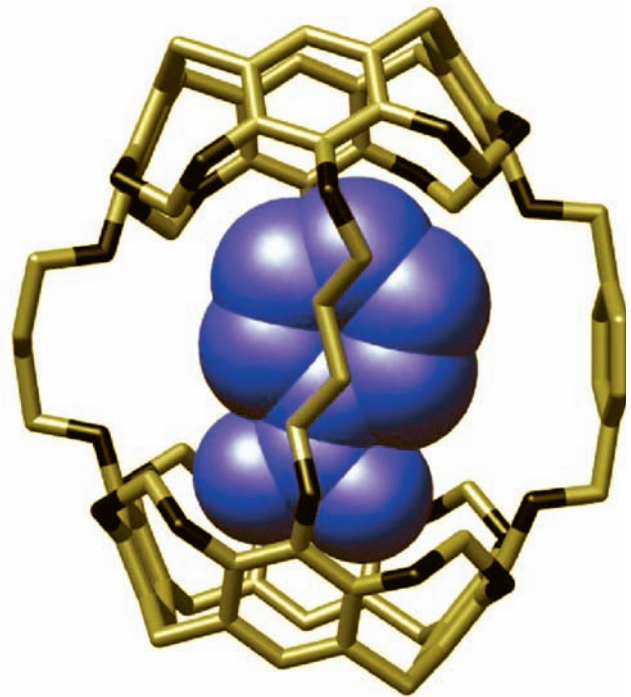


Chemistry - an introduction

Before you read

Discuss these questions with your partner.

- Can you name any famous chemists?
- What are they famous for?
- Where do chemists work?
- What equipment do they use?



A Vocabulary

Complete the sentences with words from the box.

- | | |
|------------------------|----------------|
| ■ conservation of mass | ■ matter |
| ■ combustion | ■ quantity |
| ■ accurate | ■ breakthrough |
| ■ alchemists | ■ properties |

- 1 It is a fact that substances cannot change their
- 2 means that no matter how a substance is changed, what it is made up of will always stay the same.
- 3 When scientists make a they succeed after trying very hard.
- 4 Without oxygen there cannot be – things cannot burn.
- 5 is what physical objects are made of.
- 6 All classifications in chemistry need to be
- 7 believed that they could turn iron into gold.
- 8 Mendeleev's table classifies the elements found in nature according to their

Reading 1

Chemistry A short history

Chemistry is often said to be the central science, as it connects all other sciences. While mathematicians calculate the world, physicists explain it and biologists say what lives in it, chemistry looks at everything in the world and explains how it is made and what it can do.

Chemistry began with fire. Burning changes things and ancient man must have wondered what happened to the wood he burnt. It was by burning things that ancient man discovered iron and glass, combining different substances in the fire and seeing how they combined. Once gold was found, the false science of alchemy was born. People believed they could change ordinary metals like iron into gold. Though the idea was wrong, the alchemists discovered many of the chemical processes that are in use today.

The origin of modern chemistry comes from the work of Antoine Lavoisier, an 18th century Frenchman who was executed in 1794 during the French Revolution. He formulated the idea of the conservation of mass: that is, even though

substances can be changed, their quantity of mass remains the same always. Around the same time, Mikhail Vasilyevich Lomonosov reached the same conclusions. Both men were interested in the nature of combustion – what happens when things burn – and this was the first breakthrough in our understanding of chemistry.

The second great development in chemistry came later and concerned the nature of matter itself: how it was made up and what its parts were. In the early part of the 19th century, the British scientist, John Dalton, stated that all matter was made up of atoms of different elements and that these could not be broken down into smaller parts. We know now that atoms exist and that they do have parts which can be broken down, but at the time his ideas divided chemists into those who accepted his ideas and those who did not. There was a whole century of research to be done before the work of Marie Curie on radioactivity and of Ernest Rutherford and Niels Bohr on atomic structure finally proved that John Dalton was correct after all.

