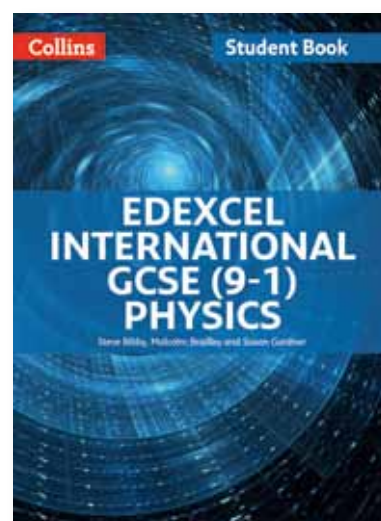
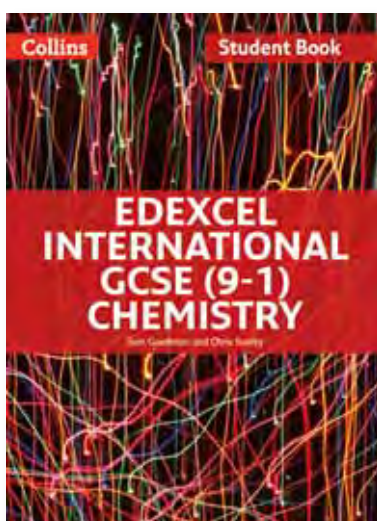
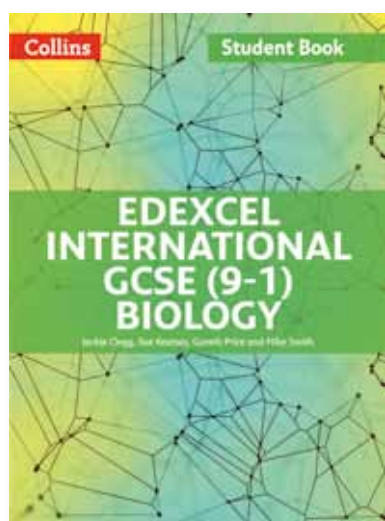


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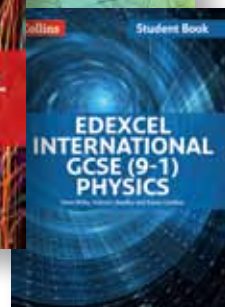
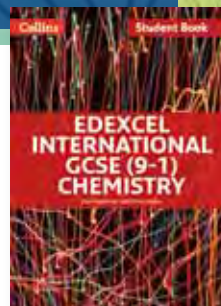
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Respiration

INTRODUCTION

In general, when we talk about respiration, we often mean breathing (or ventilation). However, in this topic, we will look at **cellular respiration**, which is the release of energy from the chemical bonds of food molecules (such as glucose). This happens inside all living cells, and most cellular respiration takes place in tiny structures called mitochondria. Cells where a lot of respiration is carried out, such as muscle cells, have many more mitochondria than cells where only a little respiration is carried out, such as in skin cells.

Fig. 2.10 The cell contains many mitochondria, which have been coloured up in the image.

KNOWLEDGE CHECK

- ✓ Organisms need energy for all the life processes that keep them alive.
- ✓ Plants get this energy from the sugars they make in photosynthesis.
- ✓ Animals get this energy from their food.

LEARNING OBJECTIVES

- ✓ Understand how the process of respiration produces ATP in living organisms.
- ✓ Know that ATP provides energy for cells.
- ✓ Describe the difference between aerobic and anaerobic respiration.
- ✓ Know the word equation and the balanced chemical symbol equation for aerobic respiration in living organisms.
- ✓ Know the word equation for anaerobic respiration in plants and in animals.
- ✓ Predict, if investigated, the evolution of carbon dioxide and heat from respiring seeds in other suitable living organisms.

REMEMBER

Be clear in your answers to distinguish between cellular respiration and the word respiration when used as a noun (breathing) (remember!).

AEROBIC RESPIRATION

Cellular respiration releases energy from dissolved and dissolved food molecules, such as glucose, for all the life processes in the body. For example, energy from respiration is used:

- to keep warm
- to enable muscles to contract
- to build up large molecules from small ones
- to move transport of substances across cell membranes.

The food is usually glucose (sugar), but other kinds of food molecules can be used if there is not enough glucose available. When food is broken down in respiration a substance called ATP (adenosine triphosphate) is made. It is the ATP that directly provides the energy that cells need.

