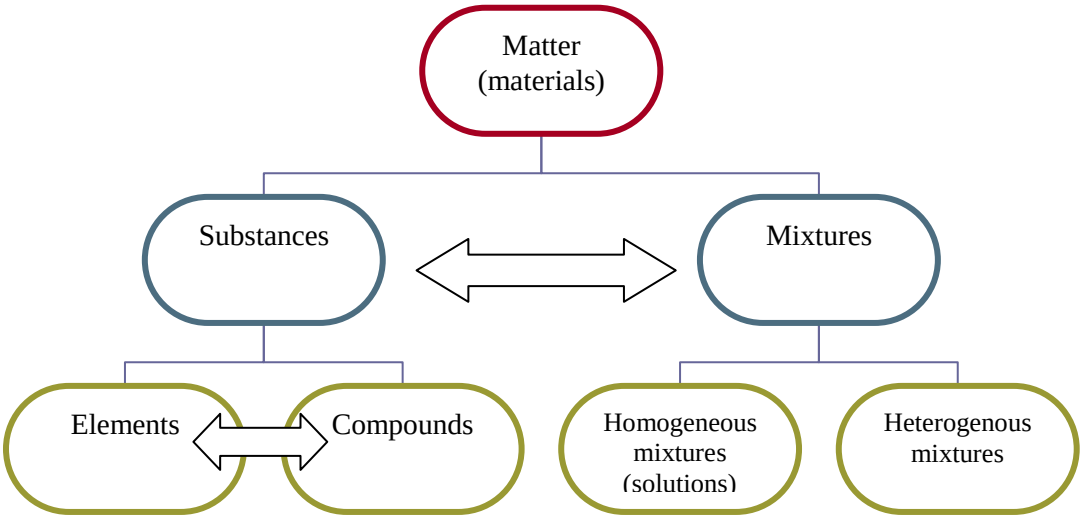
I Complete the table with the names of the elements.

Name of element	Atomic symbol	Physical appearance of element
	Al	Silvery-white metal
	Ca	Silvery-white metal
	C	Soft, black solid (graphite) or hard, colourless crystal (diamond)
	Cl	Greenish-yellow gas
	Cu	Reddish metal
	F	Pale yellow gas
	Au	Pale yellow metal
	H	Colourless gas
	I	Bluish-black solid
	Fe	Silvery-white metal
	Pb	Bluish-white metal
	Hg	Silvery-white liquid metal
	N	Colourless gas
	P	Yellowish-white, waxy solid
	K	Soft, silvery-white metal
	Ag	Silvery-white metal
	Na	Soft, silvery-white metal
	Sn	Silvery-white metal
	Zn	Bluish-white metal

Matter and states of matter

A specific kind of matter exists in different physical forms under different conditions. A great example is water which exists as solid (ice), liquid (water) and gas (vapour).The main characteristic of a **solid** is its rigidity. It has fixed shape and volume and they tend to maintain their shape when subjected to outside forces. Some substances can have more than one solid phase, for instance carbon. It can be in the form of diamond or graphite. Both forms are 100% carbon although their physical properties are not at all similar. Another example is sugar. We see it in the form of crystalline that we put on our food, but also in the form of lollipops and hard candies. Liquids and gases are fluids, that is, they flow easily and change their shapes in response to slight outside forces. **Liquids** are relatively incompressible fluids and they have fixed volume but no fixed shape. Put a liquid into a container and it will assume the shape of the container. **Gases** are easily compressible and they can fit into container of any size or shape, that is they have no definite volume or shape.

II Write the type of change on the arrows in the diagram.



III What are the opposites?

Compressibility –
Rigidity –

IV Write the processes of transforming to different states.

Liquid to gas _____
Gas to liquid _____
Solid to gas _____

V Complete the table.

Nouns	Adjectives
solid	
	liquid
	gaseous
rigidity	
	compressible
expansibility	

VI Speaking

1) Can you describe some common physical and chemical changes we can see in everyday life?
2) Give three specific professions (other than chemist) in which a knowledge of chemistry is useful and important?
3) Give three specific activities in your life in which chemistry plays an important role.

