Name: Date: Class:

Activity Follow-Up Questions Answer Key

Filter Design & Materials

1. Which materials in your filter helped the most to clean the water, and how can you tell?
Typically cotton, coffee filters, and sponge layers trap the most debris. Gravel and rice help with bulk filtration. Students should refer to clarity improvements in their results.

2. How did the order of your filter layers affect how well it worked?
Coarse materials at the top (gravel/rice), then finer materials near the bottom (cotton/coffee filter) usually improve clarity. Incorrect order can slow flow or allow sediment through.

(Follow-Up Q) How could we improve the design?
Common answers: Add more cotton, better layer compression, change order, increase neutralizer amount, or improve cap holes for improved flow.

Commented [BM1]: This is not in the follow-up questions doc - should it be added to that, or removed here? If adding it, renumber the questions in both documents so they are presented consistently.

Flow Rate & Speed

3. Was your flow rate too fast, too slow, or just right, and why does this matter?
Fast flow = poor filtration or poor neutralization. Slow flow = good filtration but takes too long. Ideal balance should be around the target ml/sec range.

Neutralization & pH

4. Did your filter raise the pH (make the water less acidic)? What data shows this?
Baking soda or antacid tablets should increase pH toward neutral. Evidence must come from recorded pH values before and after filtering.

5. Which neutralizing agent (baking soda or antacid tablets) worked better, and why?
Baking soda typically dissolves faster and neutralizes more strongly. Antacid works but more slowly due to being in tablet form.

(Follow-Up Q) How could we increase neutralization?
Add more neutralizer, crush antacid tablets to increase surface area (it should already be crushed, however), slow the flow rate, or improve mixing within the filter.

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Copper Corrosion & Real-World Impact

6. Did the filtered water cause the copper to corrode? What does this say about your filter?
If pH remains acidic, slight corrosion is expected. If pH improved, corrosion should not occur or be minimally noticeable.

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Data, Accuracy, & Improvements

7. Were your trials consistent? If not, what might have caused differences?

Inconsistent results may come from uneven pouring, inconsistent layer packing, measurement errors, or changes in material saturation.

8. How could you improve the accuracy of your measurements next time?

Use precise timing, consistent pouring height, better pH measurement tools, and repeat trials more carefully.

Engineering Reflection

9. How does this activity model real challenges environmental engineers face?

Engineers must design systems to treat polluted or acidic water, protect pipes, and ensure safe water quality. They do this by adjusting water pH, adding corrosion inhibitors, reducing acidity at treatment plants, and using protective pipe coatings.

10. What part of your filter worked best, and what would you improve in the future?

Students may cite clarity, pH change, or flow improvements. Accept any answer supported by data. Also mention any trade-offs that need to be considered, such as speed vs. clarity, neutralization vs. flow rate, material limits, bottle size, and staying within design constraints.