Pearson

International Baccalaureate Catalogue 2021

Resources for schools following an International Baccalaureate curriculum

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- 25 subjects covered
- 148 expertly-written textbooks
- 4,000+ interactive learning activities
- A pair of shoes with built-in jetpacks*

*OK, the jetpack bit isn't true, but we know that pointless gadgets aren't really what you need to teach the IB curriculum. What you need is a clear, effective and well-signposted toolkit. So, we've made sure all our resources are well-researched, clearly laid out and full of simple, practical ideas.

Everything you need, nothing you don't.
And no jetpack shoes. Sorry.

Welcome!

Our comprehensive resources are well-researched, carefully crafted, and written by experts to ensure they provide IB learners with what they need for their IB journey.

Using an international inquiry-based approach, our **PYP Readers and Companions Programme®** motivates learners to develop important early reading strategies.

Pearson Mathematics for the Middle Years Programme is our brand new five-book series with an inquiry-led approach that gives learners the opportunity to explore concepts for themselves.

Our high-quality **Diploma Programme textbooks** are written by leading IB experts, and every title comes with a free enhanced eBook for flexible learning.

The accompanying **Essentials Series** is the perfect solution for your Diploma learners' revision needs.

Pearson's support continues for students choosing to follow IB's Career-related Programme with Pearson BTEC packages and our Diploma resources.

Contents

* Primary Years Programme (PYP), Middle Years Programme (MYP), Diploma Programme (DP), and Career-related Programme (CP) are trademarks of the International Baccalaureate Organisation (IB), which was not involved in the production of these products.

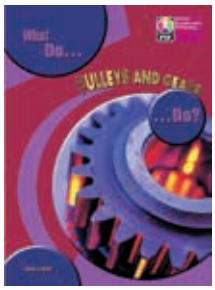
All prices displayed in this catalog are correct at time of printing and are subject to change.

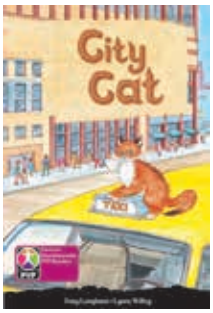
Primary Years Readers and Companions Programme

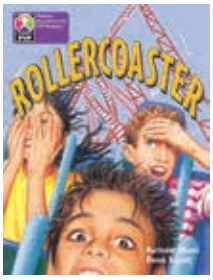
Specially designed to motivate younger learners and help them develop vital inquiry-based reading strategies.

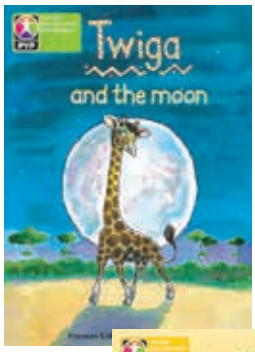
This collection of 120 inquiry-based Readers provides plenty to explore, in line with the IB PYP core principles.

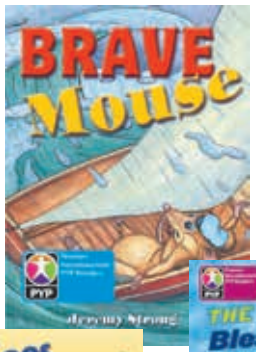
A ready-made library clearly categorised by age and organised into themes. These Readers span the six units of inquiry and come with nine Companions to support your PYP pupils with their learning.

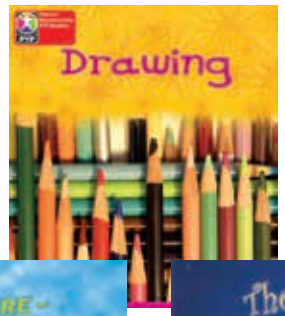




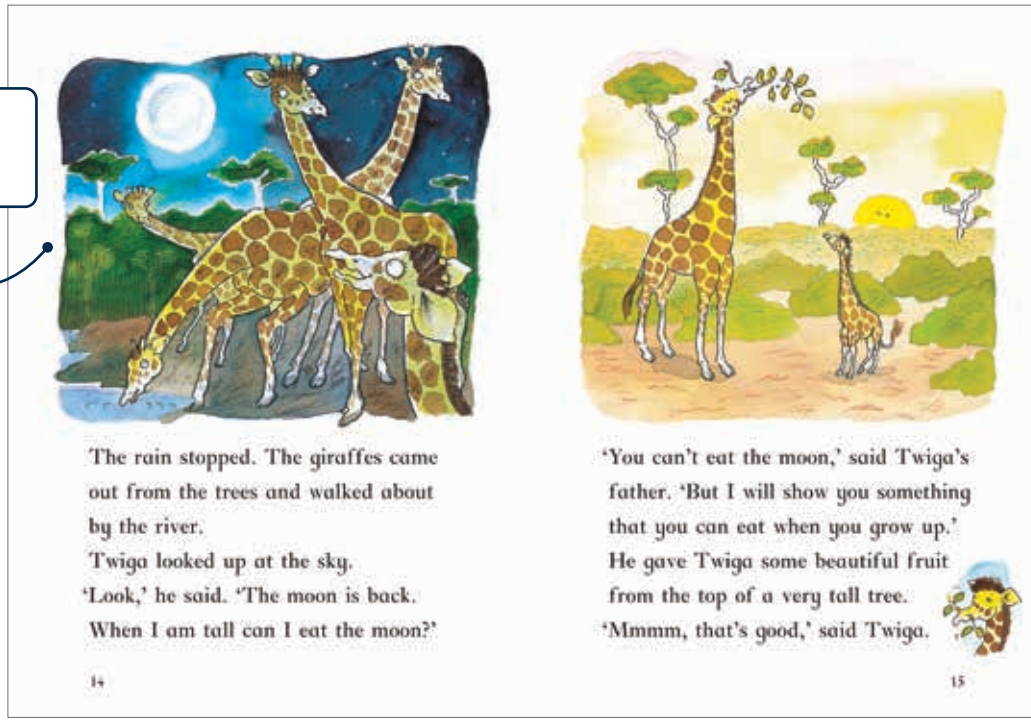








A variety of fiction and non-fiction will motivate all learners.



The rain stopped. The giraffes came out from the trees and walked about by the river.
Twiga looked up at the sky.
'Look,' he said. 'The moon is back. When I am tall can I eat the moon?'

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'You can't eat the moon,' said Twiga's father. 'But I will show you something that you can eat when you grow up.'
He gave Twiga some beautiful fruit from the top of a very tall tree.
'Mmmm, that's good,' said Twiga.

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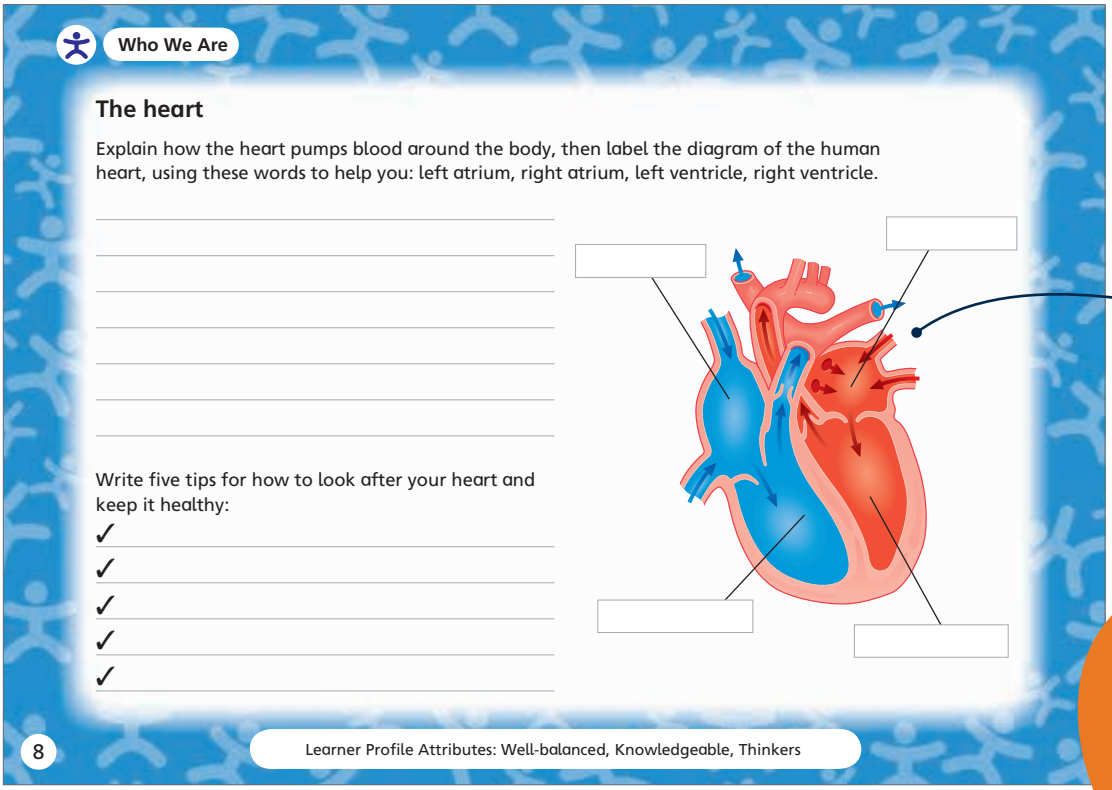
Summary of components

- 120 x high-quality, inquiry-based Readers.
- Nine supporting Companions with activities to build up individual portfolios.
- Money-saving packs available, organised by grade/year and theme.

Readers have a strong international approach and are all linked to the IB Learner Profile.



Companions include tear-out sheets for inclusion in portfolios

ELL
These books teach the higher-order skills and strategies that thinking readers need, and support comprehension and oral language.

HOW TO SAMPLE

To evaluate this series, visit: **pearsoninternational-schools.com/pyp**

PEARSON PYP READERS AND COMPANIONS PROGRAMME

To place an order, contact your customer services team or local consultant **pearsoninternational-schools.com/contact**

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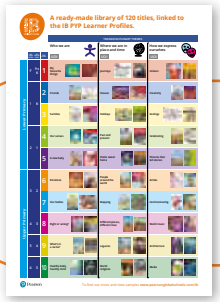
PYP Theme Pack Where We Are In Place and Time	978 0 435993 23 8	£93.00
PYP Theme Pack Who We Are	978 0 435993 22 1	£93.00

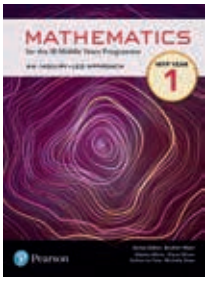


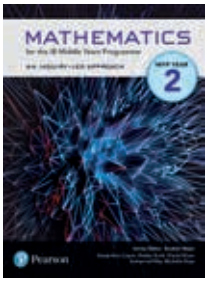
Download the PYP Readers and Companions Structure Chart
www.pearson.com/internationalschools/pyp

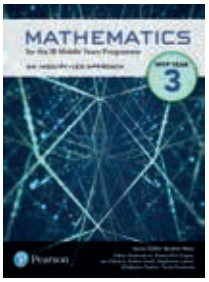
MIDDLE YEARS

Mathematics for the Middle Years Programme

NEW SERIES







This brand new series puts learners in charge with an exploratory inquiry-led approach to MYP Mathematics.

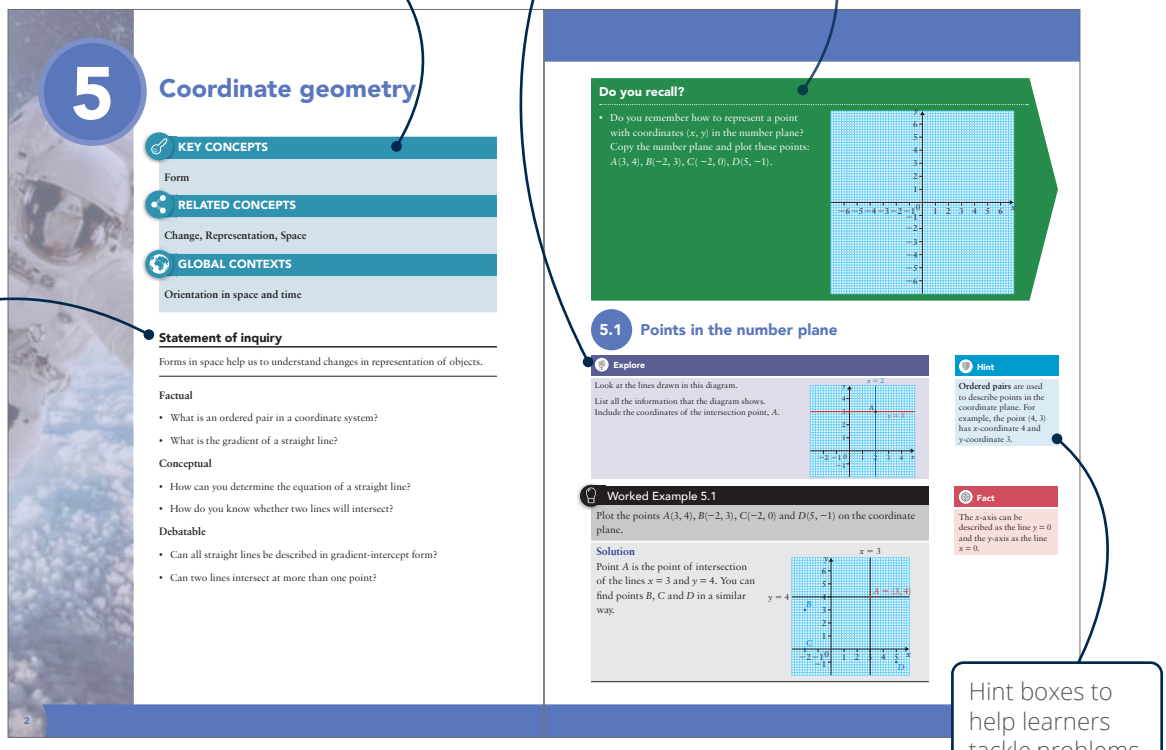
- Each full-colour book and accompanying eBook contains detailed worked examples, ideas for investigations, reflections, differentiated exercises, and check your knowledge questions to put learning into practice.
- Clear links to key concepts, related concepts and global contexts in addition to statements of inquiry and inquiry questions for each chapter.
- ATLs identified throughout.
- Written by an international team of highly experienced authors and teachers, and led by Series Editor, Ibrahim Wazir, this new series matches the 2020 Guide.

Key concepts, related concepts and global contexts identified for each chapter.

Learners are encouraged to explore concepts and problems.

Learners are reminded of prior learning.

Statement of inquiry and inquiry questions for each chapter.



Hint boxes to help learners tackle problems.

MATHEMATICS FOR THE MIDDLE YEARS PROGRAMME		
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Year 2		
Course Book	978 1 292367 41 5	£35.00
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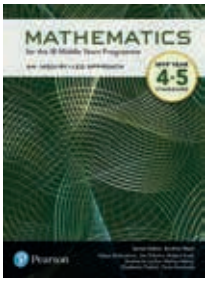
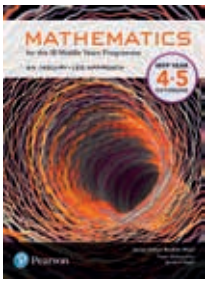
Course Book	978 1 292367 42 2	£40.00
Year 4+5 Standard		
Course Book	978 1 292367 43 9	£45.00
Year 4+5 Extended		
Course Book	978 1 292367 44 6	£50.00
Teacher Resources		
Pearson Mathematics for the IB Middle Years Programme Teacher Guide	Check our online price list	

Summary of components

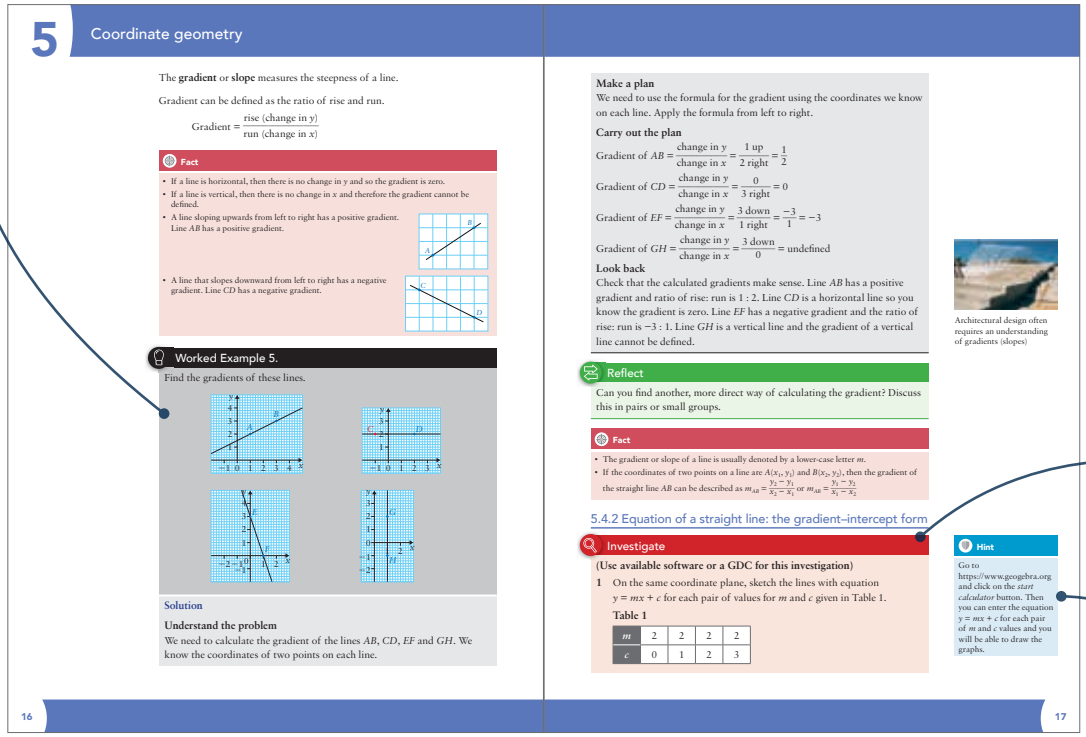
- 5 printed student books with free eBook access.
- Accompanying Teacher Guide.

New series written for the new MYP Mathematics Guide.





Clear and structured worked examples throughout.



5 Coordinate geometry

The **gradient** or **slope** measures the steepness of a line.

