Quiz Administration Instructions

1. Quizzes are aligned to each of the three module lessons (A, B, C). Administer them after completing the corresponding lesson or use it as a cumulative exam.
2. Questions are a mix of multiple-choice, short-response, true/false, short-essay, and design-based prompts.
3. Provide students with 20-25 minutes per quiz, depending on question type and depth. Can be tailored depending on how long each presentation takes.
4. Use student responses for formative assessment and discussion prompts in class.
5. Consider a group review of answers after submission to promote peer learning and reinforce content.
6. Lesson A short response and short essay do not have key words to lookout for, making it easier for students to gain points early on. Lesson B and C DO have key words to look out for, and should be more specific and detailed with their answers.

Question-Based Suggestions

1. The short essay questions are optional for the instructor to use and can be administered based on expectations.
2. True or false questions can be bonus questions or a normal question, depending on how much time the instructor has allotted for each quiz.
3. The design question should ideally be a requirement, since it should be encouraged to provide an assignment that can use critical thinking and problem solving, especially at the end of the module.
4. The design question can be an open note activity.
5. If the instructor decides to do a review of answers after submissions, encourage students to explain why incorrect answers were incorrect for participation.

Grading Rubric

Use this expectations rubric to assess short response, short essay, and design-based responses:

Criteria	Exceeds (3 pts)	Meets (2 pts)	Needs Improvement (1 pt)
Content Accuracy	Response demonstrates deep understanding with specific examples and accurate terminology.	Response addresses the question with mostly accurate content.	Response contains inaccuracies or lacks sufficient explanation.
Clarity & Organization	Response is clearly organized and easy to follow.	Response is mostly clear with minor lapses in structure.	Response is disorganized or difficult to interpret.
Use of Evidence/Data	Provides clear evidence or references to concepts discussed in class/maps/resources.	Some supporting detail or evidence is provided.	Little or no supporting evidence included.
Creativity/Insight (for design prompts)	Innovative, thoughtful, and feasible solutions with clear logic.	The solution is appropriate and meets basic requirements.	Lacks originality or feasibility; vague or incomplete solution.

Lesson A Quiz – Beyond the Trash: The Five Pathways of Food Waste
QUIZ LINKS:
>   [Module 2 Lesson A Quiz - Editor Link](#)
>   [Module 2 Lesson A Quiz - Responder Link](#)

Multiple Choice
Which of the following accurately describes organic waste?
    A. Only plastic and metal materials
    B. Non-recyclable glass and ceramics
    C. Biodegradable materials from plants or animals
    D. Synthetic chemicals and pesticides

What kind of emission is created when organic waste is left in landfills?
    A. Oxygen
    B. Nitrogen
    C. Carbon monoxide
    D. Methane

Managing organic waste sustainably can cut ___ emissions
    A. Greenhouse gas
    B. Noise pollution
    C. Light emissions
    D. Radioactive emissions

What percent of all food produced is never eaten?
    A. 40-50%
    B. 10-15%
    C. 25-30%
    D. 60-70%

What emissions does aerobic composting produce?
    A. CO2
    B. Methane
    C. Nitrous oxide
    D. Sulfur dioxide

Which is the correct process of biochar pyrolysis?
    A. Burning wet biomass in high oxygen
    B. Heating dried biomass in low oxygen
    C. Freezing biomass to remove moisture
    D. Mixing biomass with chemicals at room temperature

Second valorization:
    A. Discards all waste after the first use
    B. Only focuses on packaging products
    C. Uses the by-product of first valorization to create valuable output
    D. Converts raw materials directly into food without waste

True or False
Methane from rotting food warms the planet >25× faster than CO_2.

True

Short Answer
Briefly describe the 3 benefits of biochar pyrolysis.

Answer should:
- Describe the benefits of biochar (Hint: carbon vault, soil super sponge, microbe mansion)
- Be 3 sentences minimum

Sample Answer (Exceeds): Biochar has three main benefits for soil and the environment. First, it acts like a carbon vault by locking away a lot of carbon from plant waste for hundreds of years, helping fight climate change. Second, it works like a soil super-sponge that holds water and nutrients, so plants get more and less fertilizer washes away. Finally, its rough surface creates a microbe mansion where helpful microbes can live, which makes the soil healthier.

