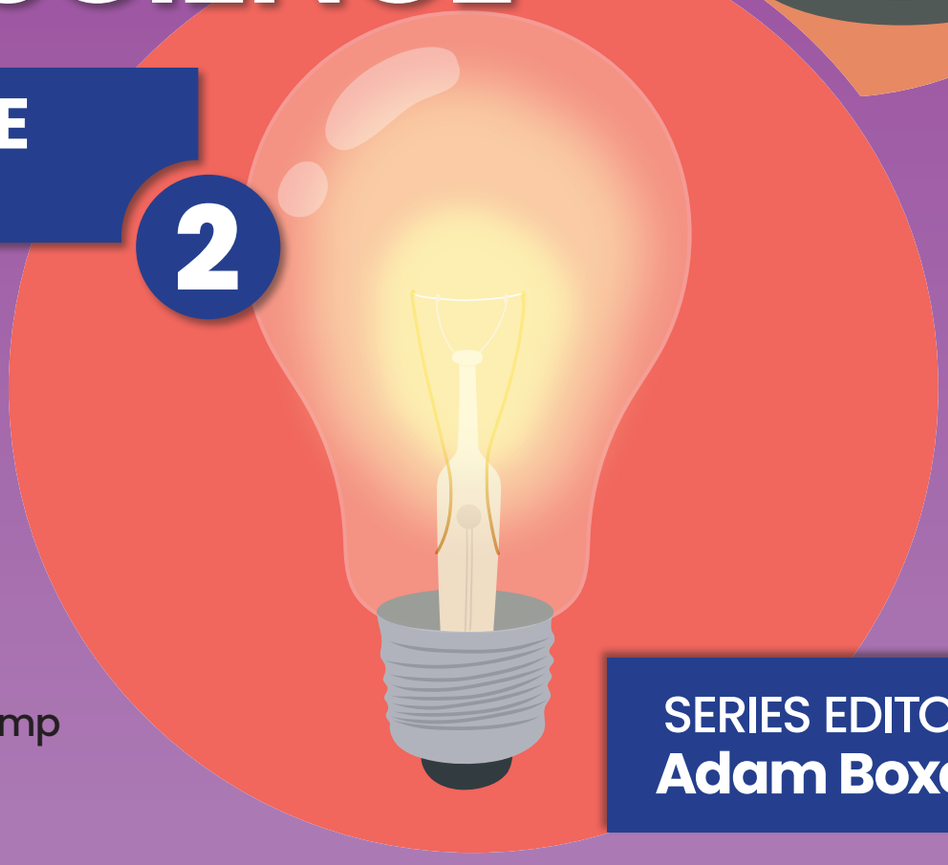
SAMPLE CHAPTER

SPRINGBOARD KS3 SCIENCE

PRACTICE BOOK 2



Claudia Allan
Jovita Castelino
Thomas Millichamp
Adam Robbins
Bill Wilkinson

SERIES EDITOR
Adam Boxer

CAROUSEL LEARNING

SUPPORTED BY Boost

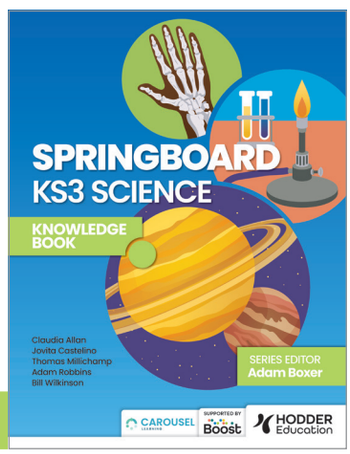
HODDER Education

ALSO AVAILABLE IN THE SERIES

Knowledge Book

Powered by cognitive science principles, this knowledge-rich book enables students to keep revisiting content, see the links between the sciences, and develop deeper understanding.

Our expert author team have used their extensive experience of research-informed teaching practice to help establish and embed the key scientific knowledge and skills that students need to succeed at KS3, ensuring they feel enthused and confident about progressing to GCSE.



Available as a Boost eBook

Teacher Handbooks

Deliver Key Stage 3 Science confidently and clearly with these essential handbooks.

These handbooks are not your usual teaching guide – they aim to inform and improve Science teaching through evidence and experience-based practice, powered by the knowledge and expertise of our author team. With high-quality guided explanations, class activities, essential practicals per unit and more, our handbooks take a workload-friendly approach to delivering KS3 Science, for non-specialist and experienced teachers alike.

eBooks available as part of the online Boost subscription

Find out more at **hoddereducation.com/springboard**

Springboard Science works with Carousel

CAROUSEL LEARNING

Carousel Learning is an integrated retrieval practice platform for schools. The partnership between Carousel and Hodder Education means that all Springboard Science Boost Knowledge Tests are available in the Carousel platform as question banks.

