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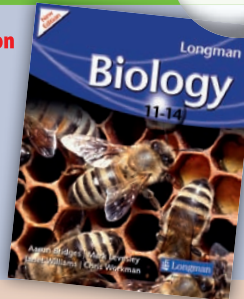
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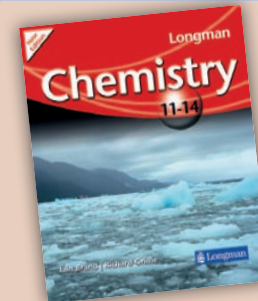
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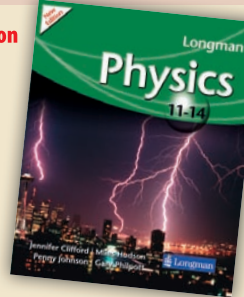
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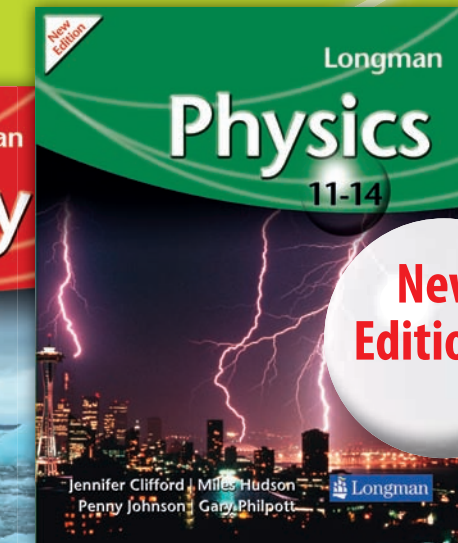
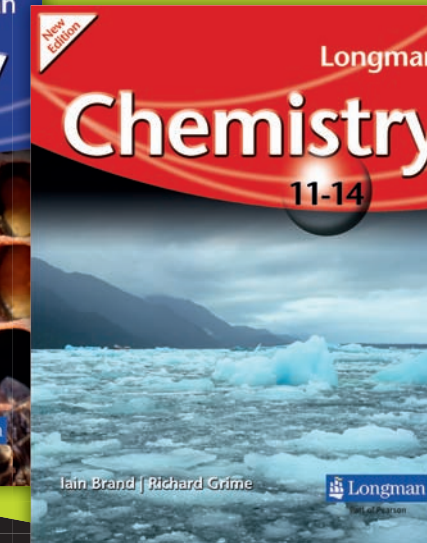
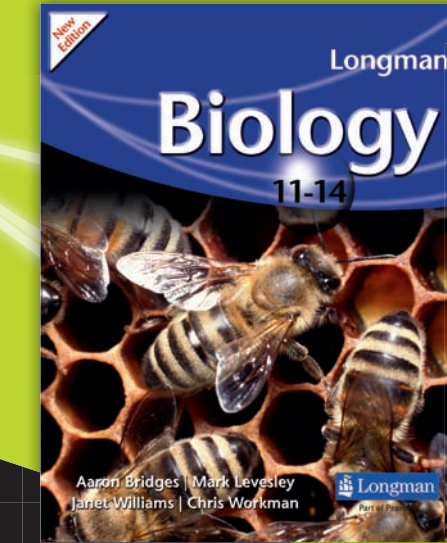
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1 Cells and life processes

How Science Works

In 1967 the first human heart transplant was performed. Simpler transplants date back much earlier. The first successful cornea transplant dates back to 1905. A doctor called Eduard Zim used corneas from the eyes of an 11-year old boy to restore the sight of a labourer who had been blinded by slaked lime (calcium hydroxide).

?

1 What might be considered when deciding who should receive a donor organ? [2]
2 Explain what an organ transplant is, using the term 'donor organ' in your answer. [2]

!

In 2005 a French woman called Isabelle Dinoire became the first person in the world to undergo a partial facial transplant. Her pet Labrador had maulled her face, leaving her disfigured. Isabelle received a triangle of tissue containing a new nose and mouth from a female donor.

1 Transplants

A matter of life or death

Sometimes organs can stop working properly, either as a result of disease or injury. An organ transplant is one solution to this problem. It involves replacing the malfunctioning organ with a healthier one from another person's body. The replacement organ (**donor organ**) may come from someone who has recently died, or in some cases it may come from a living donor.

When a person dies in an accident, many of their organs may still be in good condition and could be used to save someone else's life. This can only happen if they had previously expressed a wish to donate their organs after death. This can be done by joining the organ donor register. There are currently over 16 million people in the UK on this register – over a quarter of the population.

The biggest problem doctors face with transplantation is the lack of suitable organs. This means that many people may die while waiting for a suitable organ to become available. When an organ does become available, a decision has to be made as to who should receive it; this can be a very hard decision to make.

Once an organ has been transplanted, the **recipient** has to take drugs to stop their body from rejecting the donated organ. Rejection occurs when the immune system recognises the donated organ as being 'foreign', and then attacks it and destroys it. The drugs taken are called **immunosuppressants**, and they work by weakening the immune system. A side effect of taking these drugs is that a person will be more likely to fall ill from disease.

Margin boxes contain fascinating facts to engage pupils.

Sample pages from Longman Biology 11–14

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How Science Works

Difficult decisions

When an organ becomes available for transplantation, several different organisations work together to decide who should receive the organ. Factors that are considered include the blood group, age, and size of potential recipients. When considering heart and liver transplants, the health of the potential recipients also needs to be considered; it may be more urgent for one person than another.

