

Name:

Date:

Class:

Engineering Analysis for Clean the Dirty Water (CER)

Worksheet **Answer Key**

Mission Context

You have designed and tested a filtration system to clean contaminated water from a nuclear power plant. Now, you must analyze your data to report your findings to the city.

Guiding Question

How does the choice and order of filtration materials affect the purity and volume of the recovered water?

Claim	Write a one-sentence statement that directly answers the Guiding Question based on your experiment. (Hint: Which material arrangement worked best, and why?) Student identifies that layering materials by pore size (largest pores on top, smallest on bottom) creates the most effective filter.
Evidence	Provide specific data (qualitative and quantitative) from your experiment to support your claim. Student explicitly states the change in clarity (e.g., "went from opaque brown to translucent yellow") and notes the pH change (e.g., "pH moved closer to neutral 7").
Reasoning	Explain <i>why</i> your evidence supports your claim. You must use scientific principles to explain how your filter worked in the experiment. Student explains that the dirty water is a heterogeneous mixture. They correctly identify that gravel/grass catches large debris, while sand/coffee filters catch small particles.
Extension	Discuss the trade-off between how <i>fast</i> the water flowed and how <i>clean</i> it got during the experiment.

Teacher Guide & Answer Key

1. Connection to Standards (NGSS)

- **HS-PS1-3:** Relates the bulk properties of matter (size, state) to the filtration method.
- **HS-ETS1-3:** Evaluates the solution based on criteria (cleanliness) and trade-offs (lost water volume/cost).

2. Common Student Misconceptions to Watch For:

- **Misconception:** "The filter made the dirty stuff disappear." -> **Correction:** Matter was not destroyed; it was separated. The solids are trapped in the filter media.
- **Misconception:** "More materials always equals better water." -> **Correction:** Too many materials might absorb all the water, leaving zero volume recovered (a poor engineering result).