Find out more:

- Website: carousel-learning.com/springboard
- Follow on Twitter / Threads: @Carousel_Learn

Created in partnership with Hodder Education

HODDER Education

CONTENTS

PHYSICS

B3 Nutrition and digestion

B3.1 Healthy diet, energy requirements and dietary imbalance

What are the components of a healthy diet?

1 Why must we include carbohydrates in our diet?

2 True or false: fruits contain all the key nutrients required to be healthy. Give a reason for your answer.

3 What nutrient groups do cheese, pasta and eggs provide?

4 Why are fats needed in the diet?

5 What foods could you eat to give yourself more energy?

6 Name some foods a person should avoid if they are trying to reduce their fat intake.

7 What nutrients does fish provide?

8 Why are proteins needed in the body?

9 Copy and complete the following sentences.

a Fats are needed in the diet because ...

b Fats are needed in the diet but ...

c Fats are needed in the diet so ...

10 The card below shows the amount of fat and fibre in some types of foods and drinks from a café.

	fat in g	fibre in g
type of drink		
chocolate milkshake	7	0
lemonade	0	0
orange juice	0	0
type of burger		
single burger	15	0.7
double burger	36	1.1
cheeseburger	22	0.9
type of potato		
French fries	16	4
baked potato	0	8

a From the card, choose a meal consisting of a burger, a drink and some potato, to give:

i the least fat

ii the most fibre.

b A person orders a double burger, French fries and a chocolate milkshake. Calculate the fat content of this meal. Give the unit.

11 Which nutrient do we need to grow and repair tissues?

12 A student says, 'A healthy diet must only include fruits and vegetables.' Explain why they are wrong.

13 A person has a headache and is told to drink more water. Why do our bodies need water?

14 In what part of the cell do chemical reactions take place?

15 A student wants to investigate how much energy is given out when burning different amounts of bread.

a Write a line of enquiry for this experiment.

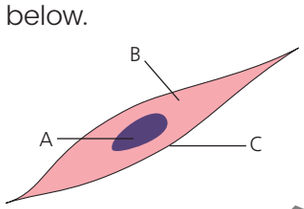
b Which is the independent variable?

c Which is the dependent variable?

d What are some control variables they need to consider?

16 A healthy diet is needed to build muscle. This question is about muscles.

a Name parts A, B and C of the muscle cell in the diagram below.



b A student says the diagram shows a plant cell. Explain why they are wrong.

c What are antagonistic muscles?

d This cell is 0.007 cm in diameter. How big will it appear to be if it is magnified ×600? Use the EVERY method to show your working.

e Convert your answer to millimetres.

f What is the function of muscles?

17 A plant cell is different to a muscle cell as it has a cell wall. What is the function of the cell wall in plant cells?

18 Plants also require certain nutrients to survive. They can make their own food through the process of photosynthesis. What is the name of the sub-cellular structure responsible for photosynthesis in plant cells?

19 What is the function of the mitochondria in animal cells?

20 What is the shape of red blood cells?

21 What is the function of red blood cells?

22 Which sub-cellular structure is missing in red blood cells?

Tip

Refer to the worked example in Topic B1.4 of the Knowledge Book to help with this question.

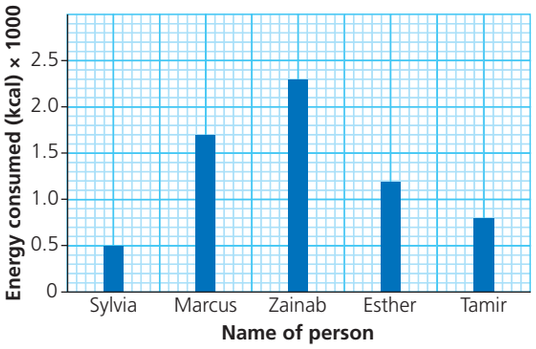
How do we draw bar charts?

EQ: Where questions cover multiple GEs in the TB2, is it OK to include just one heading? Or should both headings be included? For example, this section includes questions for both GE 'How do we draw bar charts?' and GE 'Why do some people need more food than others?'

23 Why do organisms need energy?

24 A 9-month-old baby needs approximately 700 calories a day. A 2-year-old needs approximately 1200 calories a day. Give two reasons why the 2-year-old needs more calories.

