

## 7.3 Metabolic Reactions

Content Area: **Science**  
Course(s):  
Time Period: **Marking Period 2**  
Length: **6 weeks**  
Status: **Published**

### Course Pacing Guide

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Unit	Marking Period	Length
Chemical Reactions and Matter Transformation	1	6 weeks
Cells and Systems (2019 only)	1	6 weeks
Metabolic Reactions	2	6 weeks
Genetics (2019 only)	2,3	4 weeks
Evolution (2019 only)	3	4 weeks
Photosynthesis and Matter Cycling	4	8 weeks
Ecosystems	4	6 weeks

### Unit Overview

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This unit on metabolic reactions in the human body starts out with students exploring a real case study of a middle-school girl who reported some alarming symptoms to her doctor. Her symptoms included an inability to concentrate, headaches, stomach issues when she eats, and a lack of energy for everyday activities and sports regularly. She also reported noticeable weight loss over the past few months, in spite of consuming what appeared to be a healthy diet. Her case sparks questions and investigations around trying to figure out which pathways and processes in the student's body might be functioning differently than a healthy system and why.

### Enduring Understandings

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- Develop and use a model to explain how food is rearranged through chemical reactions, forming new molecules that support growth and/or release energy this matter moves through the human body
- Develop and use a model to explain how different subsystems of the body work together to provide cells what they need to function
- Construct and defend a scientific explanation of how the student's condition (celiac disease) leads to weight loss and lack of energy
- Construct a scientific explanation based on evidence for how environmental factors, such as food intake, influence the growth of animals
- In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions
- The growth of an animal is controlled by factors including food intake
- Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules to support growth or to release energy

- Cellular respiration in animals involves chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon with oxygen to produce carbon dioxide and other materials

## Essential Questions

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- What is going on inside the student's body that is making her feel the way she does?
- Can we see anything inside the student that looks different?
- Why do molecules in the small intestine seem like they are disappearing?
- What happens to food molecules as they move through the small intestine and large intestine?
- Why do large food molecules, like some complex carbohydrates, seem to disappear in the digestive system?
- What happens to the different substances in food as it travels through the digestive system?
- What is the function of the digestive system and how is this student's digestive system different?
- What does the surface of her small intestine look like up close compared with a healthy one?
- How can a problem in one body system cause problems in other systems?
- Why is this student losing so much weight?
- What happens to matter when it is burned?
- Does this chemical reaction to burn food happen inside our bodies?
- How does a healthy body use food for energy and growth, and how is this student's body functioning differently?
- Do all animals do chemical reactions to get energy from food like humans?

## New Jersey Student Learning Standards (No CCS)

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SCI.MS-LS1-5	Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
SCI.MS-LS1-3	Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
SCI.MS-LS1-7	Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.
SCI.MS-PS1-1	Develop models to describe the atomic composition of simple molecules and extended structures.
SCI.MS-PS1-2	Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

## Interdisciplinary Connections

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LA.RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
MA.6.RP.A.3	Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

## Technology Standards

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TECH.8.1.8.A.2	Create a document (e.g., newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability.
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## 21st Century Themes/Careers

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CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.

## Instructional Strategies & Learning Activities

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Throughout this unit, students will:

- investigate data specific to this student's case in the form of doctor's notes, endoscopy images and reports, growth charts and micrographs
- plan and carry out investigations to test their ideas

Learning activities include:

- Exploring an anchoring phenomenon
- Creating an initial model
- Creating a Driving Question Board and an Ideas for Investigation chart
- Examining data (endoscopy report)
- Planning and conducting an investigation (dialysis tubing)
- Investigate food/waste data
- Map student's system to human body system
- Analyze weight data trends

- Conduct investigations to understand chemical reactions
- Develop models to explain metabolic reactions

## **Differentiated Instruction**

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Examples may include:

Inquiry/Problem-Based Learning

Learning preferences integration (visual, auditory, kinesthetic)

