

Grade 7 Science

Unit 3: Metabolic Reactions

Driving question: How do things inside our bodies work together to make us feel the way we do?

21 lessons (investigations and weekly readings) and a words quiz. Use this pack with the unit's **Teacher Guide**, **Student Procedure Guide**, **Student Work Pages** and **Science Literacy Student Reader** (download them once from the course) to teach the whole unit without the internet.

What is in this pack

- A plan for each lesson: the lesson question, how many class days it takes, the Teacher Guide pages to follow, and the student pages to print.
- For each weekly reading: the Student Reader pages, words to know and the exercise page.
- The words quiz, ready to print, with its key at the back.

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Lesson schedule

Each investigation lesson takes the number of class days shown (about 45 minutes a day). Do each reading over a week alongside the lessons. Tick each one off as you go.

	Lesson	Days	Student pages
☐	Reading: Science Literacy Preface: Put Yourself in This Scene	1 week	—
☐	Lesson 1: What is going on inside M’Kenna’s body that is making her feel the way she does?	3	6 to print
☐	Lesson 2: Can we see anything inside M’Kenna that looks different?	2	3 to print
☐	Reading: Science Literacy Collection 1: Changing Body Weight	1 week	1 to print
☐	Lesson 3: Why do molecules in the small intestine seem like they are disappearing?	2	5 to print
☐	Lesson 4: What happens to food molecules as they move through the small intestine and large intestine?	1	3 to print
☐	Lesson 5: Why do large food molecules, like some complex carbohydrates, seem to disappear in the digestive system?	2	4 to print
☐	Reading: Science Literacy Collection 2: Gut Reactions	1 week	1 to print
☐	Lesson 6: What happens to the different substances in food as it travels through the digestive system?	1	2 to print
☐	Lesson 7: What is the function of the digestive system, and how is M’Kenna’s digestive system different?	3	6 to print
☐	Lesson 8: What does the surface of M’Kenna’s small intestine look like up close compared with a healthy one?	2	4 to print
☐	Reading: Science Literacy Collection 3: Digestion Chemistry	1 week	1 to print
☐	Lesson 9: How can a problem in one body system cause problems in other systems?	1	2 to print

	Lesson	Days	Student pages
☐	Lesson 10: Why is M’Kenna losing so much weight?	2	3 to print
☐	Lesson 11: What happens to matter when it is burned?	2	3 to print
☐	Reading: Science Literacy Collection 4: Burning Calories	1 week	1 to print
☐	Lesson 12: Does this chemical reaction to burn food happen inside our bodies?	2	4 to print
☐	Lesson 13: How does a healthy body use food for energy and growth, and how is M’Kenna’s body functioning differently?	2	4 to print
☐	Lesson 14: Do all animals do chemical reactions to get energy from food like humans?	1	4 to print
☐	Reading: Science Literacy Collection 5: Built from Food	1 week	1 to print
☐	Lesson 15: What questions on our Driving Question Board can we now answer?	2	1 to print
☐	Words quiz	—	—

Page numbers are PDF page numbers of each file, so they match what your PDF reader shows.

Reading: Science Literacy Preface: Put Yourself in This Scene

Words to know

- **cholesterol** — a waxy substance found in blood and cells
- **gluten** — a family of proteins found in wheat and certain other grains

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 23–26: the steps, materials and timing for this lesson.

Read

Read Science Literacy Student Reader, Preface: “Put Yourself in This Scene”: PDF pages 6–7. Look at the pictures and maps together.

Check for understanding

- Use one of today's words in a sentence of your own.

Lesson 1: What is going on inside M’Kenna’s body that is making her feel the way she does?

LESSON QUESTION

What is going on inside M’Kenna’s body that is making her feel the way she does?

Plan about **3 class days** for this lesson.