25 A scientist is interested in how much energy is consumed by a group of people. The graph below shows their results.



a Which of these people is most likely the youngest?

b Explain why Zainab is the most likely to be an athlete.

c Which nutrient groups provide energy?

d Why do we need energy?

26 A student wants to find out if the amount of protein a person eats affects their muscle strength.

a Write a line of enquiry for this investigation.

b What is the independent variable?

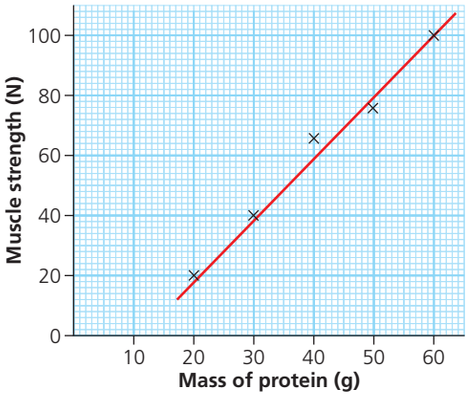
c What is the dependent variable?

d What are two control variables?

e Why do we need proteins in our diet?

f What are two foods that provide protein in our diet?

g The graph below shows the student's results. What is the relationship between mass of protein and muscle strength?



Tip

Refer to the working scientifically box in the Lines of Inquiry and Variables section of the Knowledge Book.

C4 Chemical reactions

C4.1 Reactions, conventions and signs a reaction has occurred

What goes in a chemical equation?

EQ: This section also includes questions for GE "What is a chemical reaction?'

1 What is a chemical formula?

2 Why do chemical equations use '→' and not '='?

3 What do we call the starting chemicals in a chemical reaction?

4 What do we call the end chemicals in a chemical reaction?

5 Below is a word equation for the reaction between limestone and acid.

calcium carbonate + hydrochloric acid → calcium chloride + water + carbon dioxide

a Name a product in this reaction.

b Name a reactant in this reaction.

c How many products are there in this reaction?

d How many reactants are there in this reaction?

6 Below is a word equation for the reaction between lithium and oxygen.

lithium + oxygen → lithium oxide

a Name a product in this reaction.

b Name a reactant in this reaction.

c How many products are there in this reaction?

d How many reactants are there in this reaction?

7 Below is a word equation for the reaction between magnesium and copper nitrate.

magnesium + copper nitrate → copper + magnesium nitrate

a Name a product in this reaction.

b Name a reactant in this reaction.

c How many products are there in this reaction?

d How many reactants are there in this reaction?

8 Below are some descriptions of chemical reactions. Turn the sentences into word equations.

a When methane gas burns in the presence of oxygen, the products are water and carbon dioxide.

b Copper oxide reacts with sulfuric acid making copper sulfate and water.

c Magnesium when placed in hydrochloric acid turns into magnesium chloride and hydrogen gas.

d Potassium reacts with oxygen in the air forming potassium oxide.

9 What happens in a chemical reaction?

10 Describe how particles move in:

a solids **b** liquids **c** gases.

11 What is the melting point of a substance?

12 What is the boiling point of a substance?

When are changes not a chemical reaction?

13 What is the difference between a chemical reaction and a physical change?

14 Write down the state symbols for the following four states of matter.

a Solid

b Gas

c Aqueous solution

d Liquid

15 We can represent physical state changes in equations. For example, water (ice) melting can be represented as:

H_2O (s) → H_2O (l)

Write equations showing the following state changes.

a Water boiling

b Methane (CH_4) condensing

c Mercury (Hg) melting

d Oxygen boiling

e Zinc melting

16 Explain why none of the equations in Question 15 are chemical reactions.

17 Explain why chocolate melting is not a chemical reaction.

18 A student takes a piece of paper and tears it into four parts. Has a chemical reaction taken place? Explain your answer.

19 Gallium (Ga) has a melting point of 30°C and a boiling point of 2400°C.

a What state is gallium at room temperature (20°C)?

b What happens to gallium when it is heated above 30°C?

c Write a symbol equation with state symbols representing gallium melting.

d Explain why this equation does not represent a chemical reaction.

20 Bromine (Br_2) has a melting point of −7°C and a boiling point of 59°C.

- **a** What state is bromine at room temperature (20°C)?
- **b** To what temperature must bromine be heated to turn it into a gas?
- **c** Write a symbol equation with state symbols representing bromine boiling.
- **d** Explain why this equation does not represent a chemical reaction.
- **e** Bromine dissolves in water producing a solution of bromine water. Write a symbol equation with state symbols representing bromine becoming a solution.
- **f** Explain why this equation does not represent a chemical reaction.