Gradient can be defined as the ratio of rise and run.

$$\text{Gradient} = \frac{\text{rise (change in } y)}{\text{run (change in } x)}$$

Fact

- If a line is horizontal, then there is no change in y and so the gradient is zero.
- If a line is vertical, then there is no change in x and therefore the gradient cannot be defined.
- A line sloping upwards from left to right has a positive gradient. Line AB has a positive gradient.
- A line that slopes downward from left to right has a negative gradient. Line CD has a negative gradient.

Worked Example 5.

Find the gradients of these lines.

Solution

Understand the problem

We need to calculate the gradient of the lines AB, CD, EF and GH. We know the coordinates of two points on each line.

Make a plan

We need to use the formula for the gradient using the coordinates we know on each line. Apply the formula from left to right.

Carry out the plan

$$\text{Gradient of } AB = \frac{\text{change in } y}{\text{change in } x} = \frac{1 \text{ up}}{2 \text{ right}} = \frac{1}{2}$$

$$\text{Gradient of } CD = \frac{\text{change in } y}{\text{change in } x} = \frac{0}{3 \text{ right}} = 0$$

$$\text{Gradient of } EF = \frac{\text{change in } y}{\text{change in } x} = \frac{3 \text{ down}}{1 \text{ right}} = \frac{-3}{1} = -3$$

$$\text{Gradient of } GH = \frac{\text{change in } y}{\text{change in } x} = \frac{3 \text{ down}}{0} = \text{undefined}$$

Look back

Check that the calculated gradients make sense. Line AB has a positive gradient and ratio of rise: run is 1 : 2. Line CD is a horizontal line so you know the gradient is zero. Line EF has a negative gradient and the ratio of rise: run is −3 : 1. Line GH is a vertical line and the gradient of a vertical line cannot be defined.

Architectural design often requires an understanding of gradients (slopes)

Reflect

Can you find another, more direct way of calculating the gradient? Discuss this in pairs or small groups.

Fact

- The gradient or slope of a line is usually denoted by a lower-case letter m.
- If the coordinates of two points on a line are $A(x_1, y_1)$ and $B(x_2, y_2)$, then the gradient of the straight line AB can be described as $m_{AB} = \frac{y_2 - y_1}{x_2 - x_1}$ or $m_{AB} = \frac{y_1 - y_2}{x_1 - x_2}$

5.4.2 Equation of a straight line: the gradient–intercept form

Investigate

(Use available software or a GDC for this investigation)

1 On the same coordinate plane, sketch the lines with equation $y = mx + c$ for each pair of values for m and c given in Table 1.

Table 1

m	2	2	2	2
c	0	1	2	3

Hint

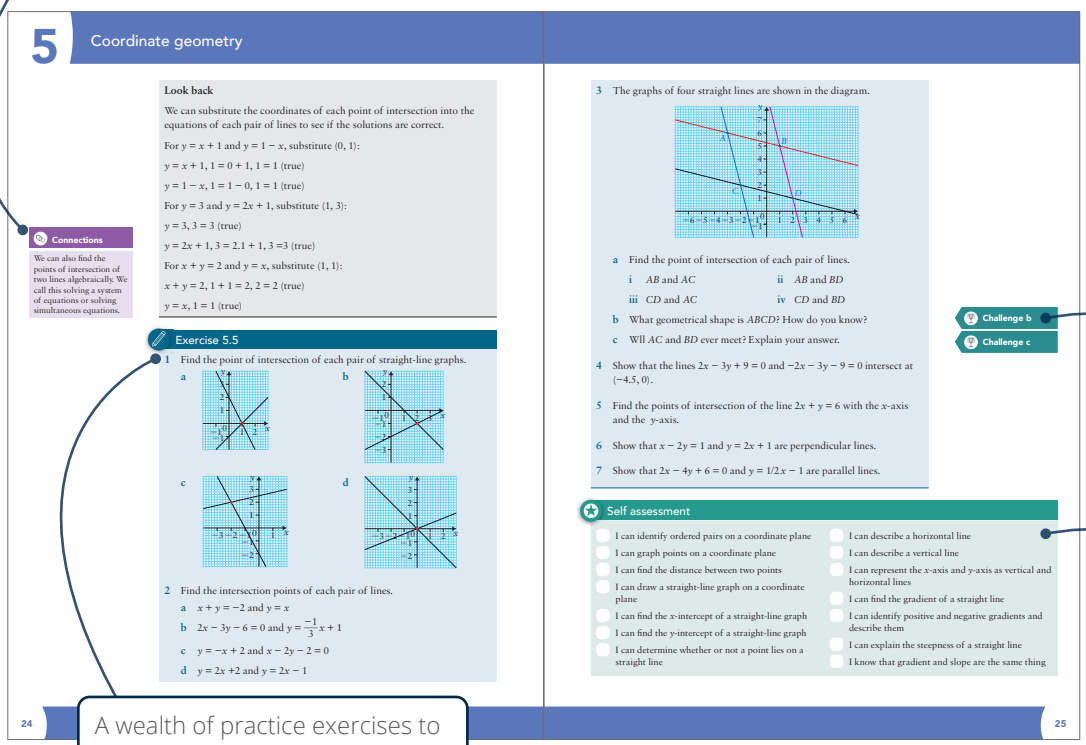
Go to https://www.geogebra.org and click on the *start calculator* button. Then you can enter the equation $y = mx + c$ for each pair of m and c values and you will be able to draw the graphs.

16 17

Ideas for investigations.

Suggestions for using technology to support learning and improve understanding.

Connections to other areas highlighted.



5 Coordinate geometry

Look back

We can substitute the coordinates of each point of intersection into the equations of each pair of lines to see if the solutions are correct.

For $y = x + 1$ and $y = 1 - x$, substitute (0, 1):

$y = x + 1$, $1 = 0 + 1$, $1 = 1$ (true)

$y = 1 - x$, $1 = 1 - 0$, $1 = 1$ (true)

For $y = 3$ and $y = 2x + 1$, substitute (1, 3):

$y = 3$, $3 = 3$ (true)

$y = 2x + 1$, $3 = 2.1 + 1$, $3 = 3$ (true)

For $x + y = 2$ and $y = x$, substitute (1, 1):

$x + y = 2$, $1 + 1 = 2$, $2 = 2$ (true)

$y = x$, $1 = 1$ (true)

Connections

We can also find the points of intersection of two lines algebraically. We call this solving a system of equations or solving simultaneous equations.

Exercise 5.5

1 Find the point of intersection of each pair of straight-line graphs.

a b

c d

2 Find the intersection points of each pair of lines.

a $x + y = -2$ and $y = x$

b $2x - 3y - 6 = 0$ and $y = \frac{-1}{3}x + 1$

c $y = -x + 2$ and $x - 2y - 2 = 0$

d $y = 2x + 2$ and $y = 2x - 1$

3 The graphs of four straight lines are shown in the diagram.

a Find the point of intersection of each pair of lines.

i AB and AC ii AB and BD

iii CD and AC iv CD and BD

b What geometrical shape is $ABCD$? How do you know?

c Will AC and BD ever meet? Explain your answer.

4 Show that the lines $2x - 3y + 9 = 0$ and $-2x - 3y - 9 = 0$ intersect at $(-4.5, 0)$.

5 Find the points of intersection of the line $2x + y = 6$ with the x-axis and the y-axis.

6 Show that $x - 2y = 1$ and $y = 2x + 1$ are perpendicular lines.

7 Show that $2x - 4y + 6 = 0$ and $y = 1/2\,x - 1$ are parallel lines.

Challenge b **Challenge c**

Self assessment

- I can identify ordered pairs on a coordinate plane
- I can graph points on a coordinate plane
- I can find the distance between two points
- I can draw a straight-line graph on a coordinate plane
- I can find the x-intercept of a straight-line graph
- I can find the y-intercept of a straight-line graph
- I can determine whether or not a point lies on a straight line
- I can describe a horizontal line
- I can describe a vertical line
- I can represent the x-axis and y-axis as vertical and horizontal lines
- I can find the gradient of a straight line
- I can identify positive and negative gradients and describe them
- I can explain the steepness of a straight line
- I know that gradient and slope are the same thing

24 25

Challenging content included and labelled for easy differentiation.

End of chapter checklists and questions to help learners track progress.

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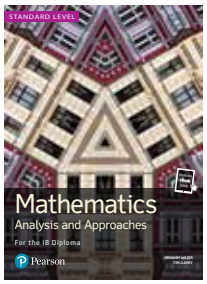

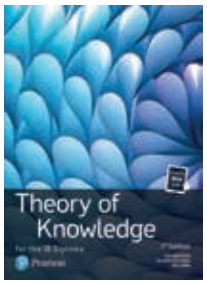

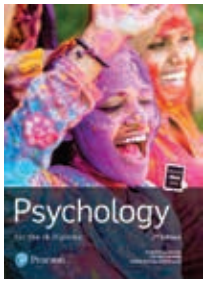

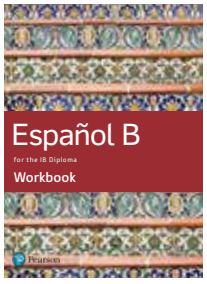

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Core Curriculum Theory of Knowledge

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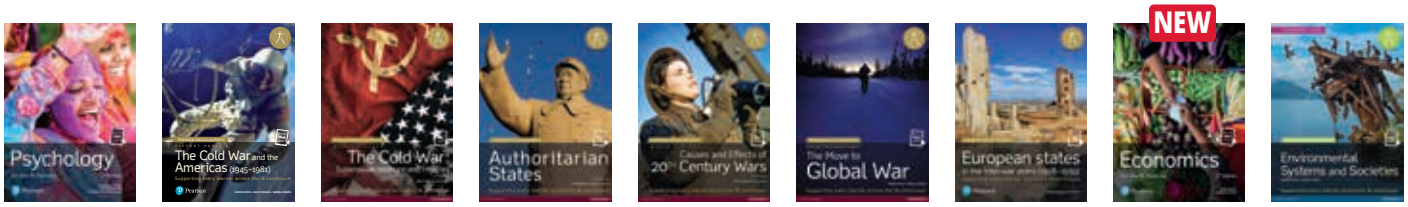
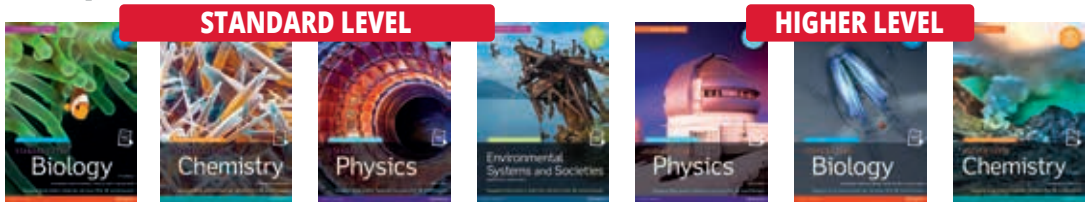
Group 2 Language Acquisition

Group 3 Individuals and Societies



Group 4 Sciences



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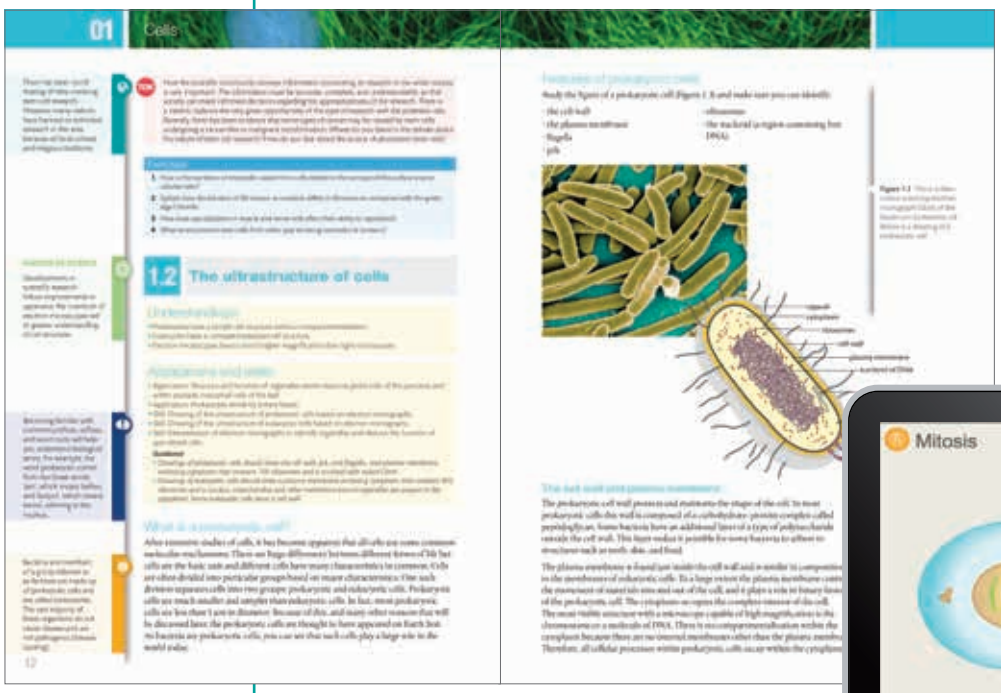

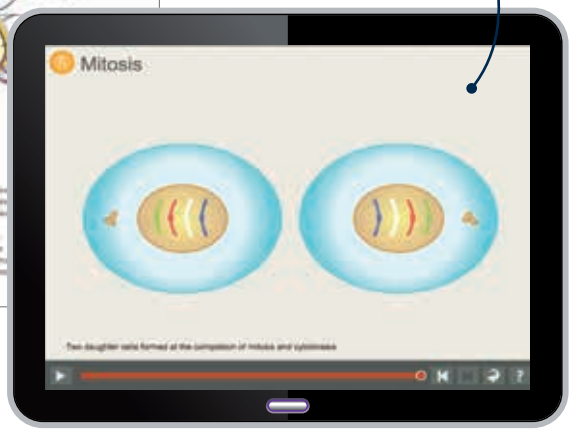

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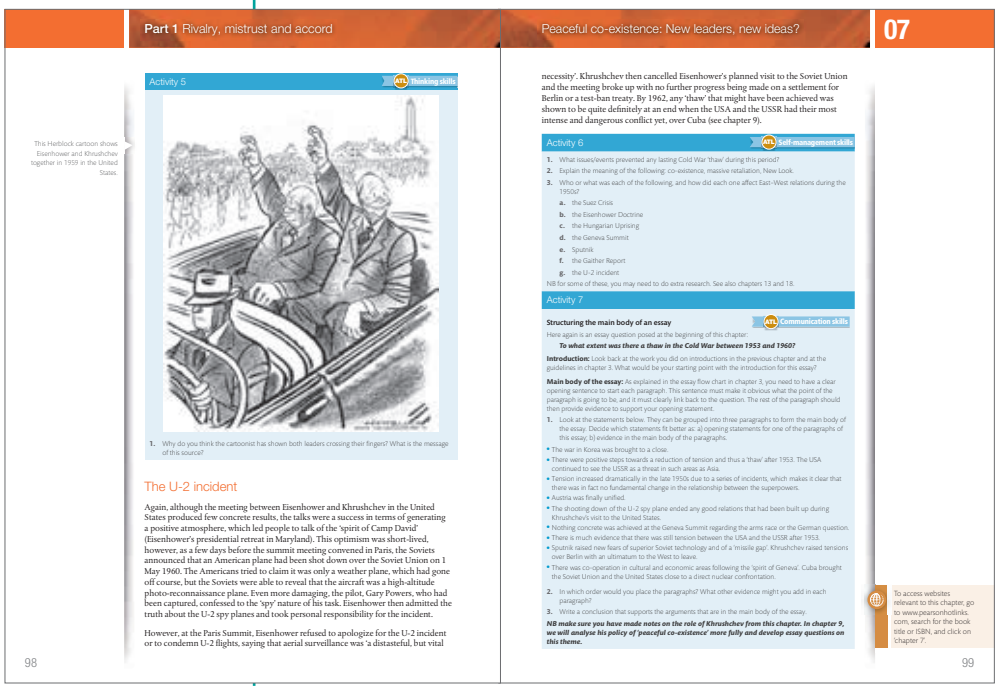

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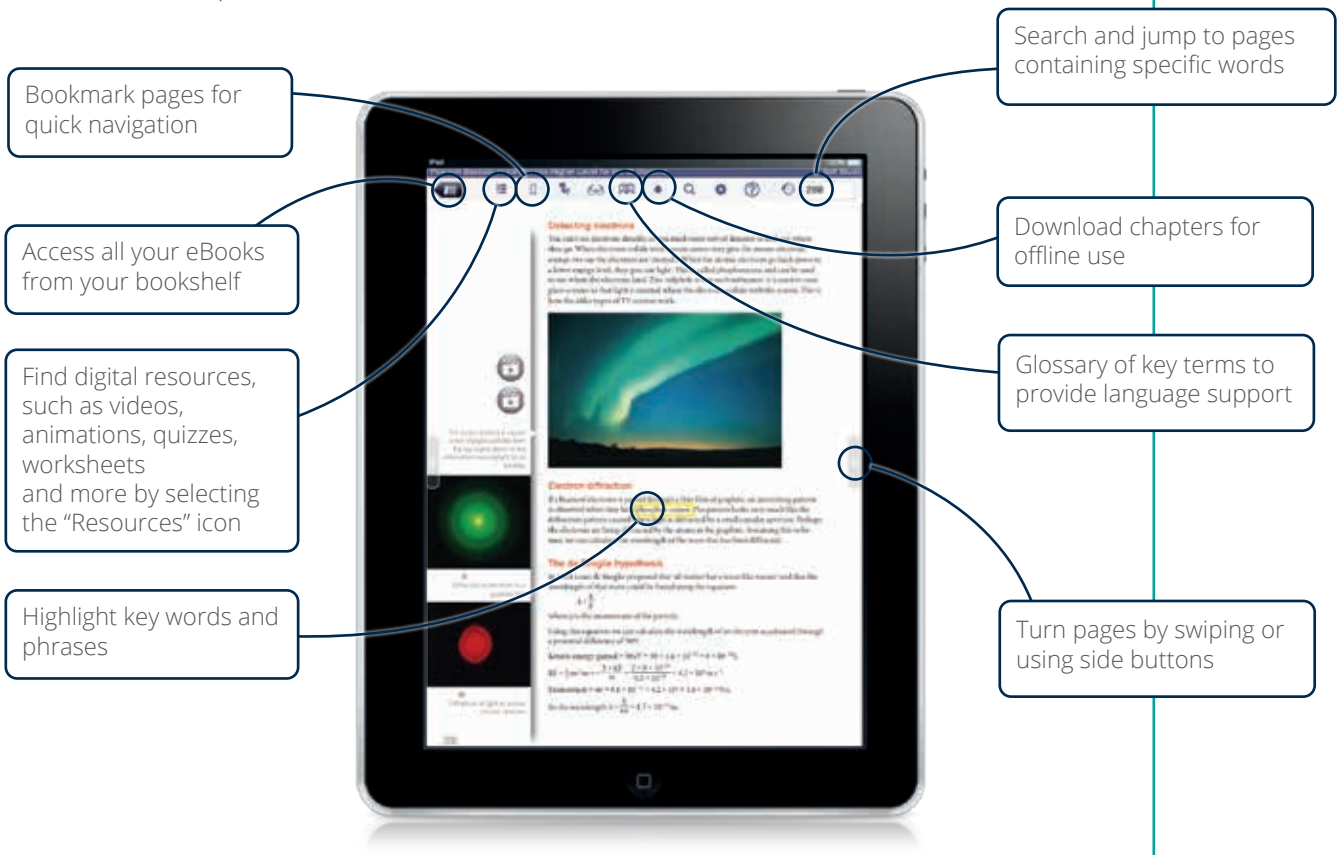