Teacher’s lesson plan

Follow the Teacher Guide, PDF pages 27–45: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 7–10
- M’Kenna’s Doctor’s Note — Student Work Pages, PDF pages 7–8
- Map M’Kenna’s Symptoms to Her Body Systems — Student Work Pages, PDF pages 9–10
- Initial Model — Student Work Pages, PDF pages 11–12
- Reference: Transcript of M’Kenna’s symptoms — Student Procedure Guide, PDF page 64
- Reference: Map M’Kenna’s Symptoms to her body systems — Student Procedure Guide, PDF page 65

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation: What is going on inside M’Kenna’s body that is making her feel the way she does?

Lesson 2: Can we see anything inside M’Kenna that looks different?

LESSON QUESTION

Can we see anything inside M’Kenna that looks different?

Plan about **2 class days** for this lesson.

Teacher’s lesson plan

Follow the Teacher Guide, PDF pages 46–59: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 11–14
- Analyzing Endoscopy Images — Student Work Pages, PDF pages 13–14
- What happens in the small intestine? — Student Work Pages, PDF pages 15–16

For the teacher

- Answer Key — Teacher Guide, PDF page 320

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
Can we see anything inside M’Kenna that looks different?

Reading: Science Literacy Collection 1: Changing Body Weight

Words to know

- **body mass index (BMI)** — a ratio of weight to height used to classify body weight in ranges of less than, within, or greater than ideal for health
- **calipers** — a instrument for measuring the thickness of a material or the width of an opening
- **colonoscopy** — a procedure for examining the colon using a flexible optical instrument
- **endoscopy** — a procedure for viewing an area or part of the body internally via video with a minimally invasive instrument
- **net** — identifying a total or number that indicates what is left after certain factors add to or subtract from a starting amount

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 60–65: the steps, materials and timing for this lesson.

Read

Read Science Literacy Student Reader, Collection 1: “Changing Body Weight”: PDF pages 8–17. Look at the pictures and maps together.

Student pages to print

- Exercise Page 1 — Student Work Pages, PDF pages 75–76

Check for understanding

- Use one of today's words in a sentence of your own.

Lesson 3: Why do molecules in the small intestine seem like they are disappearing?

LESSON QUESTION

Why do molecules in the small intestine seem like they are disappearing?

Plan about **2 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 66–86: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 15–19
- Dialysis Tube Investigation — Student Work Pages, PDF pages 17–20
- Reference: Day 1 Dialysis Tube Investigation Instructions — Student Procedure Guide, PDF pages 66–67
- Reference: Day 2 Dialysis Tube Investigation Instructions — Student Procedure Guide, PDF pages 68–71
- Reference: Starch and Glucose Molecules — Student Procedure Guide, PDF page 72

For the teacher

- Answer Key — Teacher Guide, PDF pages 321–322

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation: Why do molecules in the small intestine seem like they are disappearing?

Lesson 4: What happens to food molecules as they move through the small intestine and large intestine?

LESSON QUESTION

What happens to food molecules as they move through the small intestine and large intestine?

Plan about **1 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 87–99: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 20–21
- Analysis Strategy for Graham Cracker Data — Student Work Pages, PDF pages 21–24
- Reference: Graham Cracker Data — Student Procedure Guide, PDF pages 73–74

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
What happens to food molecules as they move through the small intestine and large intestine?

Lesson 5: Why do large food molecules, like some complex carbohydrates, seem to disappear in the digestive system?

LESSON QUESTION

Why do large food molecules, like some complex carbohydrates, seem to disappear in the digestive system?

Plan about **2 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 100–120: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 22–25
- Data Table for Chemical Reactions in the Mouth — Student Work Pages, PDF pages 25–26
- Reference: Analyze data from eating a graham cracker — Student Procedure Guide, PDF page 75
- Reference: Food Molecule Cards — Student Procedure Guide, PDF pages 76–104

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation: Why do large food molecules, like some complex carbohydrates, seem to disappear in the digestive system?

