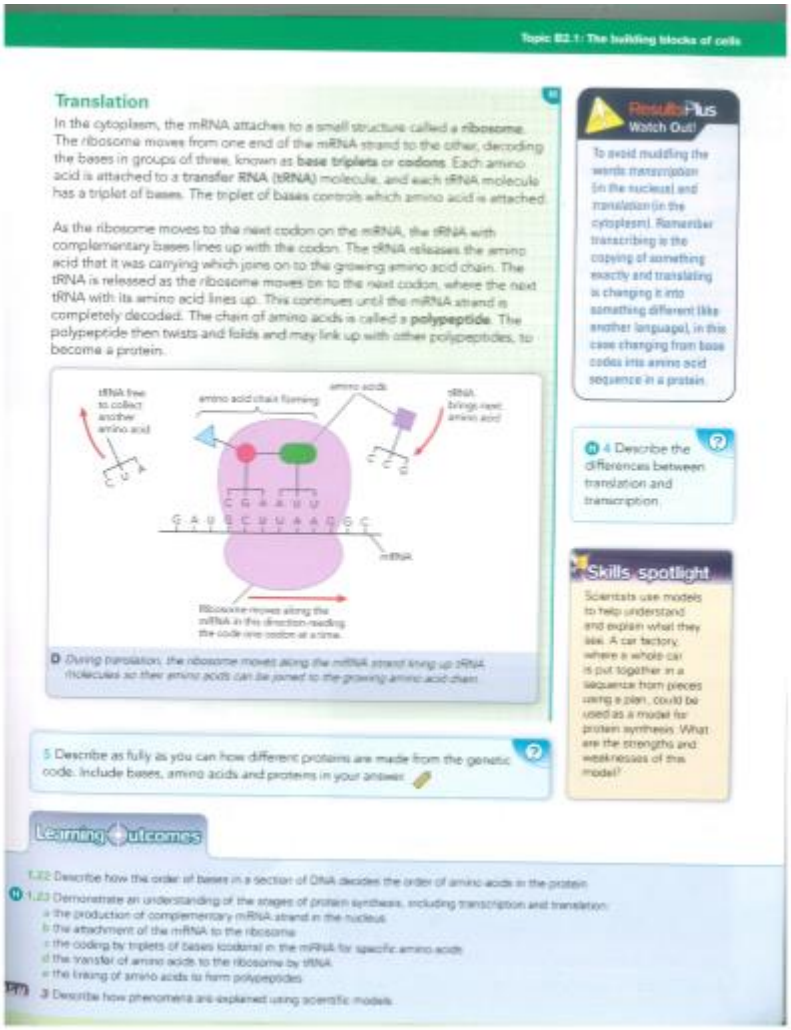
Research the Problem: Edexcel GCSE Science

Unlike any other material I have covered, these are three official educational text books used by the school my client works at to aid in teaching GCSE students the content they will be tested on.



Topic B2.1: The building blocks of cells

Translation

In the cytoplasm, the mRNA attaches to a small structure called a **ribosome**. The ribosome moves from one end of the mRNA strand to the other, decoding the bases in groups of three, known as **base triplets** or **codons**. Each amino acid is attached to a **transfer RNA (tRNA)** molecule, and each tRNA molecule has a triplet of bases. The triplet of bases controls which amino acid is attached.

As the ribosome moves to the next codon on the mRNA, the tRNA with complementary bases lines up with the codon. The tRNA releases the amino acid that it was carrying which joins on to the growing amino acid chain. The tRNA is released as the ribosome moves on to the next codon, where the next tRNA with its amino acid lines up. This continues until the mRNA strand is completely decoded. The chain of amino acids is called a **polypeptide**. The polypeptide then twists and folds and may link up with other polypeptides, to become a protein.

During translation, the ribosome moves along the mRNA strand lining up tRNA molecules so their amino acids can be joined to the growing amino acid chain.

ResultsPlus Watch Out!

To avoid muddling the words transcription (in the nucleus) and translation (in the cytoplasm). Remember transcribing is the copying of something exactly and translating is changing it into something different (like another language), in this case changing from base codes into amino acid sequence in a protein.

4 Describe the differences between translation and transcription.

Skills spotlight

Scientists use models to help understand and explain what they see. A car factory, where a whole car is put together in a sequence from pieces using a plan, could be used as a model for protein synthesis. What are the strengths and weaknesses of this model?

5 Describe as fully as you can how different proteins are made from the genetic code. Include bases, amino acids and proteins in your answer.

Learning outcomes

1.22 Describe how the order of bases in a section of DNA decides the order of amino acids in the protein

1.23 Demonstrate an understanding of the stages of protein synthesis, including transcription and translation:
a the production of complementary mRNA strand in the nucleus
b the attachment of the mRNA to the ribosome
c the coding by triplets of bases (codons) in the mRNA for specific amino acids
d the transfer of amino acids to the ribosome by tRNA
e the linking of amino acids to form polypeptides