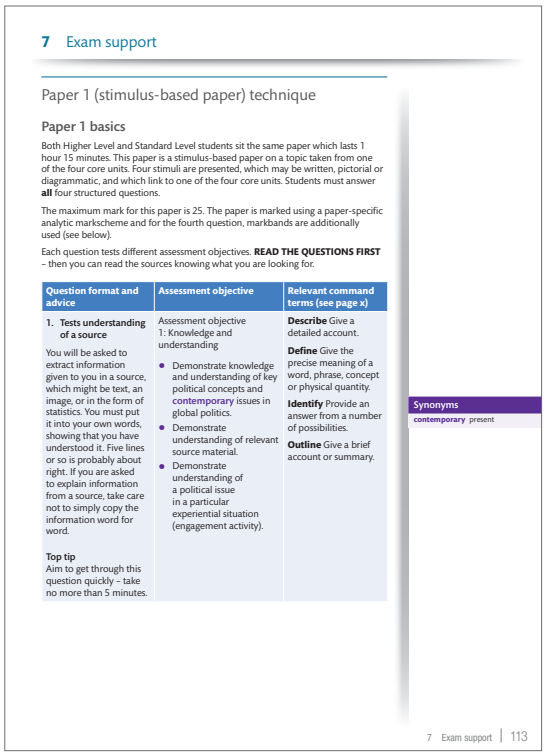

7 Exam support

Paper 1 (stimulus-based paper) technique

Paper 1 basics

Both Higher Level and Standard Level students sit the same paper which lasts 1 hour 15 minutes. This paper is a stimulus-based paper on a topic taken from one of the four core units. Four stimuli are presented, which may be written, pictorial or diagrammatic, and which link to one of the four core units. Students must answer **all** four structured questions.

The maximum mark for this paper is 25. The paper is marked using a paper-specific analytic markscheme and for the fourth question, markbands are additionally used (see below).

Each question tests different assessment objectives. **READ THE QUESTIONS FIRST** – then you can read the sources knowing what you are looking for.

Question format and advice	Assessment objective	Relevant command terms (see page x)
1. **Tests understanding of a source** You will be asked to extract information given to you in a source, which might be text, an image, or in the form of statistics. You must put it into your own words, showing that you have understood it. Five lines or so is probably about right. If you are asked to explain information from a source, take care not to simply copy the information word for word. **Top tip** Aim to get through this question quickly – take no more than 5 minutes.	Assessment objective 1: Knowledge and understanding • Demonstrate knowledge and understanding of key political concepts and contemporary issues in global politics. • Demonstrate understanding of relevant source material. • Demonstrate understanding of a political issue in a particular experiential situation (engagement activity).	**Describe** Give a detailed account. **Define** Give the precise meaning of a word, phrase, concept or physical quantity. **Identify** Provide an answer from a number of possibilities. **Outline** Give a brief account or summary.

Synonyms
contemporary present

7 Exam support | 113

Sample page from *Essentials: Global Politics*

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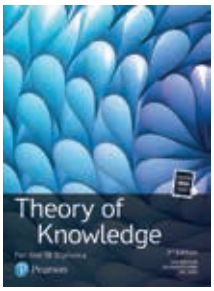

- Authoring team consisting of Julian Kitching and Ric Sims, highly regarded members of the curriculum review panel, and Sue Bastian, the architect of the original TOK curriculum.
- Provides full coverage of the 2020 Guide covering the Core, Optional Themes, and Areas of Knowledge.
- Structured to match the new knowledge framework.
- Examples of knowledge questions to help students recognise and decipher them.
- Support for the essay and the new exhibition assessment.
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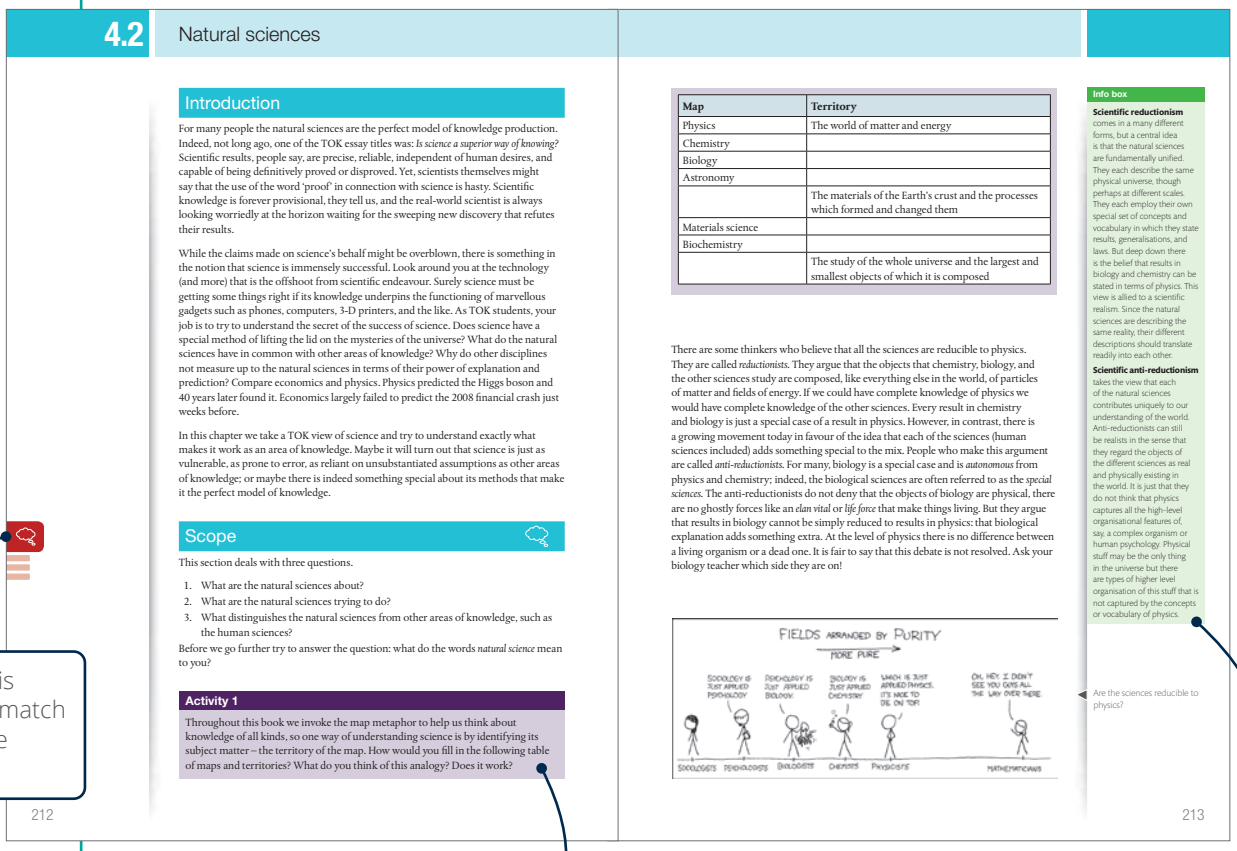

4.2 Natural sciences

Introduction

For many people the natural sciences are the perfect model of knowledge production. Indeed, not long ago, one of the TOK essay titles was: *Is science a superior way of knowing?* Scientific results, people say, are precise, reliable, independent of human desires, and capable of being definitively proved or disproved. Yet, scientists themselves might say that the use of the word 'proof' in connection with science is hasty. Scientific knowledge is forever provisional, they tell us, and the real-world scientist is always looking worriedly at the horizon waiting for the sweeping new discovery that refutes their results.

While the claims made on science's behalf might be overblown, there is something in the notion that science is immensely successful. Look around you at the technology (and more) that is the offshoot from scientific endeavour. Surely science must be getting some things right if its knowledge underpins the functioning of marvellous gadgets such as phones, computers, 3-D printers, and the like. As TOK students, your job is to try to understand the secret of the success of science. Does science have a special method of lifting the lid on the mysteries of the universe? What do the natural sciences have in common with other areas of knowledge? Why do other disciplines not measure up to the natural sciences in terms of their power of explanation and prediction? Compare economics and physics. Physics predicted the Higgs boson and 40 years later found it. Economics largely failed to predict the 2008 financial crash just weeks before.

In this chapter we take a TOK view of science and try to understand exactly what makes it work as an area of knowledge. Maybe it will turn out that science is just as vulnerable, as prone to error, as reliant on unsubstantiated assumptions as other areas of knowledge; or maybe there is indeed something special about its methods that make it the perfect model of knowledge.

Scope

This section deals with three questions.

1. What are the natural sciences about?
2. What are the natural sciences trying to do?
3. What distinguishes the natural sciences from other areas of knowledge, such as the human sciences?

Before we go further try to answer the question: what do the words *natural science* mean to you?

Activity 1

Throughout this book we invoke the map metaphor to help us think about knowledge of all kinds, so one way of understanding science is by identifying its subject matter – the territory of the map. How would you fill in the following table of maps and territories? What do you think of this analogy? Does it work?

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Map	Territory
Physics	The world of matter and energy
Chemistry	
Biology	
Astronomy	
	The materials of the Earth's crust and the processes which formed and changed them
Materials science	
Biochemistry	
	The study of the whole universe and the largest and smallest objects of which it is composed

There are some thinkers who believe that all the sciences are reducible to physics. They are called *reductionists*. They argue that the objects that chemistry, biology, and the other sciences study are composed, like everything else in the world, of particles of matter and fields of energy. If we could have complete knowledge of physics we would have complete knowledge of the other sciences. Every result in chemistry and biology is just a special case of a result in physics. However, in contrast, there is a growing movement today in favour of the idea that each of the sciences (human sciences included) adds something special to the mix. People who make this argument are called *anti-reductionists*. For many, biology is a special case and is *autonomous* from physics and chemistry; indeed, the biological sciences are often referred to as the *special sciences*. The anti-reductionists do not deny that the objects of biology are physical, there are no ghostly forces like an *elan vital* or *life force* that make things living. But they argue that results in biology cannot be simply reduced to results in physics: that biological explanation adds something extra. At the level of physics there is no difference between a living organism or a dead one. It is fair to say that this debate is not resolved. Ask your biology teacher which side they are on!

Are the sciences reducible to physics?

Info box

Scientific reductionism comes in a many different forms, but a central idea is that the natural sciences are fundamentally unified. They each describe the same physical universe, though perhaps at different scales. They each employ their own special set of concepts and vocabulary in which they state results, generalisations, and laws. But deep down there is the belief that results in biology and chemistry can be stated in terms of physics. This view is allied to a scientific realism. Since the natural sciences are describing the same reality, their different descriptions should translate readily into each other.

Scientific anti-reductionism takes the view that each of the natural sciences contributes uniquely to our understanding of the world. Anti-reductionists can still be realists in the sense that they regard the objects of the different sciences as real and physically existing in the world. It is just that they do not think that physics captures all the high-level organisational features of, say, a complex organism or human psychology. Physical stuff may be the only thing in the universe but there are types of higher level organisation of this stuff that is not captured by the concepts or vocabulary of physics.

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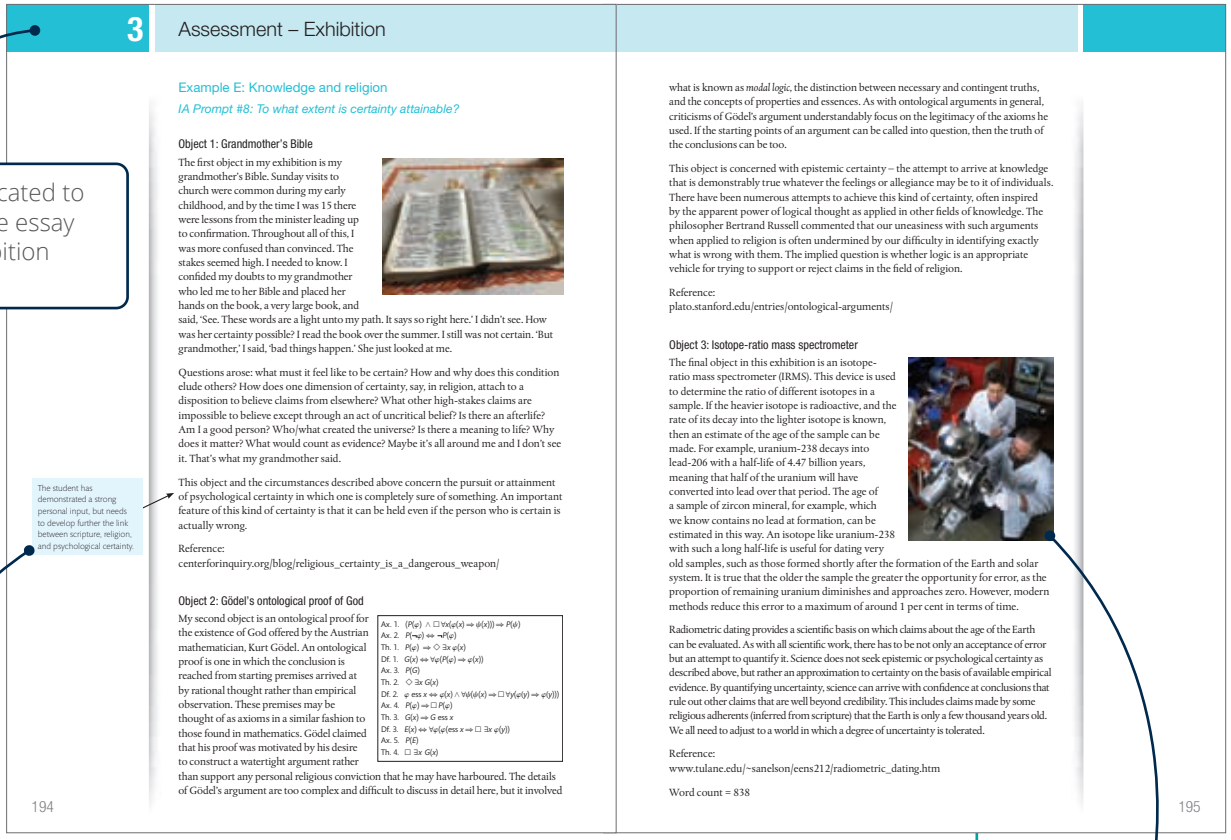

3 Assessment – Exhibition

Example E: Knowledge and religion

IA Prompt #8: To what extent is certainty attainable?

Object 1: Grandmother's Bible

The first object in my exhibition is my grandmother's Bible. Sunday visits to church were common during my early childhood, and by the time I was 15 there were lessons from the minister leading up to confirmation. Throughout all of this, I was more confused than convinced. The stakes seemed high. I needed to know. I confided my doubts to my grandmother who led me to her Bible and placed her hands on the book, a very large book, and said, 'See. These words are a light unto my path. It says so right here.' I didn't see. How was her certainty possible? I read the book over the summer. I still was not certain. 'But grandmother,' I said, 'bad things happen.' She just looked at me.

Questions arose: what must it feel like to be certain? How and why does this condition elude others? How does one dimension of certainty, say, in religion, attach to a disposition to believe claims from elsewhere? What other high-stakes claims are impossible to believe except through an act of uncritical belief? Is there an afterlife? Am I a good person? Who/what created the universe? Is there a meaning to life? Why does it matter? What would count as evidence? Maybe it's all around me and I don't see it. That's what my grandmother said.

The student has demonstrated a strong personal input, but needs to develop further the link between scripture, religion, and psychological certainty.

This object and the circumstances described above concern the pursuit or attainment of psychological certainty in which one is completely sure of something. An important feature of this kind of certainty is that it can be held even if the person who is certain is actually wrong.

Reference:
centerforinquiry.org/blog/religious_certainty_is_a_dangerous_weapon/

Object 2: Gödel's ontological proof of God

My second object is an ontological proof for the existence of God offered by the Austrian mathematician, Kurt Gödel. An ontological proof is one in which the conclusion is reached from starting premises arrived at by rational thought rather than empirical observation. These premises may be thought of as axioms in a similar fashion to those found in mathematics. Gödel claimed that his proof was motivated by his desire to construct a watertight argument rather than support any personal religious conviction that he may have harboured. The details of Gödel's argument are too complex and difficult to discuss in detail here, but it involved what is known as *modal logic*, the distinction between necessary and contingent truths, and the concepts of properties and essences. As with ontological arguments in general, criticisms of Gödel's argument understandably focus on the legitimacy of the axioms he used. If the starting points of an argument can be called into question, then the truth of the conclusions can be too.