Short Essay
From Lesson A, recall Path 3, the Bokashi Fermentation method. Describe 3 qualities of the bokashi method, and 1 drawback.

Requirements:
- Describe 3 qualities of the bokashi method
- Describe 1 drawback of the bokashi method
- Be 4-5 sentences long.

Sample Answer (Exceeds): The bokashi method can handle many types of food waste, like meat, dairy, and cooked food, which some compost methods can't. It produces almost no greenhouse gases and doesn't smell rotten, but instead smells sour. The liquid from bokashi can be diluted and used as fertilizer to help plants grow. One drawback is that bokashi needs to be sealed airtight to work properly, or it won't ferment correctly. Also, after fermentation, the waste must be buried or composted so it can fully break down.

Relevant Vocabulary for short essay/response (Lesson A):
a. Landfill
b. Aerobic Composting
c. Anaerobic Digestion
d. Biochar Pyrolysis
e. Insect Bioconversion
f. Organic Waste
g. Methane
h. CO_2-equivalent
i. Nutrient Potential
j. Circular Economy

Lesson B Quiz – Carbon Math
QUIZ LINKS:

Multiple Choice

Despite no perfect solutions, why are these paths important?
    A. They guarantee zero waste instantly
    B. They make landfills produce electricity overnight
    C. They remove the need for any recycling programs
    D. They can close the landfill loop

When thinking about the ΔCO_2-eq, positive Δ means it:____
    A. Removes all greenhouse gases
    B. Adds pollution
    C. Has no impact on the environment
    D. Creates only oxygen

Landfill = ____ CO_2-eq per kg of orange peel
    A. +500 g
    B. +100 g
    C. +250 g
    D. +800 g

When thinking about the ΔCO_2-eq, negative Δ means it:____
    A. Increases greenhouse gases
    B. Has no effect on emissions
    C. Reduces pollution
    D. Only changes the temperature

Which of the following is easiest to set up with a low cost?
    A. Anaerobic digester
    B. Compost
    C. Biochar kiln
    D. Biogas refinery

True or False

Insects produce more usable protein than biochar.

True

Short Answer

Briefly explain the case study mentioned in Lesson B about transforming campus waste.

Answer should:
- Discuss what the case study utilized
- Explain how the methods described in the case study was able to create healthy plants
- Be 3 sentences minimum

Sample Answer (Exceeds): The case study in Lesson B showed how campus organic waste was turned into two useful products: bokashi and biochar. They used 10% bokashi and 10% biochar as fertilizer, which helped reduce the amount of regular fertilizer by half but still made citrus seedlings grow taller and germinate better.

Bokashi gave quick nutrients and good microbes to the soil, while biochar helped the soil hold water and nutrients, making plants healthier overall.

Design Prompt
If you were running a school that produced a certain amount of lunch waste, let's say around 40 kg, what types of paths would you use to reduce lunch waste? (Hint: Recall the campus scenario from Lesson B)

Requirements:
- Describe which paths you would use to reduce lunch waste
- Allocate how much waste could go towards your chosen methods
- Be 3-4 sentences minimum

Sample Answer (Exceeds): If my school made 40 kg of lunch waste each day, I would divide it into different uses so almost nothing goes to the landfill. About 25 kg could be composted for the school garden. Around 8 kg could go through a bokashi system and then be used to feed larvae for chicken or fish food. 5 kg of woody waste could be made into biochar for raised beds. The leftover 2 kg of fryer oil could be sent to a biodiesel co-op. This would help turn waste into plant food, animal feed, and fuel while keeping nearly 100% out of the landfill.