Some people argue that factors such as social worth should be taken into consideration; for example, should a donated organ be used to save the life of a young working man or an old retired man? Others point out that maybe someone who has caused damage to themselves through their own actions is not deserving of a transplant. An example of this would be an alcoholic receiving a new liver to replace their own diseased organ, caused by their own drinking.

Questions

1 Kidney transplants are much more common than heart transplants. Suggest reasons why this may be so. [Total 2]

2 In 1954, the first kidney transplant between identical twins was performed in America. Richard Herrick received one of his brother Ronald's kidneys, and was soon back to good health. Despite not taking any immunosuppressant drugs, Richard's body did not reject the donated kidney. Suggest why not. [Total 4]

3 John is 18 years old and currently serving a five-year prison sentence for manslaughter while drink driving. Susan is 56 years old, has no close family, and works part-time in a garden centre. Both John and Susan are waiting for a liver transplant, without which they will probably die within the next year. A donor liver becomes available, and can be used to save the life of either John or Susan.

a) Suggest some reasons why John should receive the new liver and Susan should not. [2]
b) Suggest some reasons why Susan should receive the new liver and John should not. [2]

Transplants



Figure 3 Three children have just finished the Transplant Games. The athletes in these Games have had organ transplants.

How Science Works



Figure 1 A human kidney being transplanted.

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Transplants



Figure 3 Three children have just finished the Transplant Games. The athletes in these Games have had organ transplants.

25

Biology

Light and sound

2.1 Light

Why can you hear your friends if they are standing round a corner but you cannot see them? What form of energy enables you to read this page? Light enables us to see but you cannot see something unless light is shining on it.

Light

Light is the form of energy which enables us to see objects, as our eyes are sensitive to it. It is part of the **electromagnetic spectrum** and travels at a speed of 300 000 000 m/s (see Section 4, chapter 1 for a definition of speed).

Sound is very slow compared with light. It travels at only 330 m/s. If you are watching a race you can see the smoke from the starting pistol before you hear the sound. Thunder and lightning happen at the same time. You see the lightning before you hear the thunder. This is because sound travels so much slower than light. You can roughly estimate how far away a thunderstorm is by counting the number of seconds between the lightning flash and the thunder. The larger the number you count the further away the storm is. The storm will be 1 km away for every three seconds that you count.

Light is an energy wave. This type of wave is called a **transverse wave** and all the forms of energy in the electromagnetic spectrum travel this way.

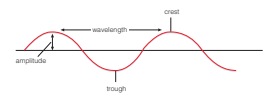


Figure 1.1 A transverse wave.

Luminous and illuminated

Imagine being in a very dark cave. It is impossible to see anything unless you strike a match or turn on a torch. The match and the torch give off their own light; they are called **luminous** objects. Your

Sample pages from Longman Physics 11–14

Highly visual pages and a contemporary design make the science clear, and motivate and extend able pupils.

Physics

1 Introduction to chemistry

1 The beginnings of chemistry

When did the study of chemistry begin? Who were the first chemists? How has chemistry changed through the years? What did we learn from the early chemists?

Our first chemical reactions

Early humans used fire to keep themselves warm and cook their food. In time, they found ways to use fire to get metals, like copper and tin, out of rocks. These early chemical reactions improved their lives by giving them better tools and weapons.

Alchemy

The philosophers of ancient Greece thought about the nature of substances but didn't do experiments. The early Egyptians and Arabs combined the philosophy of the Greeks with their methods and practical skills. In Arabic the study of matter became known as 'al-kimiya', when the ideas reached Europe it became **alchemy**. Like the ancient Greeks alchemists believed that everything was made up of four elements; earth, fire, air and water and that any substance could be made by mixing the correct amounts of each element. Many mixtures were investigated. Some spent their time trying to make gold, others tried to make a potion that would make you live forever. Ordinary people were frightened of the alchemists, as they seemed to have the ability to bring about changes, like magic. Alchemists encouraged this fear by using mysterious symbols so that no one else could understand their writings.

The first chemists

In 1661 Robert Boyle published a book called *The Sceptical Chymist*. The book challenged many of the old ideas about alchemy, including the ideas about the elements. Boyle's book didn't cause an instant change, but from this time on the study of substances was more often called chemistry.

Modern chemistry has learned a great deal from the alchemists. Their experiments produced many useful substances and they invented a number of useful practical techniques, like filtration and distillation.

Sample pages from Longman Chemistry 11–14

Chemistry

How Science Works

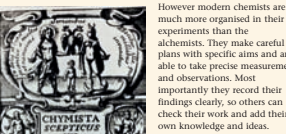


Figure 3 Robert Boyle described a substance that couldn't be broken down into a simpler substance.

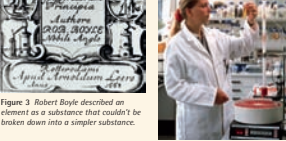


Figure 4 A chemist at work.

Questions

- Give two examples of how early man used fire to bring about chemical reactions. [Total 2]
- Alchemists believed that everything was made up of four elements. [Total 4]
 - Where did the word alchemy come from? [1]
 - What were the four elements? [Total 3]
- a) The word chemistry first appeared in the 17th century. Name the title of the book, its author and the year of publication. [2]

- Robert Boyle used a book to challenge the ideas of the early alchemists. How do scientists share their discoveries and challenge others' work today? [Total 4]
- a) How was alchemy different from the philosophy of the Greeks? [1]
- b) Describe how modern chemists are different from alchemists. [Total 4]
- Why do you think the alchemists tried to keep their work secret? [Total 2]

The beginnings of chemistry

!

The writings of one of the early alchemists, Dider, was so difficult to understand that it gave rise to the term gibberish.

?

5 Name four measuring instruments used by modern chemists that wouldn't have been used by the alchemists? [1]

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