21 Alex and Isabel were given a mixture of iron filings and some sugar.

- **a** Alex separated the mixture using a magnet, which attracted the iron filings and not the sugar. Explain why this is not a chemical reaction.
- **b** Isabel added water to the iron filings and sugar to dissolve the sugar. They then filtered the iron filings, which were insoluble. Explain why this is not a chemical reaction.

22 A student makes a glass of orange squash by adding orange squash and water. Has a chemical reaction taken place? Explain your answer.

23 A student watches an ice cube melt and says, 'A new substance, water, is formed therefore a chemical reaction has taken place.' Explain why they are wrong.

How can we tell if a chemical reaction has happened?

24 Name five signs that a chemical reaction has taken place.

25 What is *effervescence*?

26 What is *precipitation*?

27 Below are some sentences describing chemical reactions. Write a word equation for each one.

- **a** Magnesium is a silvery metal. When it is heated in oxygen, it makes a bright light. The product is a white powder called magnesium oxide.

Tip

Only the names of chemicals (not their colours or states) are put in word equations.

b When grey iron filings are mixed with yellow sulfur, a mixture is formed that can be separated with a magnet. However, after heating, the mixture glows and black iron sulfide is formed, which is a new compound.

c When grey calcium metal is added to a test tube containing hydrochloric acid, bubbles of hydrogen are formed rapidly, the solution gets very hot and a solution of calcium chloride is left in the test tube.

d When colourless solutions of lead nitrate and potassium iodide are mixed together, a yellow solid of lead iodide forms in the solution of potassium nitrate.

e When silver sodium is added to water, it fizzes and burns. It forms sodium hydroxide solution and hydrogen gas.

f Inside car exhausts, two poisonous gases, carbon monoxide and nitrogen monoxide, are converted into two less harmful gases, carbon dioxide and nitrogen. This is facilitated by the hot platinum catalyst in the exhaust box.

28 For each of the reactions described in Question 27, name the signs that a chemical reaction has taken place.

29 What are the three types of subatomic particles found inside atoms?

30 Which subatomic particles are found in the nucleus of atoms?

31 Which subatomic particles are found in shells around the nucleus?

32 A student dissolves some salt in water. They can no longer see the salt. They say that a chemical reaction must have taken place. Explain why they are wrong.

33 A student strikes a match.

a What will they observe?

b What will they be able to feel near the match?

c The student blows the match out. How will the matchstick have changed?

d Give three ways the student can tell that a chemical reaction has happened.

34 A student boils some water in a kettle. They say that because bubbles of steam are formed and the kettle gets hot that a chemical reaction has taken place. Explain why they are wrong.

35 A student is injured playing rugby. Their teacher gives them an 'instant' icepack. To activate it, a small bag inside the big bag is broken to mix two chemicals together, which makes the whole bag cold. Explain how you know that this must be a chemical reaction.

Tip

Observe means 'see'.

C4.2 Combustion, thermal decomposition, oxidation and displacement

What are combustion equations?

EQ: This section also includes questions on GE 'What is combustion?'

36 What type of energy is stored in fuels such as petrol, diesel and methane?

37 What is the scientific name for burning reactions?

38 What gas in the air is essential for combustion reactions?

39 What are the three sides of the fire triangle?

40 What three factors affect the pressure of a gas?

41 Butane (C_4H_{10}) is a fuel often used in barbeques.

- **a** Write a word equation for the combustion of butane.
- **b** Write a symbol equation for the combustion of butane.
- **c** How many types of atoms are in butane?
- **d** How many atoms are there in total in butane?

42 Methanol (CH_4O) is used in spirit burners.

- **a** Write a word equation for the combustion of methanol.
- **b** Write a symbol equation for the combustion of methanol.
- **c** How many elements are there in methanol?
- **d** How many atoms are there in total in methanol?

43 What is an element?

44 What is a compound?

45 Copy and complete the following sentences.

- **a** A fire can be extinguished by removing oxygen because ...
- **b** A fire can be extinguished by removing oxygen but ...
- **c** A fire can be extinguished by removing oxygen so ...

46 Fire breaks are gaps in forests where trees are cut down. They help to stop forest fires spreading. Use the fire triangle to explain how fire breaks help to stop forest fires spreading.

