

Filter Test Faceoff

Use criteria, constraints, and evidence to judge a design.

7.2.D "evaluate experimental and engineering designs."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each design criterion, then circle the evidence that shows whether Design B meets each one. This will help you evaluate the design using evidence.

Choosing a Field Filter

- ① A community science team designed a gravity filter for muddy pond water used to wash field equipment, not to drink. Their criteria were water below 10 NTU of turbidity, a flow rate of at least 200 milliliters per minute, and safe use without leaks or tipping. Constraints limited the team to recycled bottles and materials costing less than \$12.
- ② To compare designs fairly, the team poured the same one-liter batch of muddy water into each filter from the same height. They measured cloudiness with a turbidity tube and timed the flow into a graduated container. Each design was tested three times, and the table shows the average results. All designs stayed within the cost constraint.

AVERAGE RESULTS FOR THREE FILTER DESIGNS

Design	Turbidity (NTU)	Flow Rate (mL/min)	Leak or Tip Test
A	18	260	Passed
B	7	210	Passed
C	5	110	Passed

- ③ Design B was strongest. It met both performance criteria, while A left water too cloudy and C flowed too slowly. For safety, the team filled each filter, ran it for five minutes, and applied a 2-newton sideways push. B did not leak or tip, so it met the safety criterion. They planned a repeat test with new muddy water.

2 ANSWER WITH EVIDENCE _____ Use the passage

1 How did using the same batch of water and the same starting height help the team compare the filters fairly?

2 Name one tool the team used and state what it measured.

3 Use the table and the criteria to explain why Design B is a stronger choice than Design C.

4 What safety-test evidence shows that Design B met the safety criterion?

3 YOUR TURN _____ Your own words

Plan how you would evaluate two bicycle phone-holder designs. Fill the three rows with two measurable criteria, including one safety criterion, and one constraint. For each row, state a test or measurement and the result that would count as success.

CRITERION OR CONSTRAINT	TEST OR MEASUREMENT	SUCCESS RESULT

PART 1 • READ AND MARK

Underline each design criterion, then circle the evidence that shows whether Design B meets each one. This will help you evaluate the design using evidence. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	How did using the same batch of water and the same starting height help the team compare the filters fairly?	It kept those conditions the same, so differences in results could be attributed to the filter designs.
2	Name one tool the team used and state what it measured.	A turbidity tube measured cloudiness. Accept: a graduated container and timing measured flow rate.
3	Use the table and the criteria to explain why Design B is a stronger choice than Design C.	B met the turbidity criterion at 7 NTU and the flow criterion at 210 mL/min. C met the turbidity criterion but failed the flow criterion because it flowed at only 110 mL/min.
4	What safety-test evidence shows that Design B met the safety criterion?	The team ran B for five minutes and gave it a 2-newton sideways push. It did not leak or tip.

PART 3 • YOUR TURN (SAMPLE ANSWER)

CRITERION OR CONSTRAINT	TEST OR MEASUREMENT	SUCCESS RESULT
Phone model stays secure, safety criterion	Put the same weighted phone model in each holder and shake each holder for 1 minute	The model does not fall or move more than 1 cm
Easy to attach	Time three students attaching the same phone model to each holder	Average attachment time is 30 seconds or less
Materials cost constraint	Add the prices of all materials used for each holder	Each holder costs \$10 or less

Accept equivalent evidence-based evaluations that correctly compare results to the stated criteria and constraints. For the open task, accept reasonable measurable criteria, a safety criterion, a constraint, and tests with clear success results.