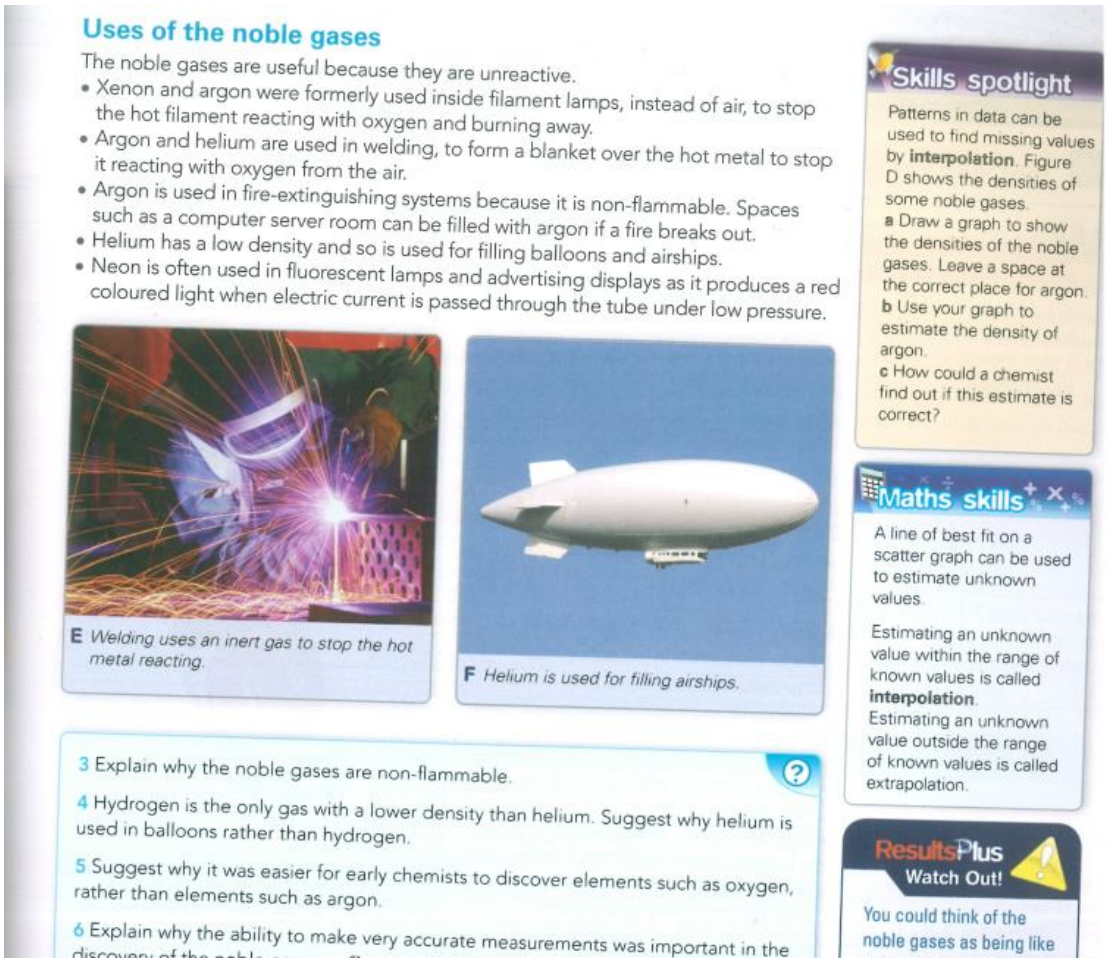
WS 3 Describe how phenomena are explained using scientific models

These are huge books full of information directly related to the content that the reader will be tested on. Notice how the page above has:

- Main text
- A model
- Exam tips on the side
- Questions to test your understanding of the text on the side
- Skills that make a good scientist on the side
- Questions at the end of each part to mimic the content you would find in an actual examination

If you have really good eyes, you would notice that unlike the other books that are split into named chapters, these books are separated into science > topic > section of that topic. This allows the

entirety of GCSE science to be numbered up according to the current content.



Uses of the noble gases

The noble gases are useful because they are unreactive.

- Xenon and argon were formerly used inside filament lamps, instead of air, to stop the hot filament reacting with oxygen and burning away.
- Argon and helium are used in welding, to form a blanket over the hot metal to stop it reacting with oxygen from the air.
- Argon is used in fire-extinguishing systems because it is non-flammable. Spaces such as a computer server room can be filled with argon if a fire breaks out.
- Helium has a low density and so is used for filling balloons and airships.
- Neon is often used in fluorescent lamps and advertising displays as it produces a red coloured light when electric current is passed through the tube under low pressure.

E *Welding uses an inert gas to stop the hot metal reacting.*

F *Helium is used for filling airships.*

3 Explain why the noble gases are non-flammable.

4 Hydrogen is the only gas with a lower density than helium. Suggest why helium is used in balloons rather than hydrogen.

5 Suggest why it was easier for early chemists to discover elements such as oxygen, rather than elements such as argon.

6 Explain why the ability to make very accurate measurements was important in the

Skills spotlight

Patterns in data can be used to find missing values by **interpolation**. Figure D shows the densities of some noble gases.

a Draw a graph to show the densities of the noble gases. Leave a space at the correct place for argon.

b Use your graph to estimate the density of argon.

c How could a chemist find out if this estimate is correct?

Maths skills

A line of best fit on a scatter graph can be used to estimate unknown values.

Estimating an unknown value within the range of known values is called **interpolation**. Estimating an unknown value outside the range of known values is called extrapolation.

ResultsPlus Watch Out!

You could think of the noble gases as being like

Unlike all the other books that I have researched, this book very clearly has a lot more text then images. This is not to say there are no images, they are used for an example of something just covered in the paragraph as a real life example of what they just explained, or it is either a model or a diagram.

While I included this into my research into other methods of solving my problem, this book is actually the problem. I have personally seen people stare at pages of this book for extended periods of time trying to understand concepts, their eyes glossed over before the information sinks in.

Interestingly enough, my levels will be designed using the same system as these books. I will also try to use the information contained in these books to design the levels. It is also interesting to compare these books to the BBC Bitesize digital learning resource. While the Bitesize website has the high ground by being digital, I find that these books deliver a higher quality of education. Of course, this only applies if you're doing the Exedcel GCSEs.