Ax. 1. $(P(\varphi) \wedge \Box \forall x(\varphi(x) \Rightarrow \psi(x))) \Rightarrow P(\psi)$
Ax. 2. $P(\neg\varphi) \Leftrightarrow \neg P(\varphi)$
Th. 1. $P(\varphi) \Rightarrow \Diamond\, \exists x\, \varphi(x)$
Df. 1. $G(x) \Leftrightarrow \forall\varphi(P(\varphi) \Rightarrow \varphi(x))$
Ax. 3. $P(G)$
Th. 2. $\Diamond\, \exists x\, G(x)$
Df. 2. $\varphi \text{ ess } x \Leftrightarrow \varphi(x) \wedge \forall\psi(\psi(x) \Rightarrow \Box \forall y(\varphi(y) \Rightarrow \psi(y)))$
Ax. 4. $P(\varphi) \Rightarrow \Box P(\varphi)$
Th. 3. $G(x) \Rightarrow G \text{ ess } x$
Df. 3. $E(x) \Leftrightarrow \forall\varphi(\varphi(\text{ess } x \Rightarrow \Box\, \exists x\, \varphi(y))$
Ax. 5. $P(E)$
Th. 4. $\Box\, \exists x\, G(x)$

This object is concerned with epistemic certainty – the attempt to arrive at knowledge that is demonstrably true whatever the feelings or allegiance may be to it of individuals. There have been numerous attempts to achieve this kind of certainty, often inspired by the apparent power of logical thought as applied in other fields of knowledge. The philosopher Bertrand Russell commented that our uneasiness with such arguments when applied to religion is often undermined by our difficulty in identifying exactly what is wrong with them. The implied question is whether logic is an appropriate vehicle for trying to support or reject claims in the field of religion.

Reference:
plato.stanford.edu/entries/ontological-arguments/

Object 3: Isotope-ratio mass spectrometer

The final object in this exhibition is an isotope-ratio mass spectrometer (IRMS). This device is used to determine the ratio of different isotopes in a sample. If the heavier isotope is radioactive, and the rate of its decay into the lighter isotope is known, then an estimate of the age of the sample can be made. For example, uranium-238 decays into lead-206 with a half-life of 4.47 billion years, meaning that half of the uranium will have converted into lead over that period. The age of a sample of zircon mineral, for example, which we know contains no lead at formation, can be estimated in this way. An isotope like uranium-238 with such a long half-life is useful for dating very old samples, such as those formed shortly after the formation of the Earth and solar system. It is true that the older the sample the greater the opportunity for error, as the proportion of remaining uranium diminishes and approaches zero. However, modern methods reduce this error to a maximum of around 1 per cent in terms of time.

Radiometric dating provides a scientific basis on which claims about the age of the Earth can be evaluated. As with all scientific work, there has to be not only an acceptance of error but an attempt to quantify it. Science does not seek epistemic or psychological certainty as described above, but rather an approximation to certainty on the basis of available empirical evidence. By quantifying uncertainty, science can arrive with confidence at conclusions that rule out other claims that are well beyond credibility. This includes claims made by some religious adherents (inferred from scripture) that the Earth is only a few thousand years old. We all need to adjust to a world in which a degree of uncertainty is tolerated.

Reference:
www.tulane.edu/~sanelson/eens212/radiometric_dating.htm

Word count = 838

194

195

Examiner's comments to give further guidance.

Virtual exhibition objects to give students ideas for their own exhibition.

About the authors

Sue Bastian – *Series Editor*

Sue Bastian has served the IB as a teacher, workshop leader, examiner, textbook author and Chief Assessor of TOK in the Philippines and at the UN School in New York City. She has recently completed a review and revision of the TOK Lessons From Around the World and is now concentrating on teaching others how to design lessons for their classroom.

Julian Kitching – *Author*

With over 30 years of involvement with the IB, Julian Kitching has taught TOK, contributed to four successive reviews of the course, and served as a workshop leader and examiner, including an 8-year period as Chief Assessor until 2018. He is Director of Studies at the SOS-Hermann Gmeiner International College in Ghana.

Ric Sims – *Author*

Ric Sims has taught TOK for nearly three decades as well as Economics, Philosophy, Maths and Music for the Diploma. He has served on the senior examining team since the late 1990s, including more than a decade as Deputy Chief Assessor. He has participated in four curriculum reviews, led workshops for TOK teachers, and is a regular keynote speaker.

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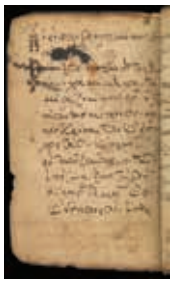
Detailed overview

Learning objectives

In this chapter you will…
- explore the question 'What is literature?'
- develop knowledge of the course through individual and collaborative activities
- engage with the aims of the IB literature course
- make connections between IB English A: literature and the IB philosophy course
- learn how the IB literature course is organised
- examine course areas of exploration:
  - readers, writers, and texts
  - time and space
  - intertextuality
- understand how the areas of exploration are linked to the course concepts
- learn about the required assessments for IB literature
- explore the purpose of the learner portfolio.

What is literature?

As we write this, the definition of literature is shifting and expanding to reflect the world around us. In simple terms, literature represents the **culture**, practices, and **communications** of people. From the Latin '*litaritura/litteratura*', literature translates to 'writing formed with letters'. Broadly speaking, civilisations from Egypt to China have celebrated literature in many forms, including texts that are spoken or sung. Ancient Greek poets such as Homer and Sophocles composed poems and plays such as *The Iliad* and *Oedipus Rex* that are still studied today. Such literature provides a window into different cultures and times. But literature is more than just a marker of civilisation: it can introduce us to fantastical worlds that are fuelled by pure imagination. Of course, not every book can be considered literature and the definition of what 'makes the cut' is often elusive. When British writer Aldous Huxley published his futuristic novel, *Brave New World*, in 1932, it was regarded by some critics as politicised propaganda. And yet today it is hailed as a timeless classic that helped define the dystopian genre.



Ancient texts were often spoken before they were rendered to written form.

The question remains: What is literature? While it is evident that instruction manuals or banal romances do not demonstrate literary merit, a quick internet search for a definition produces a wide range of results, revealing that there is no one accepted definition. 'For the times they are a-changin'', Bob Dylan proclaims through his music lyrics that earned him the Nobel Prize for Literature in 2016. As the definition of literature broadens, music and visual texts such as graphic novels are now classified as literature. Marjane Satrapi's graphic memoir, *Persepolis*, a coming of age text that records Satrapi's life in Iran during and after the Islamic Revolution, is a prime example of this literary expansion. The work has been translated from French into many languages and is widely studied in literature programmes across the world.

The opening page of *Persepolis*

So, who and what determines what is literature? Perhaps the more important question is 'Why should we read a specific work?' In the case of *Persepolis*, Satrapi's text gives a voice to a story that is often silent; her memoir style mixes history with personal experience, making her narrative believable and relatable. As she immerses us in emotive words and visuals, she allows us to experience her culture and community. This doesn't just give us a window into her world, it also gives us a better understanding of our own. Works that affect communities of readers in this way aren't placed in literary categories arbitrarily; they earn their place through readers and critics recognising their aesthetic value in local and global contexts.

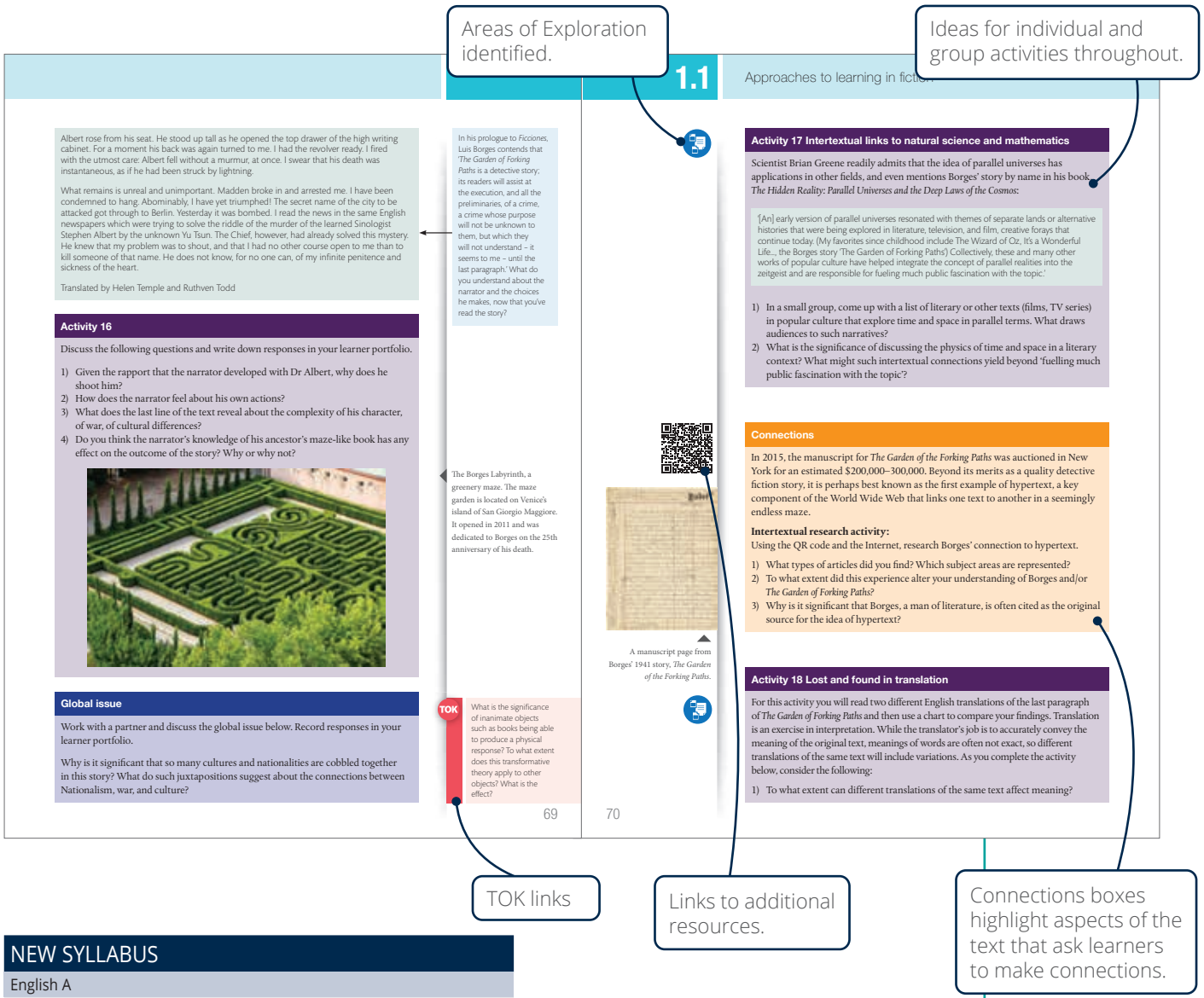
Activity 1 Why does literature matter?

While there is no one set definition of literature, consider the observations below from literary-minded individuals across the globe who derive meaning from literature in specific ways. For these individuals, literature:

- 'allows us to be open, to listen, and to be curious' (Tracy K Smith)
- 'is dangerous: it awakens a rebellious attitude in us' (Mario Vargas Llosa)
- 'becomes the living memory of a nation' (Aleksandr Solzhenitsyn)
- 'is one of the most interesting and significant expressions of humanity' (PT Barnum)
- 'sucks you into another psyche. So the creation of empathy necessarily influences how you'll behave to other people' (Barbara Kingsolver)
- 'plays a huge role in examining difficult real-life issues' (Angie Thomas)
- 'helps us transcend ourselves' (Mohsin Hamid).

1) Which statement above most appeals to you? Why?
2) Create your own statement about literature and share it with your peers.
3) What do you notice about the statements that you and your peers have written? To what extent do they overlap or differ?
4) What does this activity reveal about the nature of literature?
5) Write your responses in your learner portfolio.

Key terms highlighted and defined.



About the authors

Jan Adkins

Jan Adkins is now retired after teaching English for 40 years, including 24 years teaching IB English. Jan was an Assistant Examiner for 15 years and has lead teaching training workshops for 25 years. Jan holds a PhD in English, and is the recipient of the Robert O Lawton Award for Teaching Excellence at Florida State University, and the Teaching Excellence Award at Eckerd College. Jan was a co-author of our previous best-selling Pearson English A Literature for the IB Diploma textbook.

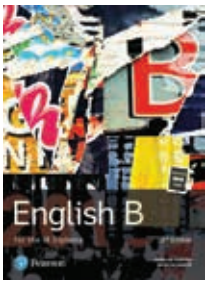
Michele Lackovic

Michele Lackovic has been involved with the IB for two decades. She began teaching IB Language A Literature in 2000 and TOK in 2008. She currently teaches IB Diploma Programme courses, coordinates the CAS programme, and chairs the English Department at Suncoast Community High School in Florida. She also leads teacher training workshops and marks IB English A Literature exams as well as Extended Essays. Michele is a National Board Certified Teacher and holds an MA in English from Penn State University and a BA in English from UCLA.

GROUP 2:

Language Acquisition

English B



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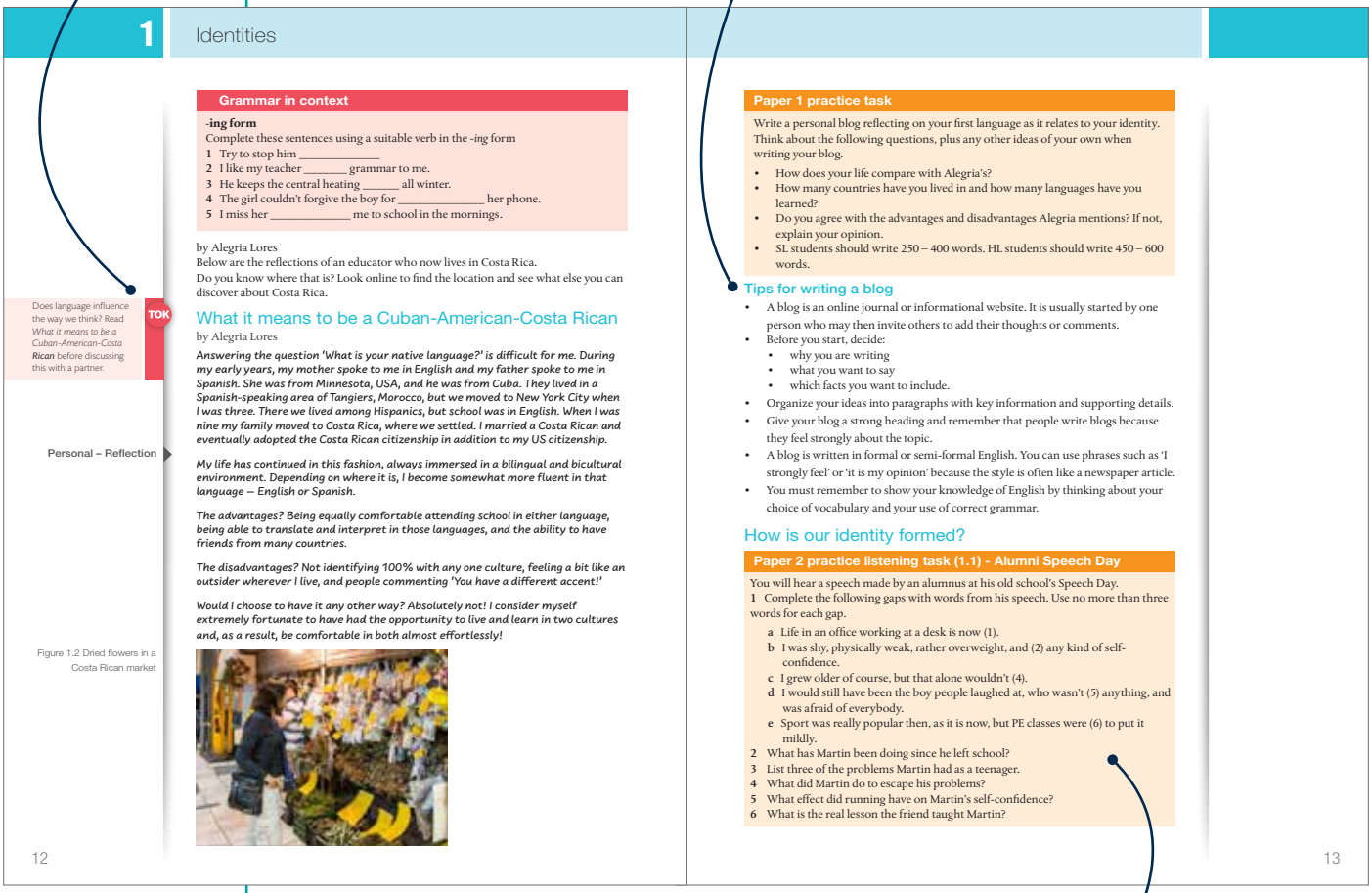
TOK links throughout.

Tips for writing different text types.



1 Identities

Grammar in context

-ing form

Complete these sentences using a suitable verb in the *-ing* form

1 Try to stop him _____
2 I like my teacher _____ grammar to me.
3 He keeps the central heating _____ all winter.
4 The girl couldn't forgive the boy for _____ her phone.
5 I miss her _____ me to school in the mornings.

by Alegria Lores

Below are the reflections of an educator who now lives in Costa Rica.
Do you know where that is? Look online to find the location and see what else you can discover about Costa Rica.

Does language influence the way we think? Read *What it means to be a Cuban-American-Costa Rican* before discussing this with a partner.

TOK

What it means to be a Cuban-American-Costa Rican

by Alegria Lores

Answering the question 'What is your native language?' is difficult for me. During my early years, my mother spoke to me in English and my father spoke to me in Spanish. She was from Minnesota, USA, and he was from Cuba. They lived in a Spanish-speaking area of Tangiers, Morocco, but we moved to New York City when I was three. There we lived among Hispanics, but school was in English. When I was nine my family moved to Costa Rica, where we settled. I married a Costa Rican and eventually adopted the Costa Rican citizenship in addition to my US citizenship.

Personal – Reflection

My life has continued in this fashion, always immersed in a bilingual and bicultural environment. Depending on where it is, I become somewhat more fluent in that language – English or Spanish.

The advantages? Being equally comfortable attending school in either language, being able to translate and interpret in those languages, and the ability to have friends from many countries.

The disadvantages? Not identifying 100% with any one culture, feeling a bit like an outsider wherever I live, and people commenting 'You have a different accent!'

Would I choose to have it any other way? Absolutely not! I consider myself extremely fortunate to have had the opportunity to live and learn in two cultures and, as a result, be comfortable in both almost effortlessly!

Figure 1.2 Dried flowers in a Costa Rican market

12

Paper 1 practice task

Write a personal blog reflecting on your first language as it relates to your identity. Think about the following questions, plus any other ideas of your own when writing your blog.

- How does your life compare with Alegria's?
- How many countries have you lived in and how many languages have you learned?
- Do you agree with the advantages and disadvantages Alegria mentions? If not, explain your opinion.
- SL students should write 250 – 400 words. HL students should write 450 – 600 words.