Unit IV Food packaging

Pre-reading exercise.

1) Do you grow any kind of food?
2) Where do you usually buy food?
3) Do you ever choose food according to the packaging?

Food packaging

Do you ever read the labels on the food you buy? Have you ever wondered how the food we eat gets from the factory to our homes without going off? It is due to various types of packaging.

Food packaging protects and preserves food. A range of materials can be used for packaging, some of which are environmentally friendly. Labels carry information for the consumer. The main purposes of food packaging are:

- to preserve the product
- to protect the product from damage
- to make the product more attractive to the consumer
- to make it easier to transport the product

Different types of food require different packaging. Packaging can be in the form of bottles, cans, tins, cartons, boxes, etc. and those can be made from different materials, including glass, plastic, metal, paper, card, etc

Packaging is also designed to attract and inform consumers. The information displayed on the packaging is generally known as food labelling. The **Food Labelling Regulations** of 1996 require certain information to be given on all pre-packed foods. These requirements are written by the EU. Some of the items on the label that are required by law, such as:

- manufacturer's name and contact details
- name of the product
- description of the product
- weight (some foods are exempt, for example bread)
- ingredients (listed in descending order of weight)
- cooking/heating instructions
- storage instructions
- shelf life
- place of origin
- allergy information

Other items are not legal requirements, but are nevertheless good practice and often included on packaging. These can also be appealing to the consumer. These items would include:

- illustration of product
- price
- nutritional values of the product
- customer guarantee
- the batch-code and bar-code numbers
- opening instructions

Packaging materials

Plastics

One of the most commonly used packaging materials is plastics. Their advantages are that they are: versatile - plastics can be flexible or rigid, and can be moulded into shapes, resistant to acids and other chemicals, easy to print on, lightweight, cheap to produce. However, not all plastics have all the above qualities.

Sometimes other techniques, besides the packaging itself, are needed to preserve the food. One of such techniques is Modified-Atmosphere Packaging (MAP). Modifying the air in the packaging prolongs the shelf-life of food. The food is modified by adding oxygen, nitrogen and carbon dioxide. The amount of each gas depends on the food we are trying to preserve. MAP is mostly used to package: cold meats, smoked fish, cheeses, salads, fresh pasta. It helps food not to rot quickly, it delays colour deterioration, preserves taste and flavour.

Other packaging materials include paper, card, metal and glass.

The table shows advantages, disadvantages and uses of different types of materials.

Material	Advantages	Disadvantages	Uses
Glass	reusable	fragile	baby foods
	heat-resistant	safety issues	salad cream
	recyclable	heavy	pickles
	keeps shape		
	low cost		
Metal	recyclable	may react with food	soup cans
	lightweight		take-away containers
	impermeable		bottle tops
	withstands heat processing		
Card / paper	easy to print on	not water-resistant	fruit-juice cartons
	cheap to produce	easily damaged	egg boxes
	biodegradable		
	recyclable		
	can be moulded		
	can be coated		
	lightweight		

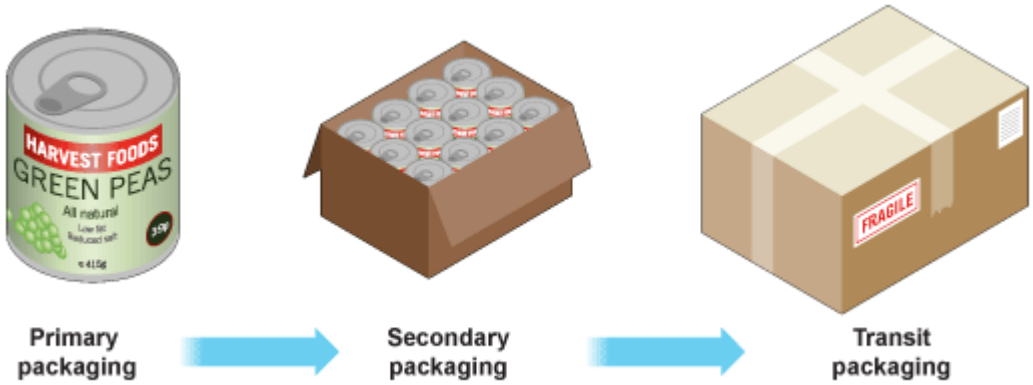
Some of the packaging materials are environmentally friendly. It means that packaging causes less damage to the environment. There are three types of environmentally friendly materials:

- **Reusable packaging** can be cleaned and re-used. For example, glass milk bottles are reused.
- **Recyclable packaging** is made of materials that can be used again, usually after processing. Recyclable materials include glass, metal, card and paper.
- **Biodegradable packaging** will easily break down in the soil or the atmosphere.