Aerobic respiration is cellular respiration using oxygen. The oxygen needed for aerobic respiration comes from the air (except for a small proportion in photosynthesising plants, which comes from photosynthesis). The carbon dioxide from cellular respiration is released into the air, and the water is either used in the body or excreted through the kidneys.

Fig. 2.11 Aerobic respiration in a cell.

SCIENCE IN CONTEXT

WATER FROM RESPIRATION

A camel can survive for many days without drinking liquid water, which means it survives well in desert conditions. The camel's hump is not a store of water, but a store of fat. Over a long period without food, the fat is broken down by aerobic respiration. Since water is one of the products of aerobic respiration, this also helps the camel to survive longer without drinking water.

Going for days without food and drinking water would kill a human in a few days, because we don't metabolise fat as well as the camel does, or retain water as well. So, before setting out into the desert, the pros make sure your camel has a large hump and you have plenty of food and water.

Fig. 2.12 An Arabian camel (dromedary) can survive for many days in the desert with little food. It can't get it if it's out in the desert.

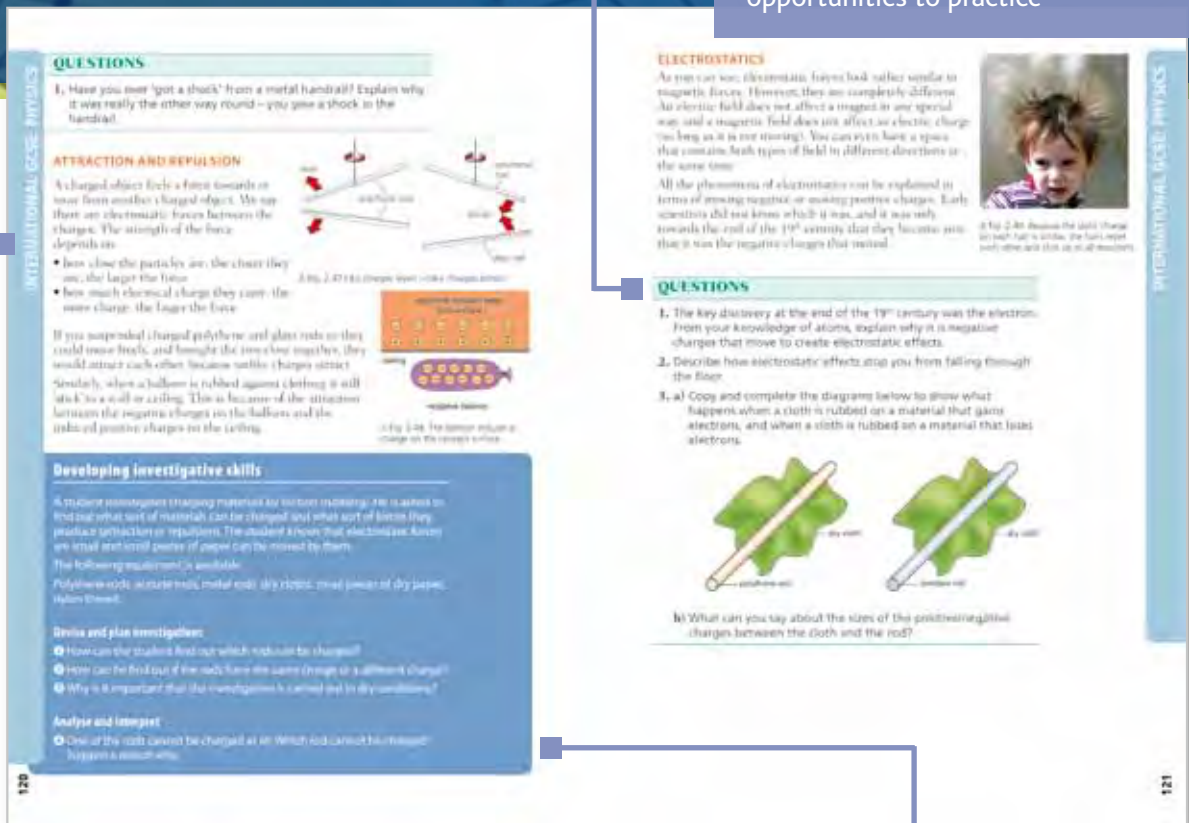
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