Tips for writing a blog

- A blog is an online journal or informational website. It is usually started by one person who may then invite others to add their thoughts or comments.
- Before you start, decide:
  - why you are writing
  - what you want to say
  - which facts you want to include.
- Organize your ideas into paragraphs with key information and supporting details.
- Give your blog a strong heading and remember that people write blogs because they feel strongly about the topic.
- A blog is written in formal or semi-formal English. You can use phrases such as 'I strongly feel' or 'it is my opinion' because the style is often like a newspaper article.
- You must remember to show your knowledge of English by thinking about your choice of vocabulary and your use of correct grammar.

How is our identity formed?

Paper 2 practice listening task (1.1) - Alumni Speech Day

You will hear a speech made by an alumnus at his old school's Speech Day.

1 Complete the following gaps with words from his speech. Use no more than three words for each gap.
   a Life in an office working at a desk is now (1).
   b I was shy, physically weak, rather overweight, and (2) any kind of self-confidence.
   c I grew older of course, but that alone wouldn't (4).
   d I would still have been the boy people laughed at, who wasn't (5) anything, and was afraid of everybody.
   e Sport was really popular then, as it is now, but PE classes were (6) to put it mildly.
2 What has Martin been doing since he left school?
3 List three of the problems Martin had as a teenager.
4 What did Martin do to escape his problems?
5 What effect did running have on Martin's self-confidence?
6 What is the real lesson the friend taught Martin?

13

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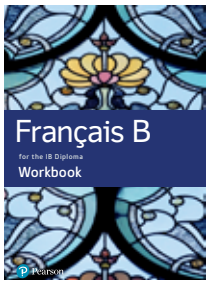

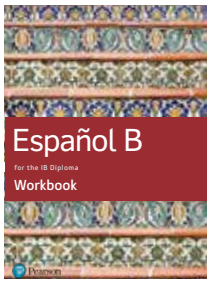

Engaging, write-in format.

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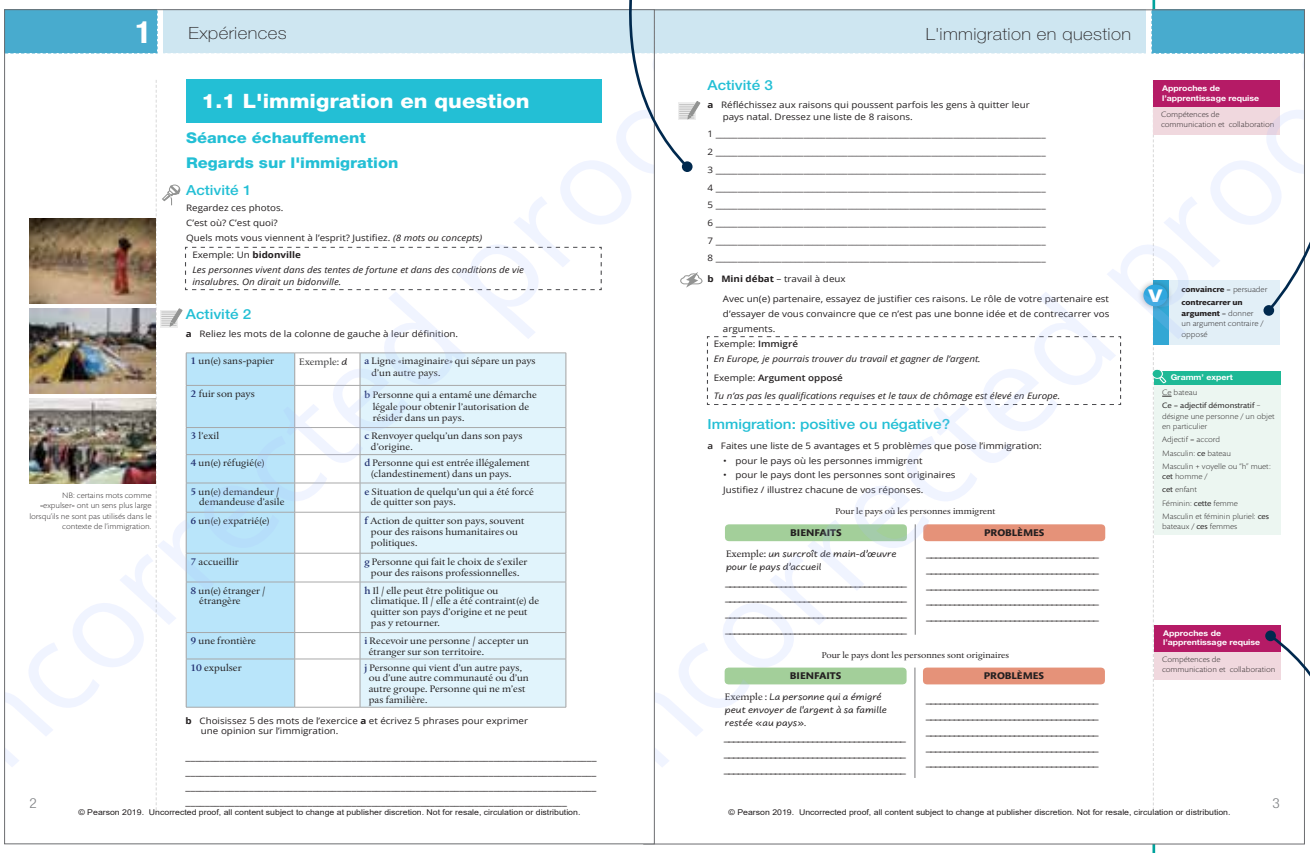

ATLs identified.

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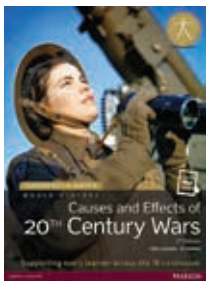

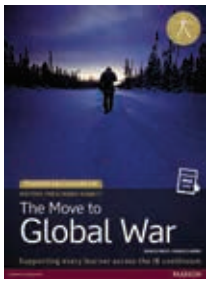

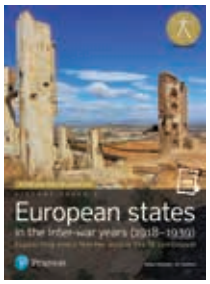

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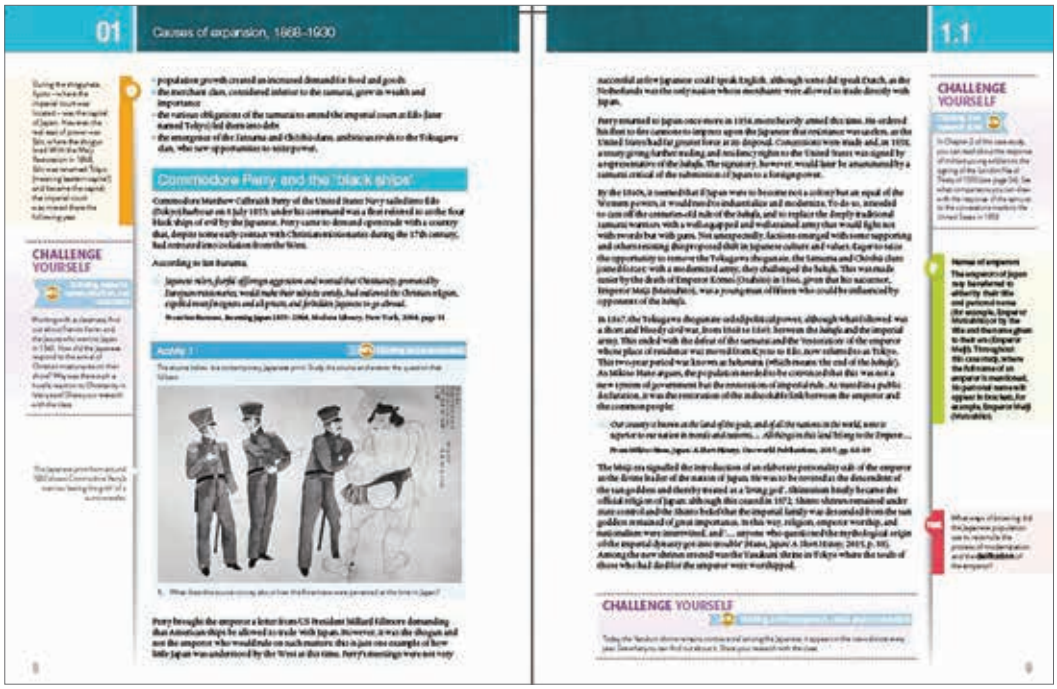

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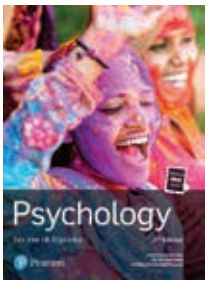

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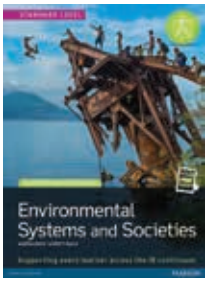

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- For more detail see page 21.

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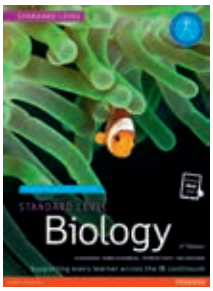

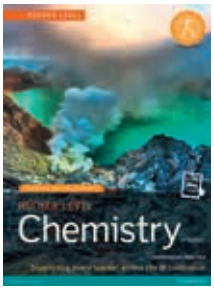

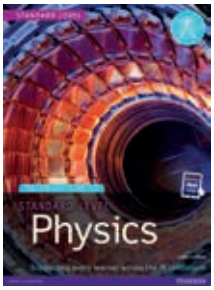

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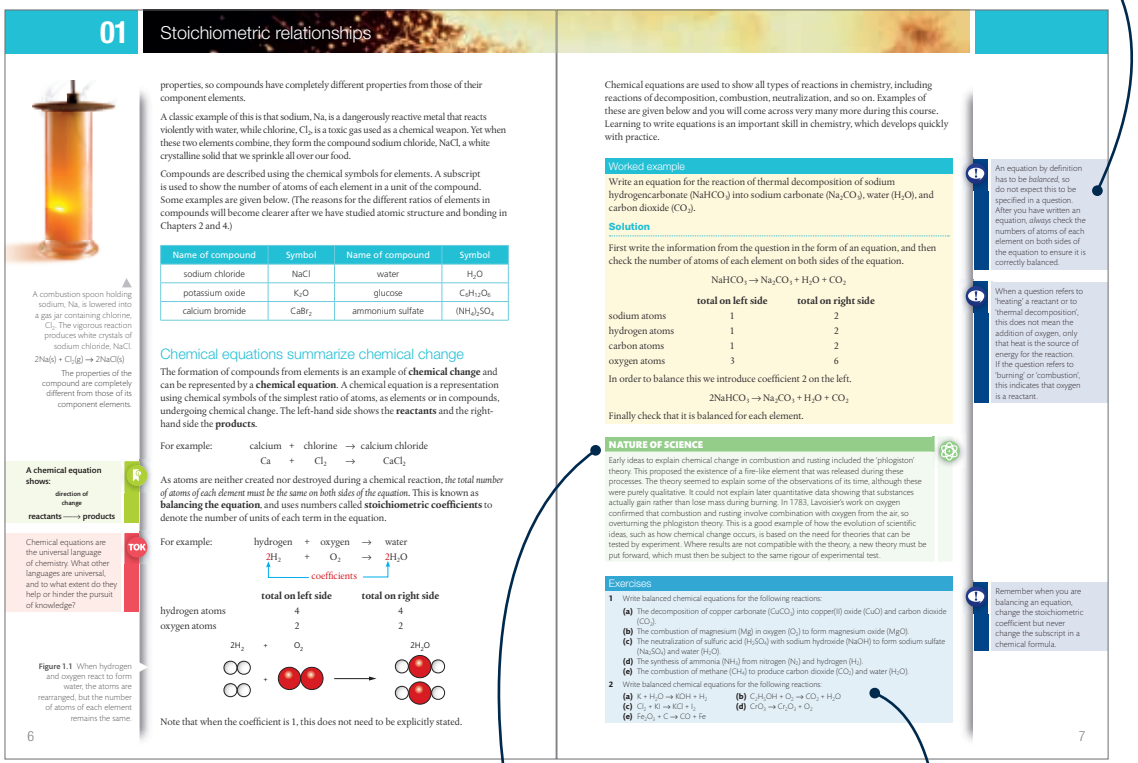
01 Stoichiometric relationships

properties, so compounds have completely different properties from those of their component elements.

A classic example of this is that sodium, Na, is a dangerously reactive metal that reacts violently with water, while chlorine, Cl_2, is a toxic gas used as a chemical weapon. Yet when these two elements combine, they form the compound sodium chloride, NaCl, a white crystalline solid that we sprinkle all over our food.

Compounds are described using the chemical symbols for elements. A subscript is used to show the number of atoms of each element in a unit of the compound. Some examples are given below. (The reasons for the different ratios of elements in compounds will become clearer after we have studied atomic structure and bonding in Chapters 2 and 4.)

Name of compound	Symbol	Name of compound	Symbol
sodium chloride	NaCl	water	H_2O
potassium oxide	K_2O	glucose	$C_6H_{12}O_6$
calcium bromide	$CaBr_2$	ammonium sulfate	$(NH_4)_2SO_4$

A combustion spoon holding sodium, Na, is lowered into a gas jar containing chlorine, Cl_2. The vigorous reaction produces white crystals of sodium chloride, NaCl.
$2Na(s) + Cl_2(g) \rightarrow 2NaCl(s)$
The properties of the compound are completely different from those of its component elements.

Chemical equations summarize chemical change

The formation of compounds from elements is an example of **chemical change** and can be represented by a **chemical equation**. A chemical equation is a representation using chemical symbols of the simplest ratio of atoms, as elements or in compounds, undergoing chemical change. The left-hand side shows the **reactants** and the right-hand side the **products**.

For example: calcium + chlorine → calcium chloride
Ca + Cl_2 → $CaCl_2$

A chemical equation shows: reactants ⟶ products (direction of change)

As atoms are neither created nor destroyed during a chemical reaction, *the total number of atoms of each element must be the same on both sides of the equation.* This is known as **balancing the equation**, and uses numbers called **stoichiometric coefficients** to denote the number of units of each term in the equation.

For example: hydrogen + oxygen → water
$2H_2$ + O_2 → $2H_2O$ (coefficients)

	total on left side	total on right side
hydrogen atoms	4	4
oxygen atoms	2	2

$2H_2$ + O_2 → $2H_2O$

Note that when the coefficient is 1, this does not need to be explicitly stated.

Chemical equations are the universal language of chemistry. What other languages are universal, and to what extent do they help or hinder the pursuit of knowledge? TOK

Figure 1.1 When hydrogen and oxygen react to form water, the atoms are rearranged, but the number of atoms of each element remains the same.

6

Chemical equations are used to show all types of reactions in chemistry, including reactions of decomposition, combustion, neutralization, and so on. Examples of these are given below and you will come across very many more during this course. Learning to write equations is an important skill in chemistry, which develops quickly with practice.

Worked example

Write an equation for the reaction of thermal decomposition of sodium hydrogencarbonate ($NaHCO_3$) into sodium carbonate (Na_2CO_3), water (H_2O), and carbon dioxide (CO_2).

Solution

First write the information from the question in the form of an equation, and then check the number of atoms of each element on both sides of the equation.

$NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$

	total on left side	total on right side
sodium atoms	1	2
hydrogen atoms	1	2
carbon atoms	1	2
oxygen atoms	3	6

In order to balance this we introduce coefficient 2 on the left.

$2NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$

Finally check that it is balanced for each element.

NATURE OF SCIENCE

Early ideas to explain chemical change in combustion and rusting included the 'phlogiston' theory. This proposed the existence of a fire-like element that was released during these processes. The theory seemed to explain some of the observations of its time, although these were purely qualitative. It could not explain later quantitative data showing that substances actually gain rather than lose mass during burning. In 1783, Lavoisier's work on oxygen confirmed that combustion and rusting involve combination with oxygen from the air, so overturning the phlogiston theory. This is a good example of how the evolution of scientific ideas, such as how chemical change occurs, is based on the need for theories that can be tested by experiment. Where results are not compatible with the theory, a new theory must be put forward, which must then be subject to the same rigour of experimental test.

Exercises

1 Write balanced chemical equations for the following reactions:
- **(a)** The decomposition of copper carbonate ($CuCO_3$) into copper(II) oxide (CuO) and carbon dioxide (CO_2).
- **(b)** The combustion of magnesium (Mg) in oxygen (O_2) to form magnesium oxide (MgO).
- **(c)** The neutralization of sulfuric acid (H_2SO_4) with sodium hydroxide ($NaOH$) to form sodium sulfate (Na_2SO_4) and water (H_2O).
- **(d)** The synthesis of ammonia (NH_3) from nitrogen (N_2) and hydrogen (H_2).
- **(e)** The combustion of methane (CH_4) to produce carbon dioxide (CO_2) and water (H_2O).

2 Write balanced chemical equations for the following reactions:
- **(a)** $K + H_2O \rightarrow KOH + H_2$
- **(b)** $C_2H_5OH + O_2 \rightarrow CO_2 + H_2O$
- **(c)** $Cl_2 + KI \rightarrow KCl + I_2$
- **(d)** $CrO_3 \rightarrow Cr_2O_3 + O_2$
- **(e)** $Fe_2O_3 + C \rightarrow CO + Fe$

An equation by definition has to be *balanced*, so do not expect this to be specified in a question. After you have written an equation, *always* check the numbers of atoms of each element on both sides of the equation to ensure it is correctly balanced.

When a question refers to 'heating' a reactant or to 'thermal decomposition', this does not mean the addition of oxygen, only that heat is the source of energy for the reaction. If the question refers to 'burning' or 'combustion', this indicates that oxygen is a reactant.

Remember when you are balancing an equation, change the stoichiometric coefficient but never change the subscript in a chemical formula.

7

Nature of science boxes encourage learners to think about the nature of scientific knowledge.

Exercises encourage learners to apply their knowledge and test their understanding. The answers can be found in the eBook.