Recyclable packaging should carry standard symbols that show what the product is made from and how it can be recycled.

Layers of packaging

There are three levels of packaging: primary, secondary and tertiary or transit packaging.



Downloaded from: http://www.bbc.co.uk/schools/gcsebitesize/design/foodtech/packaginglabellingrev4.shtml

Primary packaging is seen at the point of sale. It needs to contain and protect the food product, as well as display it and provide information. **Secondary packaging** is used for business-to-business (B2B) transactions. It is the middle layer of packaging - for example a cardboard box with a number of identical products inside. **Tertiary** or **transit packaging** is the outer container that allows easier handling during transfer between factory, distribution centres and retailers A wood pallet, the kind we see behind the grocery store or at big box stores, exemplifies a tertiary or transit package Both secondary and tertiary packaging may be used to collate goods for delivery. Each type of package is developed to serve a specific service with the goal of delivering the product safely and intact from the manufacturer to the end user.

I Choose the correct answer.

1) Why is food packaged?
   a) To preserve it
   b) To promote it
   c) To transport it
   d) All of the above
2) Which material is most commonly used for packaging baby foods?
   a) plastic
   b) cardboard
   c) glass
3) Which material is most commonly used for packaging soup?
   a) metal

b) cellophane
c) plastic

4) Modified-Atmosphere Packaging (MAP) is used for which of these products?
a) baby food
b) eggs
c) smoked fish

5) What is recyclable packaging?
a) Packaging that can be cleaned and re-used
b) Packaging that is made of materials that can be used again after processing
c) Packaging that will easily break down in the soil or the atmosphere

6) What is biodegradable packaging?
a) Packaging that can be cleaned and re-used
b) Packaging that is made of materials that can be used again after processing
c) Packaging that will easily break down in the soil or the atmosphere

7) For a can of baked beans, what type of packaging is the can?
a) tertiary / transit packaging
b) secondary packaging
c) primary packaging

8) Which of the following does NOT have to be printed on a food label by law?
a) price
b) manufacturers name and contact details
c) name and description of the product

II Vocabulary exercises

a) Find synonyms in the text.

rot /spoil –
discolouration –
change / transform -
slow / without big changes -
different / various -
adjust -

b) Find the appropriate words in the text and match them to definitions.

1) having pores or openings that permit liquids or gases to pass through _____

2) capable of being broken down especially into innocuous products by the action of living things (as micro organisms) _____

3) not harmful to the environment _____ _____

4) having been used before and then processed so that it can form a new product _____

5) capable of being used again or repeatedly _____

6) not able to be bent easily _____

7) easily broken or destroyed _____

III Grammar - countable and uncountable nouns / quantifiers / packaging

a) Match words from A and B and use *of*, e.g. a piece of advice

A: cup, teaspoon, pinch, cube, slice, jar, piece, loaf, bar, jug, can, grain, box

B: ice, salt, pepper, chocolates, chocolate, ham, cinnamon, marmalade, water, sweet corn, coffee, cake, bread

Answers:

b) Complete the sentences with a/an, some, any.

1) We didn't buy _____ flowers.
2) Can I have _____ milk in my coffee, please?
3) Would you like to be _____ actor?
4) You need _____ visa to visit _____ countries, but not all of them.
5) I haven't got _____ money. Can you lend me some?
6) I'll try and answer _____ questions you ask me.
7) There is _____ juice in the fridge.

IV Speaking and discussion

1) How important is food packaging to you?
2) Do you have a favourite food package?
3) Do you ever read the labels or buy products according to the labels? Does it affect your choice? Why (not)?