Reading: Science Literacy Collection 2: Gut Reactions

Words to know

- **ruminant** — one of a number of large, hoofed, grazing mammals that predigest plant-based food in a specialized stomach

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 121–127: the steps, materials and timing for this lesson.

Read

Read Science Literacy Student Reader, Collection 2: “Gut Reactions”: PDF pages 18–27. Look at the pictures and maps together.

Student pages to print

- Exercise Page 2 — Student Work Pages, PDF pages 77–78

Check for understanding

- Use one of today's words in a sentence of your own.

Lesson 6: What happens to the different substances in food as it travels through the digestive system?

LESSON QUESTION

What happens to the different substances in food as it travels through the digestive system?

Plan about **1 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 128-141: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 26-29
- Table to Organize Food Molecules Data — Student Work Pages, PDF pages 27-28

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation: What happens to the different substances in food as it travels through the digestive system?

Lesson 7: What is the function of the digestive system, and how is M’Kenna’s digestive system different?

LESSON QUESTION

What is the function of the digestive system, and how is M’Kenna’s digestive system different?

Plan about **3 class days** for this lesson.

Teacher’s lesson plan

Follow the Teacher Guide, PDF pages 142–159: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 30–34
- Compiled Models from Progress Tracker — Student Work Pages, PDF pages 29–30
- Gotta-Have-It Checklist — Student Work Pages, PDF pages 31–32
- Peer Feedback Guidelines — Student Work Pages, PDF pages 33–34
- Self-Assessment: Giving and Receiving Feedback — Student Work Pages, PDF pages 35–36
- Revised Model (optional) — Student Work Pages, PDF pages 37–38

For the teacher

- Rubric — Teacher Guide, PDF pages 323–328
- Answer Key 1 — Teacher Guide, PDF pages 329–332

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation: What is the function of the digestive system, and how is M’Kenna’s digestive system different?

Lesson 8: What does the surface of M’Kenna’s small intestine look like up close compared with a healthy one?

LESSON QUESTION

What does the surface of M’Kenna’s small intestine look like up close compared with a healthy one?

Plan about **2 class days** for this lesson.

Teacher’s lesson plan

Follow the Teacher Guide, PDF pages 160–173: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 35–37
- Connecting the Structure of Villi to Their Function — Student Work Pages, PDF pages 39–42
- Self-Assessment: Giving and Receiving Feedback — Student Work Pages, PDF pages 43–44
- Revisit questions from our DQB! — Student Work Pages, PDF pages 45–46

For the teacher

- Rubric — Teacher Guide, PDF pages 333–339
- Answer Key 1 — Teacher Guide, PDF pages 340–342
- Answer Key 2 — Teacher Guide, PDF page 343

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation: What does the surface of M’Kenna’s small intestine look like up close compared with a healthy one?

Reading: Science Literacy Collection 3: Digestion Chemistry

Words to know

- **gizzard** — a muscular part of the stomach of some animals that grinds food with grit
- **glucose** — a simple sugar molecule, $C_6H_{12}O_6$
- **insulin** — a hormone, produced in the pancreas, that regulates the amount of glucose in the blood
- **lactose** — a sugar present in milk, $C_{12}H_{22}O_{11}$ malnutrition, n a condition caused by a lack of sufficient nutrients in the body; can also refer to overnutrition, meaning too much of some nutrients are being consumed
- **rennet** — an enzyme produced in the stomachs of ruminants

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 174–180: the steps, materials and timing for this lesson.

Read

Read Science Literacy Student Reader, Collection 3: “Digestion Chemistry”: PDF pages 28–37. Look at the pictures and maps together.

Student pages to print

- Exercise Page 3 — Student Work Pages, PDF pages 79–80

Check for understanding

- Use one of today's words in a sentence of your own.

Lesson 9: How can a problem in one body system cause problems in other systems?

LESSON QUESTION

How can a problem in one body system cause problems in other systems?