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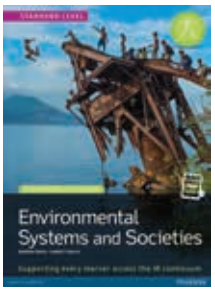

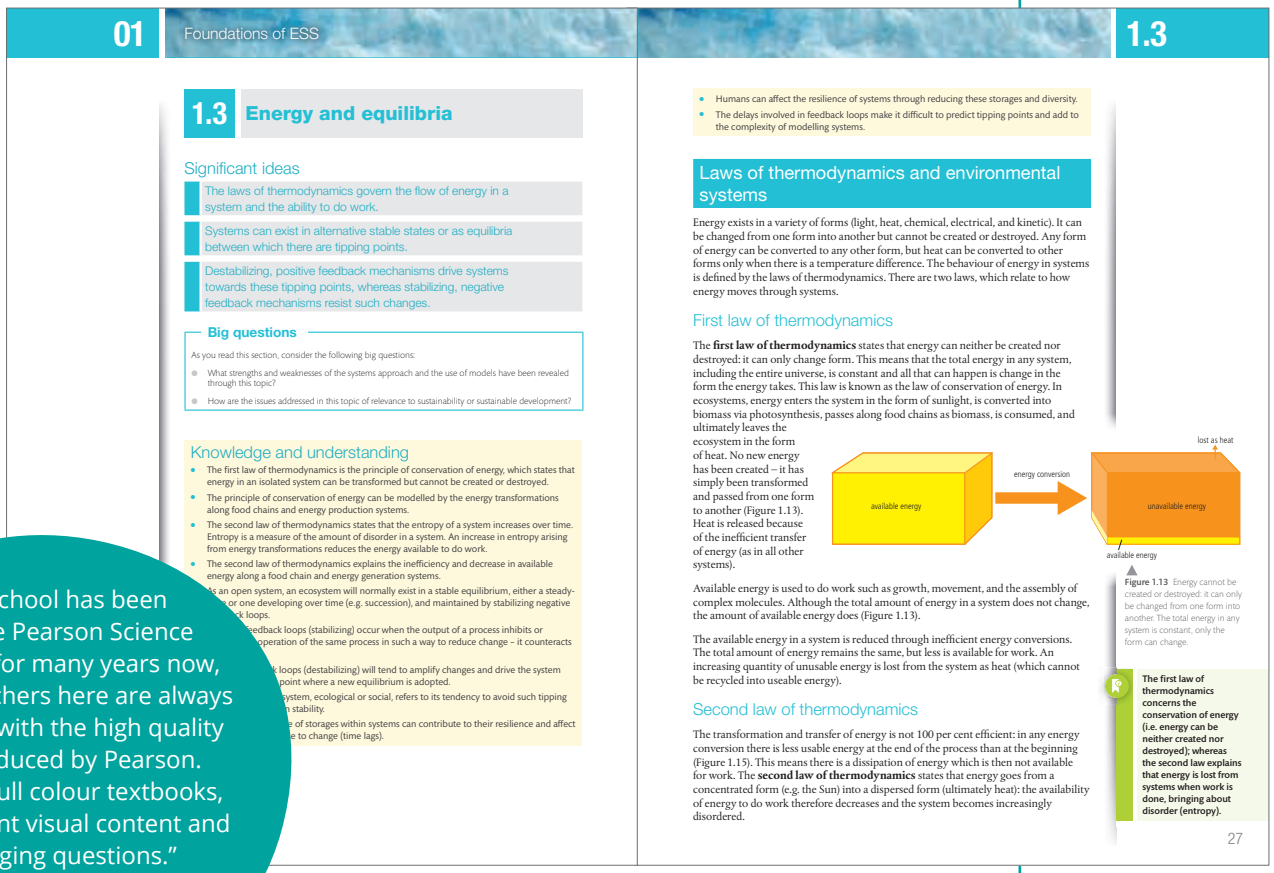

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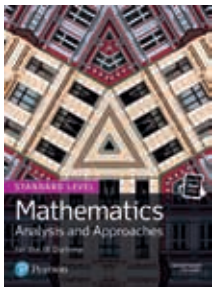

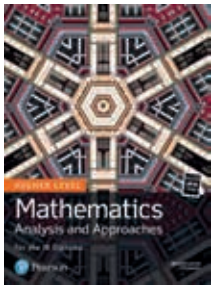

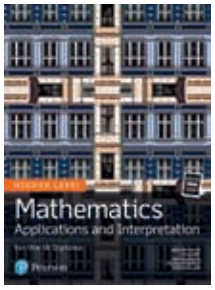

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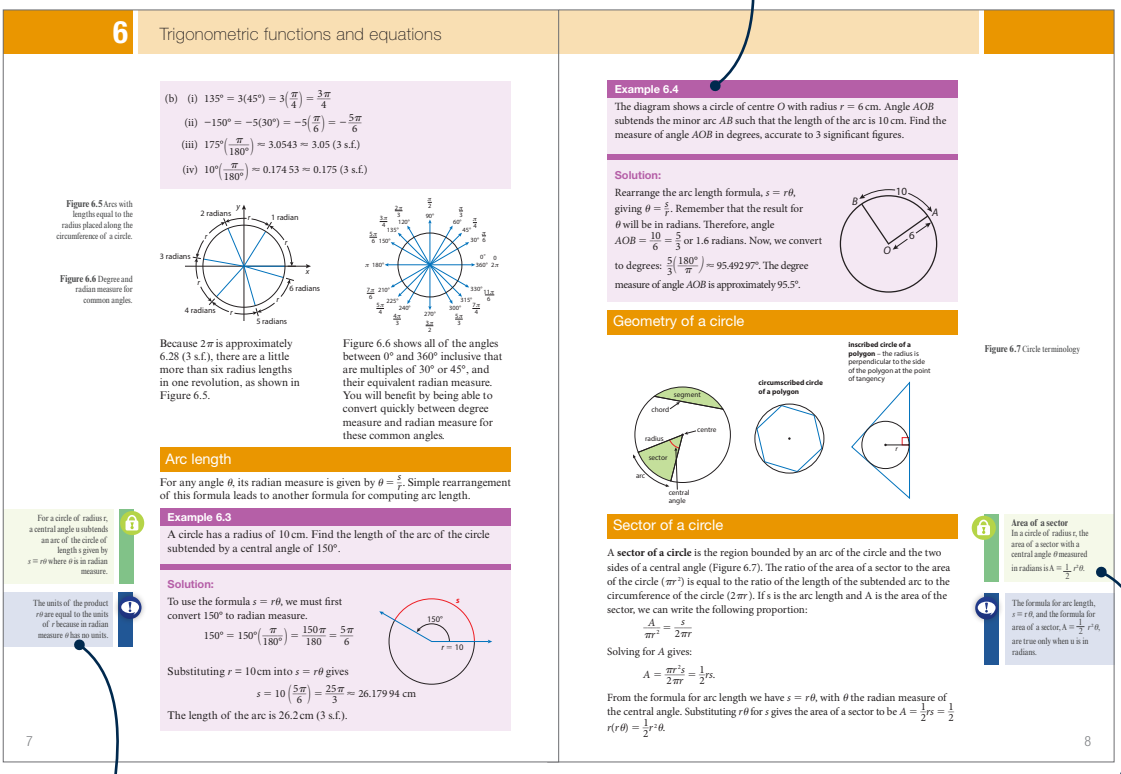
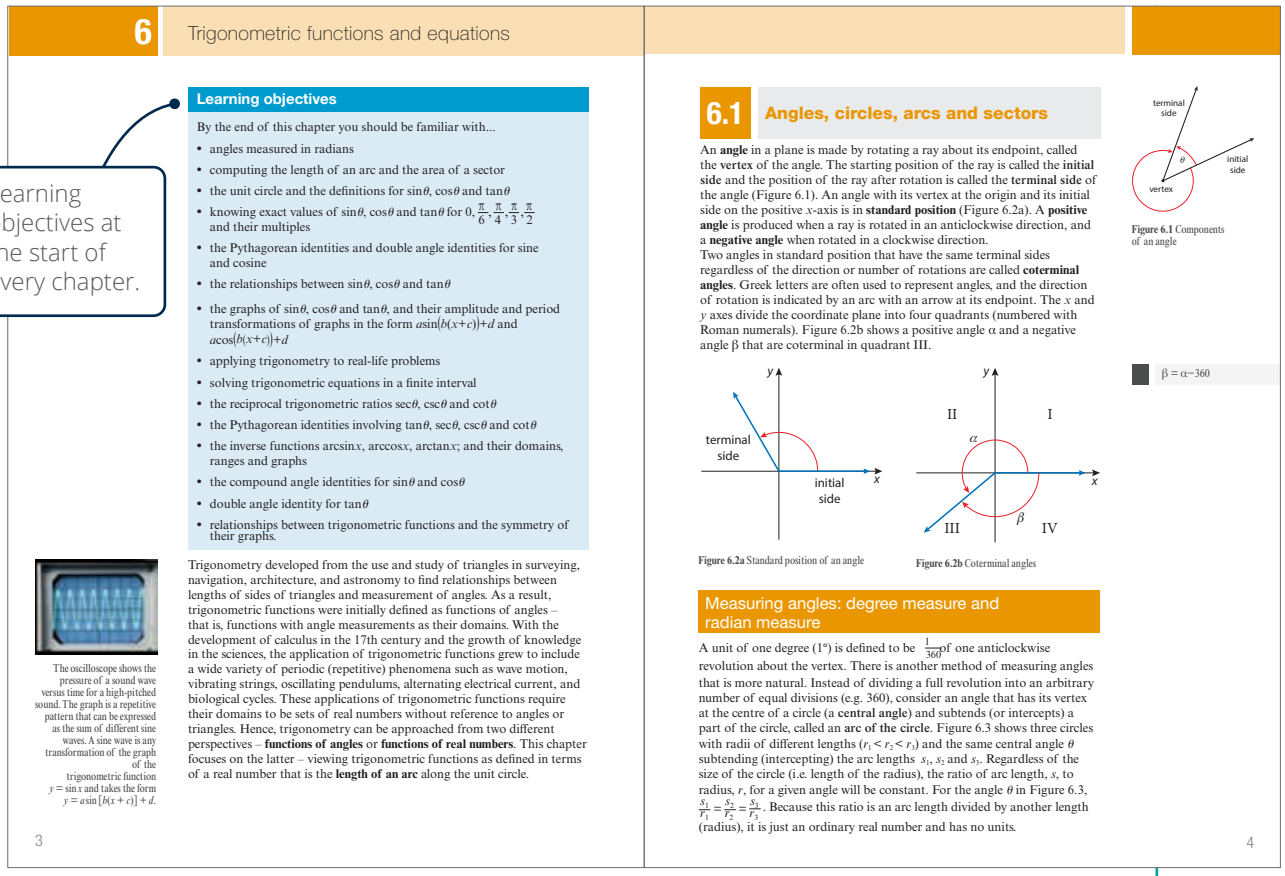


Hints and tips to help learners answer questions.

Key facts for emphasis of important points.



6 Trigonometric functions and equations

Learning objectives at the start of every chapter.

Learning objectives

By the end of this chapter you should be familiar with...

- angles measured in radians
- computing the length of an arc and the area of a sector
- the unit circle and the definitions for $\sin\theta$, $\cos\theta$ and $\tan\theta$
- knowing exact values of $\sin\theta$, $\cos\theta$ and $\tan\theta$ for $0, \frac{\pi}{6}, \frac{\pi}{4}, \frac{\pi}{3}, \frac{\pi}{2}$ and their multiples
- the Pythagorean identities and double angle identities for sine and cosine
- the relationships between $\sin\theta$, $\cos\theta$ and $\tan\theta$
- the graphs of $\sin\theta$, $\cos\theta$ and $\tan\theta$, and their amplitude and period transformations of graphs in the form $a\sin(b(x+c))+d$ and $a\cos(b(x+c))+d$
- applying trigonometry to real-life problems
- solving trigonometric equations in a finite interval
- the reciprocal trigonometric ratios $\sec\theta$, $\csc\theta$ and $\cot\theta$
- the Pythagorean identities involving $\tan\theta$, $\sec\theta$, $\csc\theta$ and $\cot\theta$
- the inverse functions $\arcsin x$, $\arccos x$, $\arctan x$; and their domains, ranges and graphs
- the compound angle identities for $\sin\theta$ and $\cos\theta$
- double angle identity for $\tan\theta$
- relationships between trigonometric functions and the symmetry of their graphs.

The oscilloscope shows the pressure of a sound wave versus time for a high-pitched sound. The graph is a repetitive pattern that can be expressed as the sum of different sine waves. A sine wave is any transformation of the graph of the trigonometric function $y = \sin x$ and takes the form $y = a\sin[b(x+c)] + d$.

Trigonometry developed from the use and study of triangles in surveying, navigation, architecture, and astronomy to find relationships between lengths of sides of triangles and measurement of angles. As a result, trigonometric functions were initially defined as functions of angles – that is, functions with angle measurements as their domains. With the development of calculus in the 17th century and the growth of knowledge in the sciences, the application of trigonometric functions grew to include a wide variety of periodic (repetitive) phenomena such as wave motion, vibrating strings, oscillating pendulums, alternating electrical current, and biological cycles. These applications of trigonometric functions require their domains to be sets of real numbers without reference to angles or triangles. Hence, trigonometry can be approached from two different perspectives – **functions of angles** or **functions of real numbers**. This chapter focuses on the latter – viewing trigonometric functions as defined in terms of a real number that is the **length of an arc** along the unit circle.

3

6.1 Angles, circles, arcs and sectors

An **angle** in a plane is made by rotating a ray about its endpoint, called the **vertex** of the angle. The starting position of the ray is called the **initial side** and the position of the ray after rotation is called the **terminal side** of the angle (Figure 6.1). An angle with its vertex at the origin and its initial side on the positive x-axis is in **standard position** (Figure 6.2a). A **positive angle** is produced when a ray is rotated in an anticlockwise direction, and a **negative angle** when rotated in a clockwise direction.

Two angles in standard position that have the same terminal sides regardless of the direction or number of rotations are called **coterminal angles**. Greek letters are often used to represent angles, and the direction of rotation is indicated by an arc with an arrow at its endpoint. The x and y axes divide the coordinate plane into four quadrants (numbered with Roman numerals). Figure 6.2b shows a positive angle α and a negative angle β that are coterminal in quadrant III.

Figure 6.1 Components of an angle

Figure 6.2a Standard position of an angle

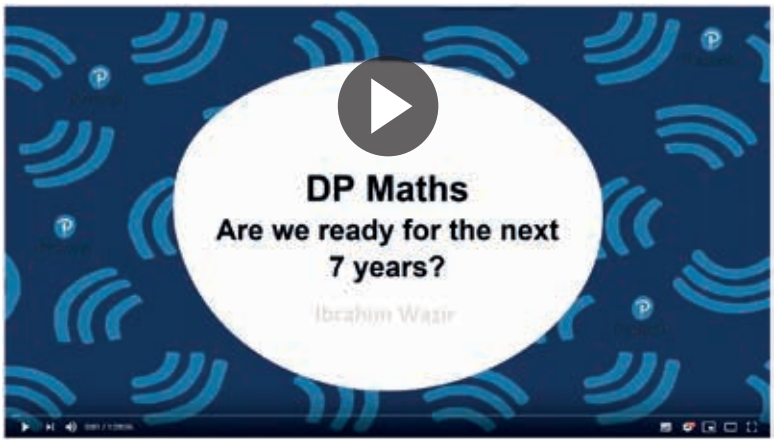
Figure 6.2b Coterminal angles

$\beta = \alpha - 360$

Measuring angles: degree measure and radian measure

A unit of one degree (1°) is defined to be $\frac{1}{360}$ of one anticlockwise revolution about the vertex. There is another method of measuring angles that is more natural. Instead of dividing a full revolution into an arbitrary number of equal divisions (e.g. 360), consider an angle that has its vertex at the centre of a circle (a **central angle**) and subtends (or intercepts) a part of the circle, called an **arc of the circle**. Figure 6.3 shows three circles with radii of different lengths ($r_1 < r_2 < r_3$) and the same central angle θ subtending (intercepting) the arc lengths s_1, s_2 and s_3. Regardless of the size of the circle (i.e. length of the radius), the ratio of arc length, s, to radius, r, for a given angle will be constant. For the angle θ in Figure 6.3, $\frac{s_1}{r_1} = \frac{s_2}{r_2} = \frac{s_3}{r_3}$. Because this ratio is an arc length divided by another length (radius), it is just an ordinary real number and has no units.

4



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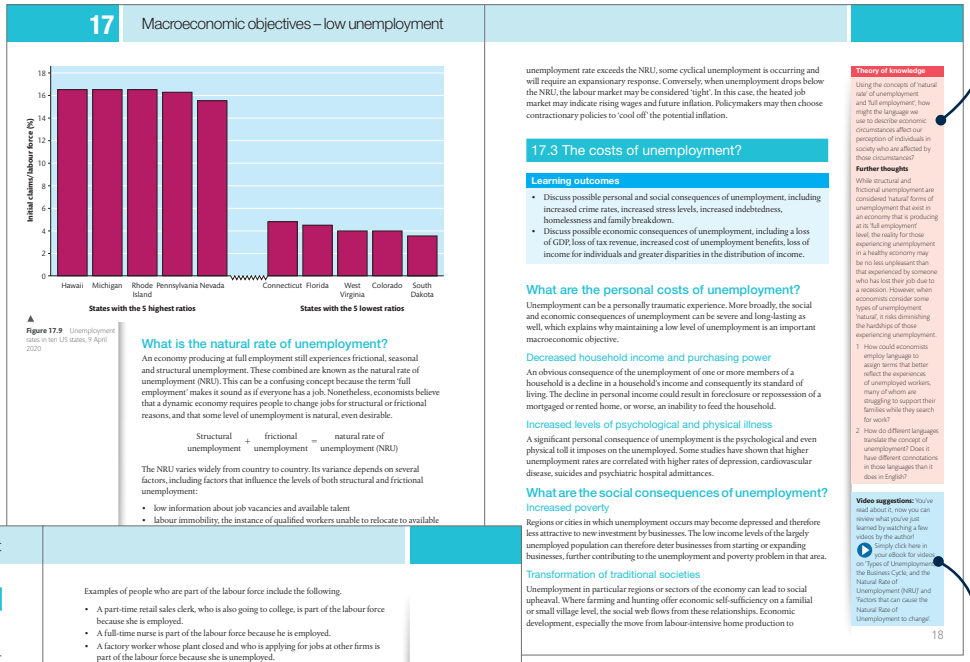

17 Macroeconomic objectives – low unemployment

Figure 17.9 Unemployment rates in ten US states, 9 April 2020

States with the 5 highest ratios: Hawaii, Michigan, Rhode Island, Pennsylvania, Nevada
States with the 5 lowest ratios: Connecticut, Florida, West Virginia, Colorado, South Dakota

What is the natural rate of unemployment?