Unit V Nutritional Information

Pre-reading exercise:

1) What are labels?
2) What kind of labels can you think of and where can you see them?
3) Which nutrients can you name in English?

Nutritional Information

Nutritional labelling is any information appearing on labelling or packaging of foods relating to energy and nutrients in the food. The information which must or may be given, and the format in which it must appear, is governed by law in most countries. For instance U.S. Food and Drug Administration addresses the labelling requirements for foods under the Federal Food, Drug, and Cosmetic Act and its amendments. Food labelling is required for most prepared foods, such as breads, cereals, canned and frozen foods, snacks, desserts, drinks, etc. Nutrition labelling for raw produce (fruits and vegetables) and fish is voluntary. We refer to these products as "conventional" foods. The FDA is proposing to update the Nutrition Facts label found on most food packages in the United States. The Nutrition Facts label, introduced 20 years ago, helps consumers make informed food choices and maintain healthy dietary practices. If adopted, the proposed changes would include the following: greater understanding of nutrition science, updated serving size requirements and new labelling requirements for certain package sizes and refreshed design.

In the UK the Food Standards Agency devised a traffic light system to make it easier for consumers to know the nutritional content of food. The nutritional criteria used by the British Food Standards Agency (FSA) for defining the colours in its traffic light labels are based on comprehensive scientific studies and consultations. This system uses a reference value of 100 grams for food products and 100 millilitres for drinks and classifies levels of fat, saturated fat, sugars and salt as low (green), medium (amber) or high (red).

Some food products in supermarkets now have traffic light colours which tell you, at a glance, if the food you're looking at has high, medium or low amounts of fat (especially saturated fat), salt and added sugars per 100g. You might also see the number of grams of **fat, saturated fat, salt and sugars** in what the manufacturer or retailer suggests as a 'serving' of the food.

If you see a **red** light on the front of the pack, you know the food is high in something we should be trying to cut down on. It's fine to have the food occasionally, or as a treat, but try to keep an eye on how often you choose these foods, or try eating them in the smallest amounts possible. If you see **amber**, you know the food isn't high or low in the nutrient, so this is an OK choice most of the time, but you might want to go for green for that nutrient some of the time. **Green** means the food is low in salt, saturated fat, fat or sugars. The more green lights, the healthier the choice.

If your shopping doesn't have traffic light colours you can still tell whether the levels of fat, sugars and salt are HIGH, MEDIUM or LOW by using this handy card and the nutrition information given on the back of most packs.

In order to satisfy the Agency's recommendations for traffic light front of pack, nutritional signpost labelling, the signpost labelling logo must incorporate each of the following four core elements:

• separate information on fat, saturated fat, sugars and salt;
• **red**, **amber** or **green** colour coding to provide at a glance information on the level (i.e. whether high, medium or low) of individual nutrients in the product;
• provision of additional information on the levels of nutrients present in a portion of the product; and
• use of the nutritional criteria as set out in this document to determine the colour banding.

If you are trying to have a healthier and more balanced diet, you should follow nutritional information, and you can be certain that you are making the best and the healthiest choices.

I Decide if the sentences are true or false. Correct the false ones.

1) Traffic light system for food is used in all countries of the world.

2) In the USA, fish, fruit and vegetable must have nutritional labelling.

3) Green label means that the food is the best choice.

4) Signpost labelling and traffic light labelling are the same.

5) The system is based on a reference value of 1 kg.

II Write down different nutrients mentioned in the text.

III Complete the table with the given words.

C (ascorbic acid) / starches / unsaturated / potassium / glucose / amino acids / maltose

Lipids: Fats and Oils	Carbohydrates	Proteins	Vitamins	Minerals
_____ **Polyunsaturated** **Saturated**	**Simple sugar (monosaccharide):_____, fructose, galactose** **Double sugar (disaccharides): sucrose, _____** **Complex sugar (polysaccharides): _____**	**_____**	**A** **B group** **_____** **D, etc.**	**Iron** **Calcium** **Magnesium** **_____** **Etc.**

IV Explain the meanings of these phrases.

To keep an eye

To come in /to be handy

At a glance

V Grammar

a) Find examples of adjectives in the text (basic form, comparative, superlative).