Plan about **1 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 181–189: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 38–39
- Symptoms and Systems — Student Work Pages, PDF pages 47–48

For the teacher

- Answer Key — Teacher Guide, PDF page 344

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
How can a problem in one body system cause problems in other systems?

Lesson 10: Why is M’Kenna losing so much weight?

LESSON QUESTION

Why is M’Kenna losing so much weight?

Plan about **2 class days** for this lesson.

Teacher’s lesson plan

Follow the Teacher Guide, PDF pages 190–205: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 40–43
- Patterns in M’Kenna’s Weight — Student Work Pages, PDF pages 49–50
- What happens to fat when it burns? — Student Work Pages, PDF pages 51–52

For the teacher

- Answer Key — Teacher Guide, PDF page 345

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
Why is M’Kenna losing so much weight?

Lesson 11: What happens to matter when it is burned?

LESSON QUESTION

What happens to matter when it is burned?

Plan about **2 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 206–230: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 44–49
- Burning Fat in Open and Closed Systems — Student Work Pages, PDF pages 53–54
- Making Sense of Burning Fat Investigation Results — Student Work Pages, PDF pages 55–56

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
What happens to matter when it is burned?

Reading: Science Literacy Collection 4: Burning Calories

Words to know

- **calorie** — the amount of heat required to raise one gram of water one degree Celsius. One Calorie equals 1,000 calories.
- **carbohydrate** — a type of compound occurring in foods and living tissues that is broken down to release energy for the organism to use
- **glucose** — a simple sugar molecule, $C_6H_{12}O_6$
- **kilocalorie** — the amount of heat required to raise one kilogram of water one degree Celsius
- **over-the-counter** — a health-related or medicinal substance that can be purchased without a prescription from a doctor

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 231–237: the steps, materials and timing for this lesson.

Read

Read Science Literacy Student Reader, Collection 4: “Burning Calories”: PDF pages 38–47. Look at the pictures and maps together.

Student pages to print

- Exercise Page 4 — Student Work Pages, PDF pages 81–82

Check for understanding

- Use one of today's words in a sentence of your own.

Lesson 12: Does this chemical reaction to burn food happen inside our bodies?

LESSON QUESTION

Does this chemical reaction to burn food happen inside our bodies?

Plan about **2 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 238–260: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 50–54
- Oxygen and Carbon Dioxide in the Blood – Part 1 — Student Work Pages, PDF pages 57–58
- Interpreting Activity Data – Part 2 — Student Work Pages, PDF pages 59–60
- Revisiting Symptoms and Systems — Student Work Pages, PDF pages 61–62

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
Does this chemical reaction to burn food happen inside our bodies?

Lesson 13: How does a healthy body use food for energy and growth, and how is M’Kenna’s body functioning differently?

LESSON QUESTION

How does a healthy body use food for energy and growth, and how is M’Kenna’s body functioning differently?

Plan about **2 class days** for this lesson.

Teacher’s lesson plan

Follow the Teacher Guide, PDF pages 261–280: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 55–58
- Three Pathways Inside Our Bodies — Student Work Pages, PDF pages 63–64
- Gotta-Have-It Checklist — Student Work Pages, PDF pages 65–66
- Who is M’Kenna, and what happened to her? — Student Work Pages, PDF pages 67–68

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
How does a healthy body use food for energy and growth, and how is M’Kenna’s body functioning differently?

Lesson 14: Do all animals do chemical reactions to get energy from food like humans?

LESSON QUESTION

Do all animals do chemical reactions to get energy from food like humans?

Plan about **1 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 281–290: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 59–61
- Self-Assessment: Giving and Receiving Feedback — Student Work Pages, PDF pages 69–70
- Let's answer questions from our DQB! — Student Work Pages, PDF pages 71–72
- Engaging in Argument from Evidence — Student Work Pages, PDF pages 73–74

For the teacher

- Rubric 1 — Teacher Guide, PDF page 346
- Rubric 2 — Teacher Guide, PDF page 347

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
Do all animals do chemical reactions to get energy from food like humans?

