

Appendix B: Water filter design brief, log, and rubric

Water Filter Design Brief

Challenge: Design and build a water filter that will remove both large and small particulates as well as diffused substances using the available materials. Think about what you need to accomplish this. What are you trying to remove from the water?

Criteria/Specifications: You are tasked with building a device that will remove large and small particles and diffuse material from a sample of water. The filter must:

1. Remove small particulate matter from the water OR
 Remove small particulate matter and some diffuse matter (better) OR
 Remove both small particulate matter and diffuse matter (best!).
2. Remove any large particulates from the water (rocks, leaves, twigs, etc)
3. Work repeatedly (more than once without getting clogged!)

During the design process, you must use your Design Log to:

1. Design, sketch, construct and test at least 2 prototypes.
2. Record your testing data.
3. Write a statement that justifies (using your data) the prototype selected for the final submission.

Resources: You will be given a \$275 budget for this project to buy your materials with.

Bottles - \$50 each	Cotton balls - \$25 each	Perlite - \$50 per bag	Soil - \$10 per bag
Sand - \$25 per bag	Pebbles - \$20 per bag	Charcoal - \$100 per bag	Tape - \$20 per strip
Peat moss - \$25 per bag			

Evaluation:

Criteria	Advanced (4)	Proficient (3)	Developing (2)	Beginning (1)
Design	Student sketched the design construction and shows good craftsmanship.	Student sketched the construction and the filter is constructed well.	Student did not sketch the construction and/or the filter does not work.	Student did not sketch the construction and the filter is not constructed.
Data	Filter can remove both particulate and diffuse matter.	Filter can remove all particulate and some diffuse matter.	Filter can remove particulate matter but not diffuse matter.	Filter allows both particulate and diffuse matter through.
Redesign	Student creates a second prototype filter that works much better than the first.	Student creates a second prototype filter that works slightly better than the first.	Student is unsuccessful in improving their original design.	Student does not attempt to improve their original design.
Justification	Student's justification is clearly reasoned and based on data.	Student's justification is based on data.	Student's justification is not clear or is not based on data.	Student does not write a justification.
Results of Agar Plate Photos	Student has recorded data from the agar plate photos and described how they analyzed the evidence to evaluate the	Student has recorded data and uses evidence from the agar plate photos to explain	Student's explanation is not based on evidence from the agar plate photos and/or the	Student did not record data and/or provide an explanation.

PARTICULATE MATTERS

Criteria	Advanced (4)	Proficient (3)	Developing (2)	Beginning (1)
	effectiveness of each method. The explanation uses the data gathered.	the effectiveness of each method.	recorded data is incomplete.	
Teacher Comments:				

Design Log

Stage 1: Brainstorming

Write down any ideas that you have about how to complete the challenge successfully. Include sketches and any materials you have in mind. You should have at least 3 different ideas before moving on.

List variables that you think you need to control for. How are you going to control these variables?

PARTICULATE MATTERS

Stage 2: Research

Find out what you need to know about this challenge. Write down questions you want to research (how to effectively control specific variables? What types of materials are best to use?). After you write down what you have learned, go back to Stage 1. In a **different color**, make any changes/additions to your original ideas.

PARTICULATE MATTERS

Stage 3: Design

Make drawings and list materials you will need to make your filter (don't forget to factor in the cost of the materials!)

After you have gone through **stage 4** and edited your designs above (in a **different color**), sketch the final version of your design here.

PARTICULATE MATTERS

Stage 4: Construction and Testing

Construct your design. Record the raw data from your trials. After each trial, write one suggestion in this section to improve your design. Then, go back to **stage 3** and make changes/additions to your design in a **different color**.

PARTICULATE MATTERS

Water Filter Justification

Name:

Group members:

On this page or an attached page, write a justification for your water filter design. The justification should:

- Tell me why you chose the design you did - what was your thinking? What did you think each different material would do (be specific)? Why did you put them in the order you did?
- Explain the results of both your first and second attempt - what happened (your data)? What else did you observe? Did it go the way you planned or did you get an unexpected result?
- Explain the changes you made between your first and second design (and possibly your third design). How did your results from the first test influence the changes you made?
- If your second design did not work as well as your first, explain why - what mistakes did you make when designing or constructing the second version of the filter? What would you have done instead for the next version?
- If it helps you explain your thinking, you can include diagrams of your filters. Please label the diagrams and the different layers of the filter.