Basic form:
Comparative:
Superlative:

b) Complete the sentences with the appropriate form of the adjective.

1) I was surprised to get here so quickly. I expected the journey to be _____ (long).
2) I'm sorry I'm late. I got here as _____ as I could. (fast)
3) She's recovering slowly, she feels _____ than yesterday. (good)
4) We stayed at _____ hotel in our town. (cheap)
5) Susan has always been _____ student in our class. (intelligent)
6) Her problem was _____ than we expected. (serious)
7) I like to keep fit so I go swimming as _____ as I can. (often)
8) Now that we have a baby we have to find a _____ flat than this one. (big)
9) _____ way to get to London is by plane. (easy)
10) That's _____ film I've ever seen. (boring)

VI Speaking

1) Why is this system called the traffic light system?
2) Do you ever read the labels or buy products according to the labels?
3) How important is nutritional value of food to you?

Appendices Irregular verbs

Base Form	Past Simple	Past Participle
be	was, were	been
beat	beat	beaten
become	became	become
begin	began	begun
bend	bent	bent
bet	bet	bet
bite	bit	bitten
blow	blew	blown
break	broke	broken
bring	brought	brought
build	built	built
burn	burned/ burnt	burned/ burnt
buy	bought	bought
catch	caught	caught
choose	chose	chosen
come	came	come
cost	cost	cost
cut	cut	cut
dig	dug	dug
do	did	done
draw	drew	drawn
dream	dreamed / dreamt	dreamed / dreamt
drive	drove	driven
drink	drank	drunk
eat	ate	eaten
fall	fell	fallen
feel	felt	felt
fight	fought	fought
find	found	found
fly	flew	flown
forget	forgot	forgotten
forgive	forgave	forgiven
freeze	froze	frozen
get	got	got /gotten
give	gave	given
go	went	gone
grow	grew	grown
have	had	had
hear	heard	heard
hide	hid	hidden
hit	hit	hit
hold	held	held
hurt	hurt	hurt
keep	kept	kept
know	knew	known
lay	laid	laid
lead	led	led
learn	learned/ learnt	learned/ learnt
leave	left	left
lend	lent	lent
let	let	let
lie	lay	lain
lose	lost	lost
make	made	made
mean	meant	meant
meet	met	met
pay	paid	paid
put	put	put
read	read	read
ride	rode	ridden
ring	rang	rung
rise	rose	risen
run	ran	run
say	said	said
see	saw	seen
sell	sold	sold
send	sent	sent
shut	shut	shut
sing	sang	sung
sit	sat	sat
sleep	slept	slept
speak	spoke	spoken
spend	spent	spent
stand	stood	stood
swim	swam	swum
take	took	taken
teach	taught	taught
tear	tore	torn
tell	told	told
think	thought	thought
throw	threw	thrown
understand	understood	understood
wake	woke	woken
wear	wore	worn
win	won	won
write	wrote	written

Symbols, expressions and formulae

	Cardinal numbers	**1,2,3,4,5,6,7….**
	Ordinal numbers	1st, 2nd, 3rd, 4th, 5th, 6th….
+	1+2 = 3	1 **plus** 2 =3 *or* 1 **and** 2 is 3
-	3 - 1 = 2	3 **minus** 1 = 2 *or* 3 **take away** 1 is 2 *or* 1 **from** 3 = 2
x	2 x 3 = 6	2 **multiplied by** 3 = 6 *or* 2 **times** 3 = 6 *or* **two threes** are six
÷	6 ÷ 2 = 3	6 **divided by** 2 = 3 *or* 2 **into** 6 **is** 3
=	1+1 = 2	1 + 1 **equal(s)** 2 *or* 1+1 **make(s)** 2 *or* 1+1 **is** 2
≠	x ≠ 2	x **is not equal to** 2 *or* x **does not equal** 2
≈	x ≈ 1	X **is approximately equal to** 1
<	x < 2	X **is less than** 2
>	x > 2	X **is greater than** 2
≥	x ≥ 2	X **is greater than or equal to** 2
√	$\sqrt{4} = 2$	**The (square) root of** 4 is 2
$^3\sqrt{}$	$\sqrt[3]{8} = 2$	**The cube root of** 8 is 2
$^4\sqrt{}$	$\sqrt[4]{16} = 2$	**The fourth root of** sixteen is two
^{2}	$2^2 = 4$	2 **squared** is 4
^{3}	$2^3 = 8$	2 **cubed** is 8
^{4}	$2^4 = 16$	2 **to the power of** 4 is 16
	1/2	A half or one half
	1/3	A third or one third
	1/4	**A quarter** or **one quarter**
	2/3	Two third**s**
	$5\frac{3}{4}$	**Five and three quarters**
%	25 %	25 **percent** or 25 per cent
°	100°	Hundred **degrees**
º C	-5ºC	Five degrees Celzius (Centigrade) **below / minus** zero
	52.52	Fifty two **point five two**
	0.75	**Nought** point seven five
	0.05	**Nought** point **oh** five
→	$CH_4 + 2\ O_2 \rightarrow CO_2 + 2\ H_2O$	**yields**