An economy producing at full employment still experiences frictional, seasonal and structural unemployment. These combined are known as the natural rate of unemployment (NRU). This can be a confusing concept because the term 'full employment' makes it sound as if everyone has a job. Nonetheless, economists believe that a dynamic economy requires people to change jobs for structural or frictional reasons, and that some level of unemployment is natural, even desirable.

Structural unemployment + frictional unemployment = natural rate of unemployment (NRU)

The NRU varies widely from country to country. Its variance depends on several factors, including factors that influence the levels of both structural and frictional unemployment:

- low information about job vacancies and available talent
- labour immobility, the instance of qualified workers unable to relocate to available

unemployment rate exceeds the NRU, some cyclical unemployment is occurring and will require an expansionary response. Conversely, when unemployment drops below the NRU, the labour market may be considered 'tight'. In this case, the heated job market may indicate rising wages and future inflation. Policymakers may then choose contractionary policies to 'cool off' the potential inflation.

17.3 The costs of unemployment?

Learning outcomes

- Discuss possible personal and social consequences of unemployment, including increased crime rates, increased stress levels, increased indebtedness, homelessness and family breakdown.
- Discuss possible economic consequences of unemployment, including a loss of GDP, loss of tax revenue, increased cost of unemployment benefits, loss of income for individuals and greater disparities in the distribution of income.

What are the personal costs of unemployment?

Unemployment can be a personally traumatic experience. More broadly, the social and economic consequences of unemployment can be severe and long-lasting as well, which explains why maintaining a low level of unemployment is an important macroeconomic objective.

Decreased household income and purchasing power

An obvious consequence of the unemployment of one or more members of a household is a decline in a household's income and consequently its standard of living. The decline in personal income could result in foreclosure or repossession of a mortgaged or rented home, or worse, an inability to feed the household.

Increased levels of psychological and physical illness

A significant personal consequence of unemployment is the psychological and even physical toll it imposes on the unemployed. Some studies have shown that higher unemployment rates are correlated with higher rates of depression, cardiovascular disease, suicides and psychiatric hospital admittances.

What are the social consequences of unemployment?

Increased poverty

Regions or cities in which unemployment occurs may become depressed and therefore less attractive to new investment by businesses. The low income levels of the largely unemployed population can therefore deter businesses from starting or expanding businesses, further contributing to the unemployment and poverty problem in that area.

Transformation of traditional societies

Unemployment in particular regions or sectors of the economy can lead to social upheaval. Where farming and hunting offer economic self-sufficiency on a familial or small village level, the social web flows from these relationships. Economic development, especially the move from labour-intensive home production to

Theory of knowledge

Using the concepts of 'natural rate' of unemployment and 'full employment', how might the language we use to describe economic circumstances affect our perception of individuals in society who are affected by those circumstances?

Further thoughts

While structural and frictional unemployment are considered 'natural' forms of unemployment that exist in an economy that is producing at its 'full employment' level, the reality for those experiencing unemployment in a healthy economy may be no less unpleasant than that experienced by someone who has lost their job due to a recession. However, when economists consider some types of unemployment 'natural', it risks diminishing the hardships of those experiencing unemployment.

1. How could economists employ language to assign terms that better reflect the experiences of unemployed workers, many of whom are struggling to support their families while they search for work?
2. How do different languages translate the concept of unemployment? Does it have different connotations in those languages than it does in English?

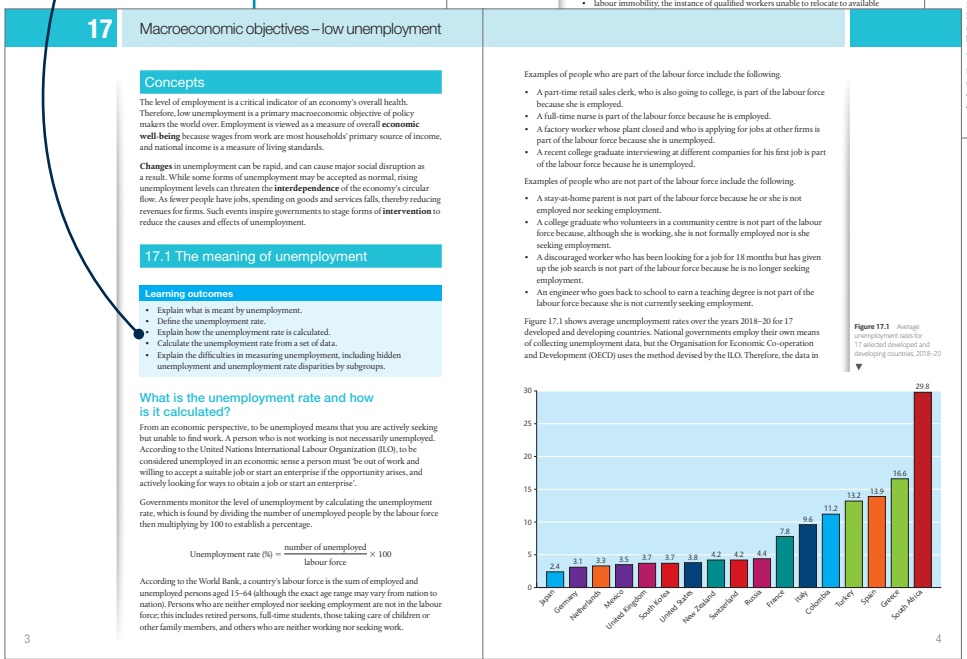
Video suggestions: You've read about it, now you can review what you've just learned by watching a few videos by the author!

Simply click here in your eBook for videos on 'Types of Unemployment', 'the Business Cycle,' and the 'Natural Rate of Unemployment (NRU)' and 'Factors that can cause the Natural Rate of Unemployment to change'.

18

Learning objectives to help focus learners' minds.

Videos to help embed knowledge and skills.


17 Macroeconomic objectives – low unemployment

Concepts

The level of employment is a critical indicator of an economy's overall health. Therefore, low unemployment is a primary macroeconomic objective of policy makers the world over. Employment is viewed as a measure of overall **economic well-being** because wages from work are most households' primary source of income, and national income is a measure of living standards.

Changes in unemployment can be rapid, and can cause major social disruption as a result. While some forms of unemployment may be accepted as normal, rising unemployment levels can threaten the **interdependence** of the economy's circular flow. As fewer people have jobs, spending on goods and services falls, thereby reducing revenues for firms. Such events inspire governments to stage forms of **intervention** to reduce the causes and effects of unemployment.

17.1 The meaning of unemployment

Learning outcomes

- Explain what is meant by unemployment.
- Define the unemployment rate.
- Explain how the unemployment rate is calculated.
- Calculate the unemployment rate from a set of data.
- Explain the difficulties in measuring unemployment, including hidden unemployment and unemployment rate disparities by subgroups.

What is the unemployment rate and how is it calculated?

From an economic perspective, to be unemployed means that you are actively seeking but unable to find work. A person who is not working is not necessarily unemployed. According to the United Nations International Labour Organization (ILO), to be considered unemployed in an economic sense a person must 'be out of work and willing to accept a suitable job or start an enterprise if the opportunity arises, and actively looking for ways to obtain a job or start an enterprise'.

Governments monitor the level of unemployment by calculating the unemployment rate, which is found by dividing the number of unemployed people by the labour force then multiplying by 100 to establish a percentage.

$$\text{Unemployment rate (\%)} = \frac{\text{number of unemployed}}{\text{labour force}} \times 100$$

According to the World Bank, a country's labour force is the sum of employed and unemployed persons aged 15–64 (although the exact age range may vary from nation to nation). Persons who are neither employed nor seeking employment are not in the labour force; this includes retired persons, full-time students, those taking care of children or other family members, and others who are neither working nor seeking work.

3

Examples of people who are part of the labour force include the following.

- A part-time retail sales clerk, who is also going to college, is part of the labour force because she is employed.
- A full-time nurse is part of the labour force because he is employed.
- A factory worker whose plant closed and who is applying for jobs at other firms is part of the labour force because she is unemployed.
- A recent college graduate interviewing at different companies for his first job is part of the labour force because he is unemployed.

Examples of people who are not part of the labour force include the following.

- A stay-at-home parent is not part of the labour force because he or she is not employed nor seeking employment.
- A college graduate who volunteers in a community centre is not part of the labour force because, although she is working, she is not formally employed nor is she seeking employment.
- A discouraged worker who has been looking for a job for 18 months but has given up the job search is not part of the labour force because he is no longer seeking employment.
- An engineer who goes back to school to earn a teaching degree is not part of the labour force because she is not currently seeking employment.

Figure 17.1 shows average unemployment rates over the years 2018–20 for 17 developed and developing countries. National governments employ their own means of collecting unemployment data, but the Organisation for Economic Co-operation and Development (OECD) uses the method devised by the ILO. Therefore, the data in

Figure 17.1 Average unemployment rates for 17 selected developed and developing countries, 2018–20

Japan 2.4, Germany 3.1, Netherlands 3.3, Mexico 3.5, United Kingdom 3.7, South Korea 3.7, United States 3.8, New Zealand 4.2, Switzerland 4.2, Russia 4.4, France 7.8, Italy 9.6, Colombia 11.2, Turkey 13.2, Spain 13.9, Greece 16.6, South Africa 29.8

4

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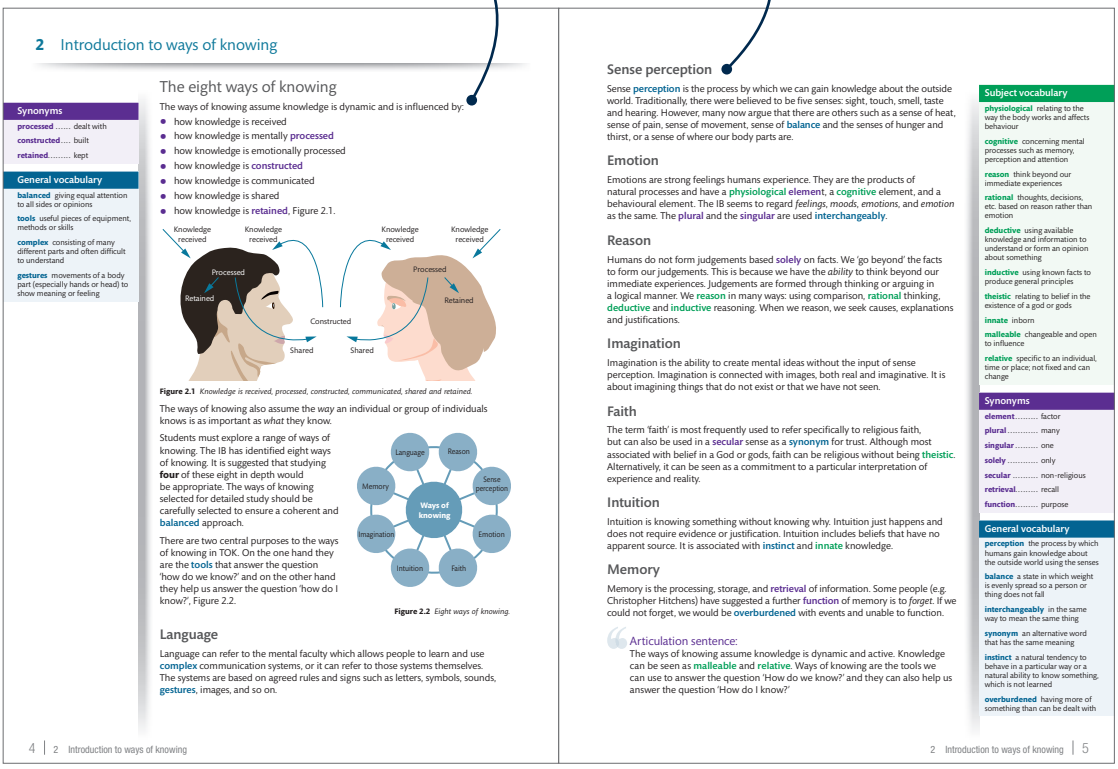
Opening sentences suggest how to best refer to a Learning Outcome at the very start of an exam answer.

Logical sub-headings organize content to support understanding of the most important parts of the learning outcome.



2 Introduction to ways of knowing

The eight ways of knowing

The ways of knowing assume knowledge is dynamic and is influenced by:

- how knowledge is received
- how knowledge is mentally processed
- how knowledge is emotionally processed
- how knowledge is constructed
- how knowledge is communicated
- how knowledge is shared
- how knowledge is retained, Figure 2.1.

Synonyms

processed ..... dealt with
constructed.... built
retained..... kept

General vocabulary

balanced giving equal attention to all sides or opinions
tools useful pieces of equipment, methods or skills
complex consisting of many different parts and often difficult to understand
gestures movements of a body part (especially hands or head) to show meaning or feeling

Knowledge received
Processed
Retained
Constructed
Shared

Figure 2.1 *Knowledge is received, processed, constructed, communicated, shared and retained.*

The ways of knowing also assume the *way* an individual or group of individuals knows is as important as *what* they know.

Students must explore a range of ways of knowing. The IB has identified eight ways of knowing. It is suggested that studying **four** of these eight in depth would be appropriate. The ways of knowing selected for detailed study should be carefully selected to ensure a coherent and balanced approach.

There are two central purposes to the ways of knowing in TOK. On the one hand they are the tools that answer the question 'how do we know?' and on the other hand they help us answer the question 'how do I know?', Figure 2.2.

Language
Reason
Sense perception
Emotion
Faith
Intuition
Imagination
Memory
Ways of knowing

Figure 2.2 *Eight ways of knowing.*

Language

Language can refer to the mental faculty which allows people to learn and use complex communication systems, or it can refer to those systems themselves. The systems are based on agreed rules and signs such as letters, symbols, sounds, gestures, images, and so on.

4 | 2 Introduction to ways of knowing

Sense perception

Sense perception is the process by which we can gain knowledge about the outside world. Traditionally, there were believed to be five senses: sight, touch, smell, taste and hearing. However, many now argue that there are others such as a sense of heat, sense of pain, sense of movement, sense of balance and the senses of hunger and thirst, or a sense of where our body parts are.

Emotion

Emotions are strong feelings humans experience. They are the products of natural processes and have a physiological element, a cognitive element, and a behavioural element. The IB seems to regard *feelings*, *moods*, *emotions*, and *emotion* as the same. The plural and the singular are used interchangeably.

Reason

Humans do not form judgements based solely on facts. We 'go beyond' the facts to form our judgements. This is because we have the *ability* to think beyond our immediate experiences. Judgements are formed through thinking or arguing in a logical manner. We reason in many ways: using comparison, rational thinking, deductive and inductive reasoning. When we reason, we seek causes, explanations and justifications.

Imagination

Imagination is the ability to create mental ideas without the input of sense perception. Imagination is connected with images, both real and imaginative. It is about imagining things that do not exist or that we have not seen.

Faith

The term 'faith' is most frequently used to refer specifically to religious faith, but can also be used in a secular sense as a synonym for trust. Although most associated with belief in a God or gods, faith can be religious without being theistic. Alternatively, it can be seen as a commitment to a particular interpretation of experience and reality.

Intuition

Intuition is knowing something without knowing why. Intuition just happens and does not require evidence or justification. Intuition includes beliefs that have no apparent source. It is associated with instinct and innate knowledge.

Memory

Memory is the processing, storage, and retrieval of information. Some people (e.g. Christopher Hitchens) have suggested a further function of memory is to *forget*. If we could not forget, we would be overburdened with events and unable to function.

Articulation sentence:
The ways of knowing assume knowledge is dynamic and active. Knowledge can be seen as malleable and relative. Ways of knowing are the tools we can use to answer the question 'How do we know?' and they can also help us answer the question 'How do I know?'

Subject vocabulary

physiological relating to the way the body works and affects behaviour
cognitive concerning mental processes such as memory, perception and attention
reason think beyond our immediate experiences
rational thoughts, decisions, etc. based on reason rather than emotion
deductive using available knowledge and information to understand or form an opinion about something
inductive using known facts to produce general principles
theistic relating to belief in the existence of a god or gods
innate inborn
malleable changeable and open to influence
relative specific to an individual, time or place; not fixed and can change

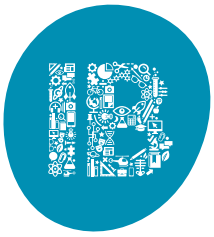
Synonyms

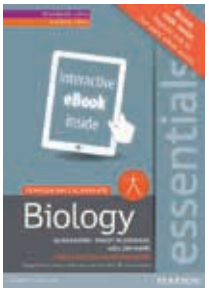
element..... factor
plural..... many
singular..... one
solely..... only
secular..... non-religious
retrieval..... recall
function..... purpose

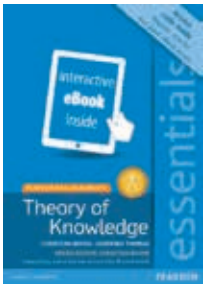
General vocabulary

perception the process by which humans gain knowledge about the outside world using the senses
balance a state in which weight is evenly spread so a person or thing does not fall
interchangeably in the same way to mean the same thing
synonym an alternative word that has the same meaning
instinct a natural tendency to behave in a particular way or a natural ability to know something, which is not learned
overburdened having more of something than can be dealt with

2 Introduction to ways of knowing | 5







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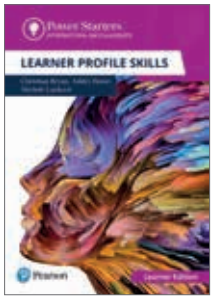

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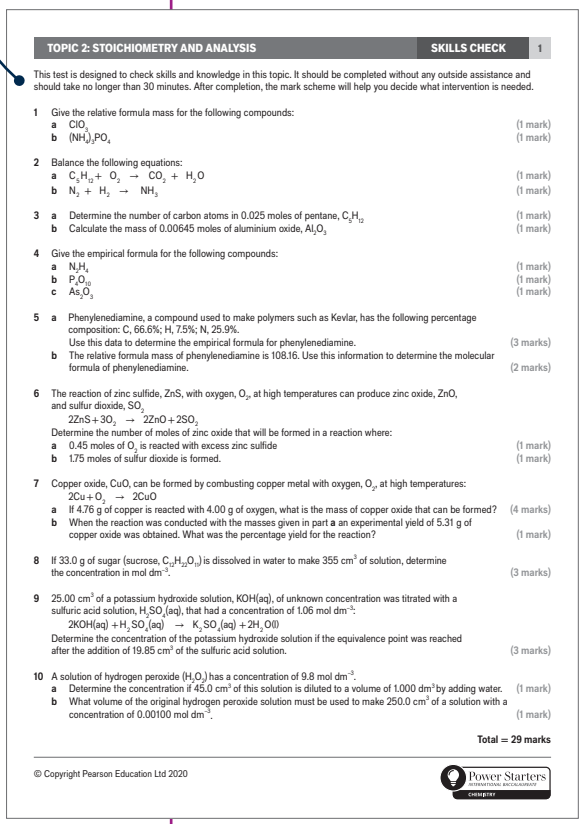


TOPIC 2: STOICHIOMETRY AND ANALYSIS — **SKILLS CHECK** 1

This test is designed to check skills and knowledge in this topic. It should be completed without any outside assistance and should take no longer than 30 minutes. After completion, the mark scheme will help you decide what intervention is needed.