Relevant Vocabulary for short essay/response (Lesson B):
a. Renewable Energy
b. Emissions Avoided
c. Process Conditions
d. Compost
e. Biogas
f. Biochar
g. Fertilizer
h. Protein
i. Methane
j. Carbon Storage

Lesson C Quiz – Measuring Waste & Calculating CO₂ Impact
QUIZ LINKS:

Multiple Choice
What is the first step for measuring waste?
A. Estimating waste volumes
B. Calculating CO₂ emissions
C. Sorting waste by color
D. Measuring bin weight after collection

Use ____ to convert volume to mass.
A. Temperature (°C)
B. Surface area (m²)
C. Density (kg/L)
D. Pressure (Pa)

If mass per bin is 15 kg, and is emptied 3 times a week, what is the weekly waste total?
A. 30 kg/week
B. 50 kg/week
C. 60 kg/week
D. 45 kg/week

Which of the following is the correct formula for CO2-eq?
A. CO₂-eq = Mass of waste (kg) ÷ Emission factor
B. CO₂-eq-eq = Mass of waste (kg) × Emission factor (kg CO2-eq/kg waste)
C. CO₂-eq = Volume of waste (L) × Density (kg/L)
D. CO₂-eq = Emission factor × Temperature (°C)

What is the correct emission factor for food waste?
A. 0.9 kg CO₂-eq/kg
B. 2.5 kg CO₂-eq/kg
C. 3.2 kg CO₂-eq/kg
D. 1.9 kg CO₂-eq/kg

If the density of food waste is .5 kg/L, and bin volume is 30 L, what is the mass per bin?
A. 15 kg per bin
B. 10 kg per bin
C. 5 kg per bin
D. 30 kg per bin

Which of the following is NOT a method mentioned when estimating waste volumes?
A. Visual estimation
B. Counting bins
C. Weighing samples
D. Methodical estimation

Graph Question – Waste Measurement & CO₂ Impact
A cafeteria tracked its food waste for one week. The graph below shows the **total mass of waste (kg)** sent to three different pathways:

Pathway	Waste Mass (kg)	Emission Factor (kg CO_2-eq/kg)
Landfill	30	2.5
Compost	20	0.9
Anaerobic Digestion	10	0.5

The following 3 questions will use the table above

Question 1 (Multiple Choice)
Which pathway produced the **highest CO_2-eq emissions**?
a) Landfill
b) Compost
c) Anaerobic Digestion
d) All are equal

Question 2 (Short Answer)
Calculate the **CO_2-eq** for each pathway and the **total weekly emissions**. Show your work.
Landfill:
30kg waste x 2.5kg CO2-eq/kg = 75kg CO2-eq
Compost:
20kg waste x 0.9kg CO2-eq/kg = 18kg CO2-eq
Anaerobic digestion:
10kg waste x 0.5kg CO2-eq/kg = 5kg CO2-eq

Total = 75+18+5 = 98kg CO2-eq

Question 3 (Interpretation)
If the cafeteria wanted to cut its emissions in half, which pathway should it reduce first, and why? Write 2–3 sentences

Answer:
They should reduce waste going to the landfill, because it produces by far the largest share of emissions (75 out of 98 total). Shifting food waste from landfill to composting or anaerobic digestion would cut emissions the most effectively.

True or False
We don't need to know data when measuring waste, and can rely on guessing for solutions.

False

Short Answer
A cafeteria has a 30 L bin for food waste. The density of food waste is 0.5 kg/L. If the bin is emptied twice a week, what is the total weekly mass of waste?

Answer should:
- Show your work

Short Essay

Explain how to measure the amount of food waste a cafeteria makes in a week and how to figure out how much CO_2 it produces. Use an example with numbers in your answer. (Hint: Start with a bin that is <u>XX</u> liters and is emptied <u>XX</u> per week. From there, you can find your calculations. Recall that the density of food waste is 0.5 kg per liter.)

Requirements:
- Show your work
- Be 3 sentences minimum

Sample Answer (Exceeds): If the bin is 30 liters and is emptied twice a week, that's 30 L × 2 = 60 liters of waste per week. Turn the volume into mass using the density of food waste, which is 0.5 kg per liter. That means 30 L × 0.5 kg/L = 15 kg per bin. Since the bin is emptied twice, that's 15 kg × 2 = 30 kg per week. Then use the emission factor for food waste, which is 1.9 kg CO_2 per kg of waste. Multiply 30 kg × 1.9 = 57 kg CO_2 per week.

Relevant Vocabulary for short essay/response (Lesson C):
a. Circular Economy
b. Sustainable Development Goals (SDGs)
c. Waste Reduction
d. Resource Recovery
e. Pollution Prevention
f. Food Security
g. Job Creation
h. Responsible Consumption
i. Recycling
j. Reuse