Adapted from: English for Engineering, V. Vyroubal and V. Vyroubal

Conversions

Length		
1 kilometre (km)		**0.621 miles (mi)**
1 meter (m)		**39.37 inches (in)**
1 inch (in)		**0.08333 feet (ft)**
Weight		
1 gram (g)		**0.03527 ounce (oz)**
1 kilogram (kg)		**2.2046 pounds (lbs)**
Temperature		
1° Celzius (1°C)	274.15° Kelvin (274.5°K)	**33.8° Fahrenheit (33.8° F)**
Energy		
1 calory		**4.18400 joules**

References:

1) Bender A. E. And Bender D.A., Dictionary of Food and Nutrition, 1995, Oxford University Press
2) Bellis, M., Birth of Coca Cola, http://inventors.about.com/od/cstartinventions/a/coca_cola.htm (27.4.2014)
3) Ebbing D. and Gammon S. D., General Chemistry, 7th edition, 2002, Boston, Houghton Mifflin Company
4) Helmestine, A., Chemistry Laboratory Glassware http://chemistry.about.com/od/chemistrylabexperiments/ig/Chemistry-Laboratory-Glassware/(3.3.2014)
5) Ivić V. And Pavličević A., Structures in Context, 2006, Zagreb, Školska knjiga
6) Murphy R., English Grammar in Use, third edition, 2004, Cambridge University Press
7) Sevenair J.P. and Burkett A.R., Introductory Chemistry Investigating the Molecular Nature of Matter, 1997, Dubuque, WCB Publishers
8) Vyroubal V. And Vyroubal, V., English for Engineering, 2012, Veleučilište u Karlovcu
9) Cambridge Advanced Learner's Dictionary, Third edition, 2008, Cambridge
10) Oxford Advanced Learner's Dictionary Resource Book, 2005, Oxford University Press
11) GSCE Bitesize Design & Technology Food Packaging and Labeling http://www.bbc.co.uk/schools/gcsebitesize/design/foodtech/packaginglabellingrev4.shtml(25.4.2014)
12) Red, amber and green for understandable information, Foodwatch https://www.foodwatch.org/en/what-we-do/topics/traffic-light-labels/more-information/how-traffic-light-labeling-works/http://www.food.gov.uk/northern-ireland/nutritionni/niyoungpeople/survivorform/bestreadbefore/signposting#.U1jyFYX-k80 (15.4.2014)
13) Front –of- Pack Traffic Light Signpost Labelling Technical Guidance, Issue 2, 2007, Food Standards Agency http://multimedia.food.gov.uk/multimedia/pdfs/frontofpackguidance2.pdf (15.4.2014)
14) The History of Coca Cola,http://iml.jou.ufl.edu/projects/spring08/Cantwell/invention.html
15) Extracting iron from Breakfast Cereal, Nuffield Foundation, practical Chemistry http://www.nuffieldfoundation.org/practical-chemistry/extracting-iron-breakfast-cereal (20.4.2014)
16) Proposed changes to the Nutrition Facts Label, U.S. Food and Drug Administration http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/LabelingNutrition/ucm385663.htm (15.4.2014)