1 Give the relative formula mass for the following compounds:
a ClO_3 (1 mark)
b $(NH_4)_3PO_4$ (1 mark)

2 Balance the following equations:
a $C_5H_{12} + O_2 \rightarrow CO_2 + H_2O$ (1 mark)
b $N_2 + H_2 \rightarrow NH_3$ (1 mark)

3 **a** Determine the number of carbon atoms in 0.025 moles of pentane, C_5H_{12} (1 mark)
b Calculate the mass of 0.00645 moles of aluminium oxide, Al_2O_3 (1 mark)

4 Give the empirical formula for the following compounds:
a N_2H_4 (1 mark)
b P_4O_{10} (1 mark)
c As_2O_3 (1 mark)

5 **a** Phenylenediamine, a compound used to make polymers such as Kevlar, has the following percentage composition: C, 66.6%; H, 7.5%; N, 25.9%.
Use this data to determine the empirical formula for phenylenediamine. (3 marks)
b The relative formula mass of phenylenediamine is 108.16. Use this information to determine the molecular formula of phenylenediamine. (2 marks)

6 The reaction of zinc sulfide, ZnS, with oxygen, O_2, at high temperatures can produce zinc oxide, ZnO, and sulfur dioxide, SO_2.
$2ZnS + 3O_2 \rightarrow 2ZnO + 2SO_2$
Determine the number of moles of zinc oxide that will be formed in a reaction where:
a 0.45 moles of O_2 is reacted with excess zinc sulfide (1 mark)
b 1.75 moles of sulfur dioxide is formed. (1 mark)

7 Copper oxide, CuO, can be formed by combusting copper metal with oxygen, O_2, at high temperatures:
$2Cu + O_2 \rightarrow 2CuO$
a If 4.76 g of copper is reacted with 4.00 g of oxygen, what is the mass of copper oxide that can be formed? (4 marks)
b When the reaction was conducted with the masses given in part **a** an experimental yield of 5.31 g of copper oxide was obtained. What was the percentage yield for the reaction? (1 mark)

8 If 33.0 g of sugar (sucrose, $C_{12}H_{22}O_{11}$) is dissolved in water to make 355 cm^3 of solution, determine the concentration in mol dm^{-3}. (3 marks)

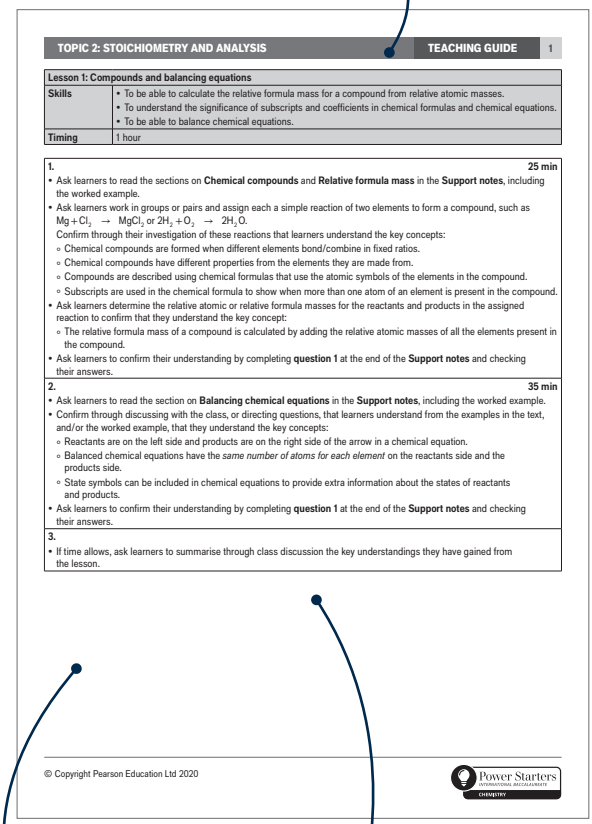
9 25.00 cm^3 of a potassium hydroxide solution, KOH(aq), of unknown concentration was titrated with a sulfuric acid solution, H_2SO_4(aq), that had a concentration of 1.06 mol dm^{-3}:
$2KOH(aq) + H_2SO_4(aq) \rightarrow K_2SO_4(aq) + 2H_2O(l)$
Determine the concentration of the potassium hydroxide solution if the equivalence point was reached after the addition of 19.85 cm^3 of the sulfuric acid solution. (3 marks)

10 A solution of hydrogen peroxide (H_2O_2) has a concentration of 9.8 mol dm^{-3}.
a Determine the concentration if 45.0 cm^3 of this solution is diluted to a volume of 1.000 dm^3 by adding water. (1 mark)
b What volume of the original hydrogen peroxide solution must be used to make 250.0 cm^3 of a solution with a concentration of 0.00100 mol dm^{-3}. (1 mark)

Total = 29 marks

Power Starters INTERNATIONAL BACCALAUREATE CHEMISTRY

Intervention lesson plans and content written by IB subject experts.



TOPIC 2: STOICHIOMETRY AND ANALYSIS — **TEACHING GUIDE** 1

Lesson 1: Compounds and balancing equations	
Skills	• To be able to calculate the relative formula mass for a compound from relative atomic masses. • To understand the significance of subscripts and coefficients in chemical formulas and chemical equations. • To be able to balance chemical equations.
Timing	1 hour

1. **25 min**
- Ask learners to read the sections on **Chemical compounds** and **Relative formula mass** in the **Support notes**, including the worked example.
- Ask learners work in groups or pairs and assign each a simple reaction of two elements to form a compound, such as $Mg + Cl_2 \rightarrow MgCl_2$ or $2H_2 + O_2 \rightarrow 2H_2O$.
  Confirm through their investigation of these reactions that learners understand the key concepts:
  - Chemical compounds are formed when different elements bond/combine in fixed ratios.
  - Chemical compounds have different properties from the elements they are made from.
  - Compounds are described using chemical formulas that use the atomic symbols of the elements in the compound.
  - Subscripts are used in the chemical formula to show when more than one atom of an element is present in the compound.
- Ask learners determine the relative atomic or relative formula masses for the reactants and products in the assigned reaction to confirm that they understand the key concept:
  - The relative formula mass of a compound is calculated by adding the relative atomic masses of all the elements present in the compound.
- Ask learners to confirm their understanding by completing **question 1** at the end of the **Support notes** and checking their answers.

2. **35 min**
- Ask learners to read the section on **Balancing chemical equations** in the **Support notes**, including the worked example.
- Confirm through discussing with the class, or directing questions, that learners understand from the examples in the text, and/or the worked example, that they understand the key concepts:
  - Reactants are on the left side and products are on the right side of the arrow in a chemical equation.
  - Balanced chemical equations have the *same number of atoms for each element* on the reactants side and the products side.
  - State symbols can be included in chemical equations to provide extra information about the states of reactants and products.
- Ask learners to confirm their understanding by completing **question 1** at the end of the **Support notes** and checking their answers.

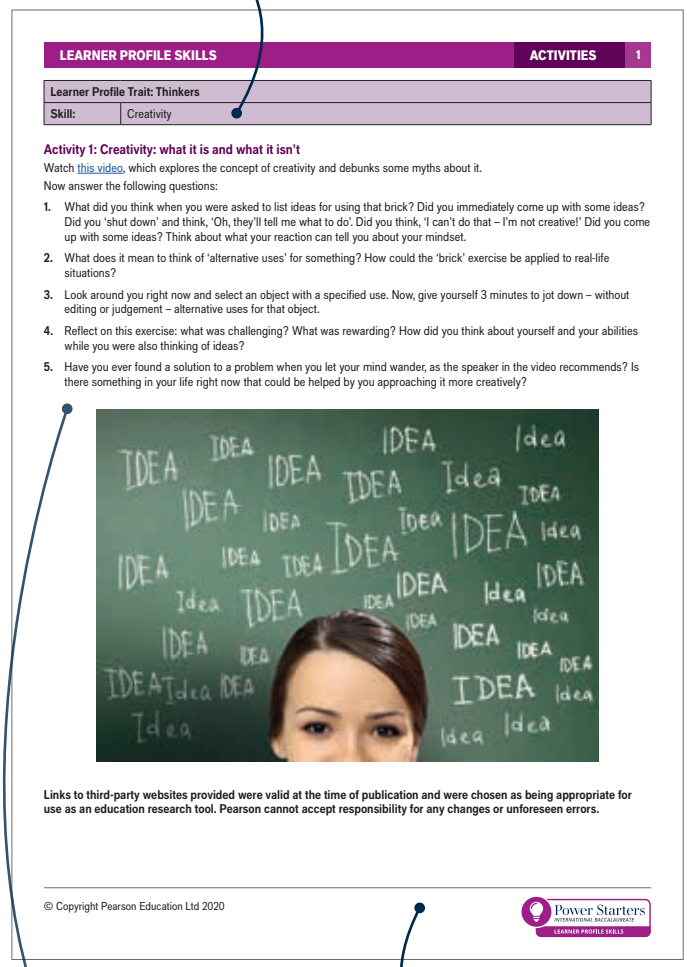
3.
- If time allows, ask learners to summarise through class discussion the key understandings they have gained from the lesson.

Power Starters INTERNATIONAL BACCALAUREATE CHEMISTRY

Check that the skills and knowledge from the lessons have been embedded with end of topic tests.

Identify and tailor lesson plans to learner needs.

Individual and group activities to improve transferable skills.



LEARNER PROFILE SKILLS ACTIVITIES 1

Learner Profile Trait: Thinkers	
Skill:	Creativity

Activity 1: Creativity: what it is and what it isn't

Watch this video, which explores the concept of creativity and debunks some myths about it.

Now answer the following questions:

1. What did you think when you were asked to list ideas for using that brick? Did you immediately come up with some ideas? Did you 'shut down' and think, 'Oh, they'll tell me what to do'. Did you think, 'I can't do that – I'm not creative!' Did you come up with some ideas? Think about what your reaction can tell you about your mindset.
2. What does it mean to think of 'alternative uses' for something? How could the 'brick' exercise be applied to real-life situations?
3. Look around you right now and select an object with a specified use. Now, give yourself 3 minutes to jot down – without editing or judgement – alternative uses for that object.
4. Reflect on this exercise: what was challenging? What was rewarding? How did you think about yourself and your abilities while you were also thinking of ideas?
5. Have you ever found a solution to a problem when you let your mind wander, as the speaker in the video recommends? Is there something in your life right now that could be helped by you approaching it more creatively?

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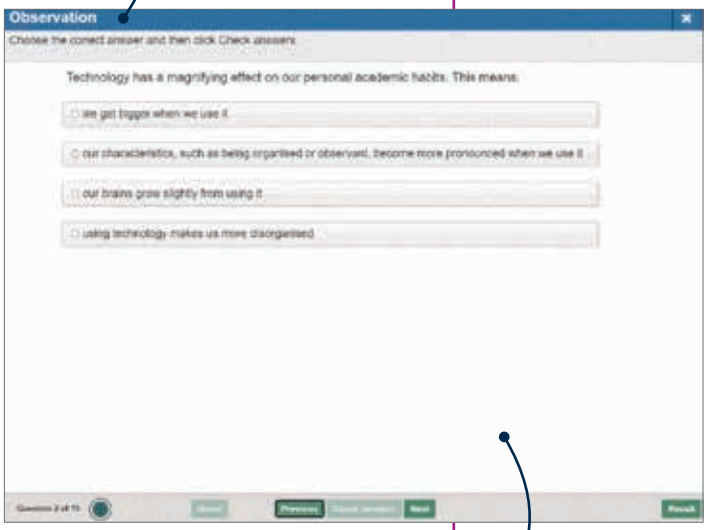
Power Starters INTERNATIONAL BACCALAUREATE LEARNER PROFILE SKILLS

Huge variety of activities.

Designed for learning either in class or at home.

Individual skills mapped to the Learner Profile traits.



Auto-marked quizzes identify strengths and weaknesses within a particular skill.

Available for the following IB Diploma subjects:

- Mathematics Analysis and Approaches (Standard and Higher Level)
- Mathematics Applications and Interpretation (Standard Level)
- Mathematics Applications and Interpretation (Higher Level)
- Biology
- Chemistry
- Physics
- Learner Profile skills

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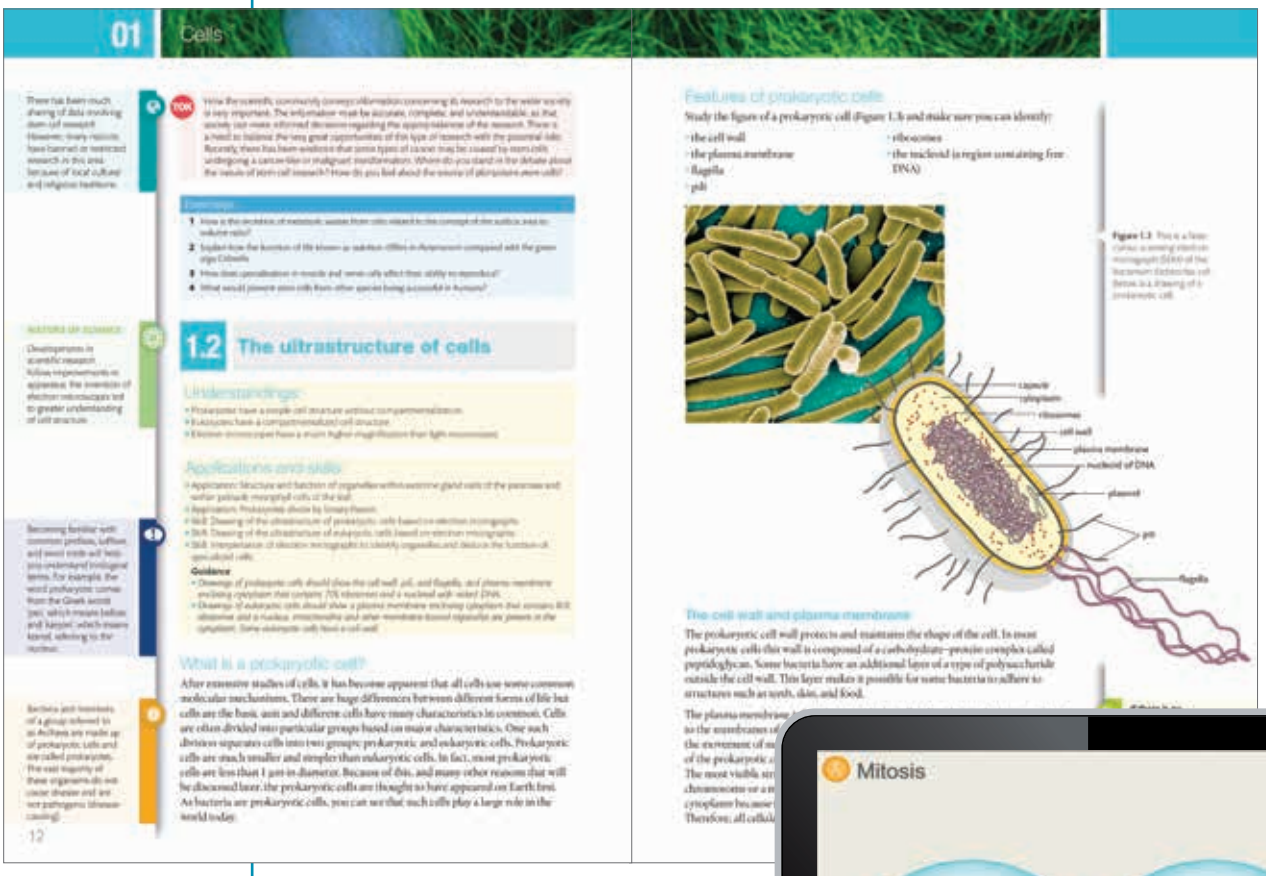
Pearson for the IBCP

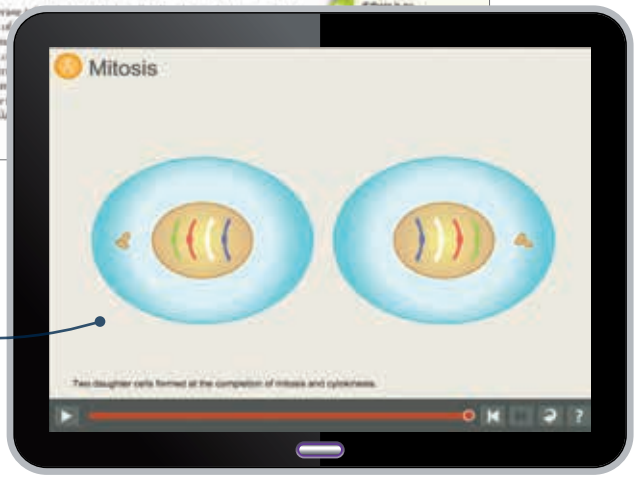
The International Baccalaureate Career-related Programme (IBCP) framework is built around three interconnected elements:

- At least two Diploma Programme courses – Pearson publishes high-quality textbooks and eBooks for the IB Diploma.
- The CP core that includes Personal and Professional Skills, Service Learning, Language Development and a Reflective Project.
- An approved career-related study – Pearson has worked in collaboration with IB to ensure Pearson BTEC programs offer IBCP students everything they need to succeed and to be work ready.

Pearson Resources for the IB Diploma courses

Students choose two IB Diploma Subjects from a list of options as part of their IBCP studies.





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BTEC

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- Focus on skills-based learning and are designed around themed units.
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