

Challenge 2: Solution Guide

This question is very challenging. However, most students who are willing to persevere with the research should be able to construct a reasonable working model that mimics the motion of water in a wave action pool. Students will need to finetune their Internet research to find useful and understandable information about wave action pools. Research might also include contacting the designers or operators of such facilities.

As for Challenge 1, students should document their research.

Source of Information:	
Web Site Address	Comments
www.wavesltd.co.uk/prod02.htm	This Web site promotes the products of a company that designs and builds wave action pools.
www.essc.psu.edu/~arthur/waves.txt	This Web page is an article called “The Surf’s Up Somewhere — The Hows and Whys of Waves,” by M. A. Arthur.
www.antrimdesign.com/resume/waves.html	This Web page is an article called “Wave Action — How and Why Waves Behave as They Do,” by Jim Antrim.

Once students have collected information, they can start designing and constructing a working model. By working through this chapter, students should be able to model the wave motion for a pool with constant depth. And, for some students, this model will be the solution to the challenge.

Finding an algebraic model that represents the wave’s motion through the model pool is a significant theoretical extension of Chapter 5. A complete answer to this challenge might be an equation, found through research, and its graph.

CHAPTER 5: RUBRIC FOR CHALLENGE 2

Assessment Category	Scores and Criteria			
	Passable level of achievement – below provincial standard LEVEL 1	Moderate level of achievement – below, but approaching provincial standard LEVEL 2	High level of achievement – at provincial standard LEVEL 3	Very high to outstanding level of achievement – above provincial standard LEVEL 4
Knowledge and Understanding				
Performance of an algorithm by hand, mentally, or using technology	Some of algorithm developed but may contain inaccuracies.	Most of the algorithm for the constant end of the pool developed but may contain inaccuracies.	Algorithm for the constant end of the pool developed completely; most computations generally correct.	Algorithm for entire pool developed completely, accurately, and verified or supported.
Demonstration of understanding of a concept	The attempted solution demonstrates limited understanding of concept	The solution demonstrates some evidence of understanding of concept.	The solution demonstrates sufficient evidence to show understanding of the concept. The model shows the pneumatic effect that produces the initial wave and the resulting shape of the wave as it encounters a shallowing of the wave action pool.	The detailed solution demonstrates thorough understanding of concept

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CHAPTER 5: RUBRIC FOR CHALLENGE 2 (continued)

Assessment Category	Scores and Criteria			
	Passable level of achievement – below provincial standard LEVEL 1	Moderate level of achievement – below, but approaching provincial standard LEVEL 2	High level of achievement – at provincial standard LEVEL 3	Very high to outstanding level of achievement – above provincial standard LEVEL 4
Thinking, Inquiry, Problem Solving				
Formulation and defence of hypothesis/conjecture	A hypothesis is created but variables may be identified incorrectly and/or insufficient links are made to problem	A hypothesis is created but connection to variables and/or problem is weak	Variables and constants of the initial wave action identified correctly and the effect of the shallowing of the pool on the wave action hypothesized.	The clearly expressed hypothesis relates given variables to the context of the problem
Creation of a model (algebraic, graphical, geometric, physical, technological) to solve a problem	The student uses a model or plan that addresses few aspects of the problem.	The student uses a model or plan that addresses some aspects of the problem.	The student uses an appropriate plan. The design of the actual model should be based on accurate research. The working model should reflect the design, and the algebraic model should reflect most of the concepts available to students after studying chapter 5.	- The student uses an appropriate plan that integrates all aspects of the problem. - The algebraic model reflects the change in depth of the pool.
Selection and sequencing of a variety of tools and strategies to solve a problem	The student elects a few appropriate tools and uses these to make a limited attempt to solve the problem	The student selects some appropriate tools and uses these to solve some of the problem	The student chooses appropriate tools and uses these to solve most of the problem. Research — using the Internet, in an external scientific library, or by visiting a wave action pool and talking to the operator — will likely be the most valuable tool to preparing for the task.	The student chooses appropriate tools and incorporates these in execution of a plan to solve problem and verify solution.
Justification of reasoning and/or conclusion	Reasoning is evident but lacks consistency.	Reasoning is evident and logical in parts of the problem.	Reasoning is logical and consistent within context.	Reasoning is logical and consistent and relates to broader context.
Making conclusions and inferences	The conclusions are somewhat connected with the student's solution but are unsupported.	The conclusions are consistent with the student's solution but are not fully supported.	The conclusions are supported by evidence and integrate aspects of the problem.	The conclusions are supported, integrate all aspects of the problem, and are convincing.

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