Reading: Science Literacy Collection 5: Built from Food

Words to know

- **calorie** — the amount of heat required to raise one gram of water one degree Celsius. One Calorie equals 1,000 calories.
- **diabetes** — a disorder in which the body does not produce enough of the hormone insulin, resulting in large amounts of sugar in the blood and urine
- **food insecurity** — a general lack of access to safe, nutritious food for normal growth and development
- **insulin** — a hormone, produced in the pancreas, that regulates the amount of glucose in the blood
- **prevalence** — a condition of being common

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 291–296: the steps, materials and timing for this lesson.

Read

Read Science Literacy Student Reader, Collection 5: “Built from Food”: PDF pages 48–57. Look at the pictures and maps together.

Student pages to print

- Exercise Page 5 — Student Work Pages, PDF pages 83–87

Check for understanding

- Use one of today's words in a sentence of your own.

Lesson 15: What questions on our Driving Question Board can we now answer?

LESSON QUESTION

What questions on our Driving Question Board can we now answer?

Plan about **2 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 297–301: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 62–63

For the teacher

- Rubric — Teacher Guide, PDF pages 348–355
- Answer Key — Teacher Guide, PDF pages 356–363

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
What questions on our Driving Question Board can we now answer?

WORDS QUIZ

Metabolic Reactions

Name: _____ Date: _____

Circle the letter of the best answer.

1. Which word means “a instrument for measuring the thickness of a material or the width of an opening”?
 - a) calipers
 - b) net
 - c) colonoscopy
 - d) prevalence
2. Which word means “a simple sugar molecule, $C_6H_{12}O_6$ ”?
 - a) glucose
 - b) carbohydrate
 - c) body mass index (BMI)
 - d) kilocalorie
3. Which word means “the relationship between the amount of food fed to livestock and the amount of weight the animals gain”?
 - a) feed conversion ratio (FCR)
 - b) endoscopy
 - c) carbohydrate
 - d) gastrolith
4. Which word means “a small stone that aids digestion in the gizzard of certain types of animals”?
 - a) calipers
 - b) gastrolith
 - c) gluten
 - d) carbohydrate
5. Which word means “a muscular part of the stomach of some animals that grinds food with grit”?
 - a) food insecurity
 - b) gastrolith
 - c) over-the-counter
 - d) gizzard
6. Which word means “a procedure for examining the colon using a flexible optical instrument”?
 - a) colonoscopy
 - b) body mass index (BMI)
 - c) kilocalorie
 - d) gastrolith

7. Which word means “a procedure for viewing an area or part of the body internally via video with a minimally invasive instrument”?

- a) net
- b) endoscopy
- c) colonoscopy
- d) ruminant

8. Which word means “a ratio of weight to height used to classify body weight in ranges of less than, within, or greater than ideal for health”?

- a) net
- b) body mass index (BMI)
- c) colonoscopy
- d) over-the-counter

9. Which word means “identifying a total or number that indicates what is left after certain factors add to or subtract from a starting amount”?

- a) endoscopy
- b) colonoscopy
- c) net
- d) feed conversion ratio (FCR)

10. Which word means “a health-related or medicinal substance that can be purchased without a prescription from a doctor”?

- a) carbohydrate
- b) diabetes
- c) over-the-counter
- d) rennet

11. Which word means “a disorder in which the body does not produce enough of the hormone insulin, resulting in large amounts of sugar in the blood and urine”?

- a) carbohydrate
- b) over-the-counter
- c) calorie
- d) diabetes

12. Which word means “one of a number of large, hoofed, grazing mammals that predigest plant-based food in a specialized stomach”?

- a) calipers
- b) ruminant
- c) gastrolith
- d) over-the-counter

FOR THE TEACHER

Answers

Unit quiz key

1. a 2. a 3. a 4. b 5. d 6. a 7. b 8. b 9. c 10. c 11. d 12. b