Even while chemists were divided on atomism, it became necessary for someone to make sense of the growing list of elements that were being discovered. That someone was Dmitri Mendeleev. He took Dalton's theory of atomism and arranged the elements by their atomic weight and by their chemical properties. So accurate was his classification of the elements, that he was able to predict the properties of undiscovered ones to fill the gaps in the table. Mendeleev's table is one of the most useful and important generalizations of chemistry and of all science.

These three developments give us the definition of chemistry. It is the science of the composition, structure and properties of substances and how they can be transformed.

Pronunciation guide

alchemy /ælkəmi/

Antoine Lavoisier /æntwən lævu'ɑ:ʒə/

Dmitri Mendeleev /dɪmɪ:tri: mendeli:v/

Marie Curie /məri 'kjʊəri/

Mikhail Vasilyevich Lomonosov /mɪ:kəɪl væsɪləvɪtʃ
ləmɒnɒsɒv/

Rutherford /rʌðəfəd/

B Comprehension

Read the text and complete this summary. Use words from the text.

Chemistry is the science which
(1) all other sciences. Through chemistry, we can study how things are made and what they can do.

Alchemists discovered a lot of chemical
(2) before chemistry developed properly. There are three main areas of study in modern chemistry. The first is about how (3) change when something happens to them. The second is about how things are made, and looks at the atomic (4) of elements. The third is to look at the (5) of elements.

Before you listen

Discuss these questions with your partner.

- What is the difference between an element and a compound?
- What is the difference between a liquid, a solid and a gas? Name as many as you can.

C Listening

Listen to a chemist talking about chemical processes. Then listen again and complete these notes. Choose from the words in the box. There are more words in the box than you need.

■ solid ■ elements ■ liquid ■ bond
■ materials ■ compound ■ process
■ form ■ atoms ■ gas

For example, two (1) : hydrogen and oxygen. Hydrogen has the atomic number (2) and oxygen (3)

Two molecules of hydrogen and one of oxygen = one (4)

Water can change its (5) but is still H₂O. Some chemical processes appear complicated as they have different (6) bonding in different quantities.

Before you read

Discuss these questions with your partner.

- What do chemists produce?
- Why do doctors need chemists?
- Do you think chemists can do anything to help pollution?

D Vocabulary

Match these words and phrases with their definitions.

- | | |
|---------------------|--|
| 1 preservation | A to take out of |
| 2 oil refining | B watch carefully |
| 3 waste | C something added to give taste |
| 4 flavouring | D process that keeps something in the same condition |
| 5 meet the standard | E very small strands |
| 6 monitor | F produce |
| 7 cure | G making oil purer |
| 8 manufacture | H unwanted part of production process |
| 9 fibre | I be of the right level |
| 10 extract | J make healthy |

Reading 2

Chemistry today

Careers in chemistry: what can you do with a degree in chemistry?

This leaflet has been written to help you decide about your future. You have studied chemistry at university and have decided that you want to continue working in the science. What career opportunities are available? There are two main areas where your knowledge of chemistry will be called upon: medicine and industry.

Medicine

Many chemists work in medicine. In fact, it is probable that our hospitals and doctors could not



operate without the support they get from chemists. Chemists are the people who carry out the research and develop new medicines. All over the country, chemists are working on new cures for diseases. There is always more work to be done on antibiotics. Bacteria develop resistance to these drugs and biochemists need to be constantly testing how well these medicines are working as well as looking at new antibiotics to replace the old ones. There are many illnesses which have no cure at the present time and a great deal of research is going on looking for new and better treatments for cancer, HIV/AIDS and malaria.

There are career opportunities within hospitals, too. Doctors need the support of chemists analyzing samples from patients, conducting tests and measuring how well patients are responding to treatment. One quickly developing area is in the testing and recording of DNA samples.