47 How many different types of atoms are there?

48 Where are all the different types of atoms listed?

49 How do different atoms differ from each other?

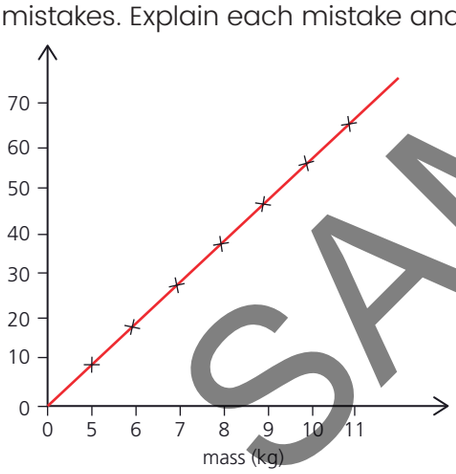
50 Angela and Mario are watching a Bunsen burner flame. Angela says that a chemical reaction is taking place because there is heat given off. Mario says that there is no chemical reaction because they cannot see any new substances. Explain which student is correct and explain to the incorrect student why they are wrong.

P5 Sound

P5.1 Types of waves

What do waves do?

1. Give two examples of a wave.
2. What do waves transfer from one place to another?
3. What are the standard units of energy?
4. What do waves not transfer from one place to another?
5. What is a medium?
6. Name the four transfers of energy.
7. Give a way in which we know that waves do not transfer particles.
8. Which medium can sound not travel through?
9. A student has drawn the graph below but made two mistakes. Explain each mistake and how to fix it.



What are waves made of?

10. Give an example of an object that oscillates.
11. What is an oscillation?
12. A student says, 'Water waves transport particles because particles of water move.' Explain why they are wrong.
13. What do sound waves, light waves and water waves have in common?
14. Which type of wave can travel in a vacuum: light waves or sound waves?

15 A speaker has a power of 50 W.

a How many joules of energy does it transfer per second?

b The speaker is left on for 2 minutes. How much energy is transferred in this time?

c What happens to the particles in the air as the sound travels through the air?

d The sound wave comes to a wall. Can the sound travel through the wall? Explain your answer.

> **Tip**
>
> Look at the worked example in Topic 1.3 of the Knowledge Book.

16 A student attaches a mass to a spring and lets it go.

a What force pulls the mass towards Earth?

b What happens to the elastic force as the spring stretches more?

c When the mass is let go, how would we describe the motion of the mass?

d The spring constant of the spring is 250 N/m. The spring is stretched at one point by 0.2 m. What is the force on the spring?

> **Tip**
>
> Look at the worked example in Topic 3.4 of the Knowledge Book.

What types of waves are there?

17 What are the names of the two types of waves?

18 How are the direction of the oscillation and the direction of the wave related in a transverse wave?

19 What is oscillating in a sound wave when:

a it travels through the air

b it travels through a wall

c it travels through water?

20 How are the direction of the oscillation and the direction of the wave related in a longitudinal wave?

21 Give three examples of a transverse wave.

22 What do transverse and longitudinal waves have in common?

23 What is the main example of a longitudinal wave?

24 Draw a transverse wave and label the peak and trough.

25 In a longitudinal wave, what is a compression?

26 In a longitudinal wave, what is a rarefaction?

27 Sound wave 1 travels at 330 m/s in air. Sound wave 2 travels at 1100 m/s in water. What is the relative speed of sound wave 1 to sound wave 2 if:

a they travel in the same direction

b they travel in opposite directions?

> **Tip**
>
> Look at the worked example in Topic 2.3 of the Knowledge Book.

Provide all the independent practice needed for your Springboard Science course with over 1000 questions in each Practice Book.

Designed to be used alongside our Knowledge Book, our Practice Books provide shed loads of practice (SLOP) for students to consolidate, apply and extend the knowledge that they have learnt.

With decades of teaching experience and extensive knowledge of applying cognitive science in the classroom, you can trust our author team to have created carefully crafted and varied questions for independent practice.

- **Improve students' long-term retention**. Spacing is built in throughout this Practice Book, improving retention over time.
- **Highlight connections between topics and Sciences**. Interleaving of content encourages students to recognise and focus on the connections, similarities and differences across science, enabling them to reflect on their learning in more depth.
- **Build confidence in the key skills**. Question sets include coverage of the key mathematical and working scientifically skills that students need to understand, ensuring that this knowledge is embedded throughout their independent practice.
- **Support every student**. Links to the relevant worked examples in the Knowledge Book are highlighted throughout each topic for easy reference.
- **Prepare for the next step**. Questions increase in difficulty throughout each topic, enabling students to progress through the KS3 curriculum and prepare for KS4 and beyond.

Answers are available online for free, and also embedded into the lesson presentations in our Boost digital teaching and learning resources for easy in-class independent practice review.

HODDER Education
+44 (0)1235 827827
education@hachette.co.uk
hoddereducation.com

ISBN 978-1-3983-8575-7