Sentence & Discussion Stems

Tiered Learning Targets

Meaningful Student Voice & Choice

Relationship-Building & Team-Building

Self-Directed Learning

LMS use

Student Data Inventories

Mastery Learning (feedback toward goal)

Grouping

Rubrics

Jigsaws

Assessment Design & Backwards Planning

Student Interest & Inventory Data

## **Formative Assessments**

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Include, but are not limited to:

- Initial models
- Driving Question Board
- Notebook checks
- Progress Trackers
- Scientists Circle discussions
- Peer Feedback rubrics

## **Summative Assessment**

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Scientific Explanation (Midpoint assessment)

Transfer task (final unit assessment): Students will apply understanding of phenomenon to a related phenomenon (investigating other animals).

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## **Benchmark Assessments**

Fall/Winter LinkIt Assessments

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## **Alternate Assessments**

Modifications to assessments based on IEP/504; alternate assessments may include oral explanations, scaffolded templates, digital choice for final model representations

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## **Resources & Technology**

Adapted from OpenSciEd unit: Metabolic Reactions

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## **BOE Approved Texts**

N/A

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## **Closure**

Individual classes and lessons will end with a closure activity that reinforces what students figured out during class, and helps navigate toward next steps.

Closure activities may include:

- Scientists' Circle
- Post-it reflection
- Google form exit ticket

- Group performance reflection
- Science notebook jot

## **ELL**

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- Alternate Responses
- Extended Time
- Teacher Modeling
- Simplified Written and Verbal Instructions
- Frequent Breaks
- Google Translate

## **Special Education**

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Accommodations will be made in accordance with students' IEPs. The following list provides examples:

- Shorten assignments to focus on mastery of key concepts.
- Substitute alternatives for written assignments (clay models, posters, panoramas, collections, etc.)
- Keep workspaces clear of unrelated materials.
- Provide a computer for written work.
- Seat the student close to the teacher or a positive role model.
- Provide an unobstructed view of the chalkboard, teacher, movie screen, etc.
- Keep extra supplies of classroom materials (pencils, books) on hand.
- Maintain adequate space between desks.
- Give directions in small steps and in as few words as possible.
- Number and sequence the steps in a task.
- Have student repeat the directions for a task.
- Provide visual aids.

- Go over directions orally.
- Allow the student to complete an independent project as an alternative test.
- Show a model of the end product of directions (e.g., a completed math problem or finished quiz).
- Stand near the student when giving directions or presenting a lesson.
- Mark the correct answers rather than the incorrect ones.
- Use a pass-fail or an alternative grading system when the student is assessed on his or her own growth.

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## **504**

Examples of accommodations in 504 plans include but are not limited to:

- preferential seating
- extended time on tests and assignments
- reduced homework or classwork
- verbal, visual, or technology aids
- modified textbooks or audio-video materials
- behavior management support
- verbal testing
- excused lateness, absence, or missed classwork
- pre-approved nurse's office visits and accompaniment to visits

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## **At Risk**

Examples may include:

- Have student restate information
- Provision of notes or outlines
- Concrete examples
- Assistance in maintaining uncluttered space

- Weekly home-school communication tools (notebook, daily log, phone calls or email messages)
- Peer or scribe note-taking
- Use of manipulatives
- No penalty for spelling errors or sloppy handwriting
- Follow a routine/schedule
- Teach time management skills
- Verbal and visual cues regarding directions and staying on task
- Adjusted assignment timelines
- Visual daily schedule
- Immediate feedback
- Work-in-progress check
- Pace long-term projects
- Preview test procedures
- Film or video supplements in place of reading text
- Pass/no pass option
- Cue/model expected behavior
- Use de-escalation strategies
- Use peer supports and mentoring
- Have parent sign homework/behavior chart

## **Gifted and Talented**

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Examples may include:

- Offer choice
- Speak to Student Interests
- Allow G/T students to work together
- Tiered learning



- Focus on effort and practice
- Encourage risk taking