Industry

Chemists work in the food industry, creating chemical flavourings and preservatives to improve the quality of what we eat or to help keep it fresher for longer. Other people work in quality control, sampling and testing the food products to make sure that they meet the standards we expect them to have. In recent years, the European Union has revised its standards for quality and health in all food products

sold in the EU, including both those made there and imported. Chemists have their part to play in monitoring these products as well as in developing new methods of meeting these standards.

Another very important industry that our knowledge of chemistry has created is the oil refining industry. Oil is taken out of the ground and put through a chemical process which turns it into many different products. From oil, we can make not only petrol, but also plastics, synthetic fibres, paint and gases for fuel and other uses. A major concern in the industry today is the pollution resulting from these processes. Industries are trying to reduce the impact of this by wasting less and by extracting more from the waste products of the manufacturing process. Chemists are working to filter harmful waste, preventing it from going into the atmosphere.

Almost all other industries depend in some way on the work of chemists. Chemistry has given us a huge range of plastics and colourings. In fact, there is a chemical process involved in everything we make. The whole manufacturing process needs to be designed, managed and tested for safety by chemists.

Other choices

Career opportunities for chemists also exist in journalism, the law and education.

Pronunciation guide

antibiotic /æntɪbɪə'ɒtɪk/

HIV/AIDS /eɪtʃaɪv'ɪ:/ /eɪdz/

malaria /mə'leəriə/

E Comprehension

Read the text and answer the questions in your own words.

- 1 How do chemists help to treat and cure diseases?
- 2 How can chemists support doctors working in hospitals?
- 3 What do chemists do to make sure we have good quality food?
- 4 What part do chemists play in the production of plastics?
- 5 How are chemists working to reduce pollution?

Before you listen

Discuss this question with your partner.

- How is life today different from life last century when medical drugs weren't available?

F Listening

Listen to a chemist talking about his job. Then answer the questions.

- 1 What kind of a business does he work for?
- 2 How long does it take to test a new compound?
- 3 Where does he spend his time working?
- 4 Can he usually predict the result of his experiments?
- 5 What percentage of his experiments fail?

G Speaking

Discuss these questions with your partner.

- What are the main branches of modern chemistry?
- Do you know of any recent inventions in the field of chemistry?
- Would you like to work as a chemist? Why / Why not?
- Would you say it was one of the best jobs available? Give your reasons.

Task

Working in a group, discuss the opportunities for chemists in today's economy. Use the information in text 2 and any ideas of your own.

Talk about:

- where chemists work
- what they do
- what they are responsible for

First complete these notes. Use them in your discussion.

Career opportunities working in chemistry

Main work areas:

Medicine

Research, development and testing:

.....

Offer support to doctors:

sampling and recording (esp. DNA)

Industry

Developing new products: food

Designing and organizing chemical processes for industry

Monitoring and improving processes (food production, pollution control)

Conclusion

Remember to:

- read the text again
- add any ideas of your own
- explain the general idea and then give details
- allow everybody to speak

Speaking tips

- ✓ You could choose a secretary to keep notes of what you discuss and inform you of any points you forget.
- ✓ Make sure everyone is given plenty of opportunity to speak. The secretary could check this too.

H Writing

Write a short essay with the title: 'What is chemistry and what does it study?'

Read text 1 again and use these notes to write four paragraphs.

PARAGRAPH 1

Introduction (how the essay is organized)

- What do chemists do?
- What are they interested in?
- What are the main areas of the science?

Vocabulary: To begin with, chemists, chemistry, etc

PARAGRAPH 2

Chemistry studies matter, how matter is made, what happens when matter changes

Vocabulary: moreover, matter, materials, structure, transform

PARAGRAPH 3

three important areas in chemistry:

- transformation – how chemical changes occur
- atomic structure – how materials are made and how they are different from each other
- elements of matter – what they are and what their properties are, classified by Mendeleev

Vocabulary: furthermore, atom, elements, properties

PARAGRAPH 4

Conclusion (summarize ideas)

Vocabulary: finally, to sum up, generally, science

Write 200-250 words.