## PERFORMANCE ASSESSMENT TEMPLATE

V2.18.14

1	<b>Project Title: (</b> Discipline - Course - Competency # - Title)	Science - Physical Science - 608 - Roller Coaster Physics		
2 Purpose (General Task Description)		You are a mechanical engineer ( <u>http://education-portal.com/mechanical_engineer.html</u> ) working with a roller coaster design team to design a new thrill ride for a local amusement park. Your job is to create the initial design for the ride. Your design will take into account safety and cost. You will create a scale drawing of your design and present your design to the chief operating officer of the amusement park.		
		kinetic energy. Engineers need to analyze and understand how physics will affect a rider throughout the course of a ride. This task will allow you to explore physics concepts while designing a new roller coaster for an amusement park.		
3	<b>Prerequisites</b> (list course prerequisites, if any, not competency level prerequisites)	none		
4	Competency	Student will demonstrate an understanding of motion, forces and energy by using lab data to differentiate among the various forms of energy, describing the relationship between work and power, and by constructing a machine that identifies types of energy used and how energy is transformed from one form to another. <i>Suggested wording:</i> Student will demonstrate a <i>conceptual</i> understanding of <i>work, power,</i> and energy, by <i>designing</i> a machine and identifying types of energy used and how energy is transformed from one form to another.		



5	Competency Analysis blue = skills red - content	Student will demonstrate a conceptual understanding of work, power, and energy by designing a machine that identifies types of energy used and how energy is transformed from one form to another.		
6	Competency Analysis - numbered list	<ol> <li>work, power, and energy</li> <li>types of energy</li> <li>how energy is transformed</li> </ol>		
7	Discussion Based Assessments	<ol> <li>How is work determined?</li> <li>What is the relationship between work and power?</li> <li>Identify 3 forms of potential energy and 3 forms of kinetic energy.</li> <li>Describe a scenario when you could use energy but not do any work.</li> <li>What does it mean that energy is conserved during an energy transformation?</li> <li>Think of a device you use every day and explain how energy is transformed within it.</li> </ol>		
8	Task 1 Title	Work, Energy, and Power		
9	Purpose (formerly overview)	As background research for your own design, you will learn about the energy involved in motion. You will also explore the law of conservation of energy and energy transformations.		
10	Directions (formerly steps)	By enrolling in this project, you're on your way to becoming an independent learner which will continue to become an increasingly valuable skill as technology continues to increase the rate of change in our society. Before you begin to conduct searches on the Internet we recommend that you review the following links which provide methods and techniques for conducting successful searches. Click here for tips on effective internet searches and click on this link for information on evaluating the quality and accuracy of internet resources.		





12	Deliverables	<ul> <li>Your written research notes along with a works cited page</li> <li>Progress Review Meeting</li> </ul>
13	Specifications	<ul> <li>Research Notes and Works Cited <ul> <li>Are clear, neat, and well-organized</li> <li>Contain an outline of what you've learned</li> <li>List important vocabulary with definitions</li> <li>Contain a list of questions about what you've learned</li> <li>Are typed using a word processing program or handwritten, scanned, and saved as a PDF file</li> <li>Include a separate works cited page, using MLA formatting <ul> <li><u>Click here to review MLA formatting</u></li> <li>Task Specific Criteria: <ul> <li>o</li> </ul> </li> <li>Progress Review Meeting</li> <li>Use your instructor's scheduling calendar to set up a meeting</li> <li>Task Specific Criteria: <ul> <li>o</li> </ul> </li> </ul></li></ul></li></ul>
14	Technology or supplies required	none
15	Task 2 Title (if needed)	Roller Coaster Design and Safety
16	Purpose (formerly overview)	In this section, you will learn how roller coasters work, how they are designed, and how riders are kept safe.



17	Directions (formerly steps)	If this task requires additional research, please click here [insert link to Task 1 specifications] for notetaking guidelines.			
		1. Use provided resources along with other independent research to learn about roller coasters.			
		<ul> <li>2. Be sure you investigate:</li> <li>How a roller coaster works:</li> <li>How physics is used in roller coaster design and operation</li> <li>How roller coasters keep riders safe</li> </ul>			
		How a roller coaster works: http://science.howstuffworks.com/engineering/structural/roller-coaster.htm http://www.learner.org/interactives/parkphysics/coaster.html			
		Roller coaster physics: http://www.glencoe.com/sec/science/webquest/content/rollercoast.shtml			
		Roller Coaster Design Games: https://games.ciconline.org/CoasterCrafter/default.aspx http://puzzling.caret.cam.ac.uk/game.php?game=roller			
		Scientific investigation of roller coaster safety: http://defendingscience.org/sites/default/files/upload/Exponent_AmusementPark.pdf			
		3. Use your research to develop a list of design and safety elements you would need to consider when designing a roller coaster.			
		4. Send your list to your instructor.			
18	Duration (1 week = ~7 hrs)	1 week			
19	Deliverables	A list of design and safety elements to consider when designing a roller coaster			

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20	Specifications	List <ul> <li>Includes a title and your name</li> <li>Is typed in complete sentences, double spaced, and in 12-point font</li> <li>Is organized logically</li> <li>Is fluid, focused, and consistent</li> <li>Contains creative uses of your vocabulary</li> <li>Uses a clear, compelling, and engaging writing voice</li> <li>Possesses a clearly defined purpose</li> <li>Is appropriate for your intended audience</li> <li>Uses correct grammar, capitalization, punctuation, and spelling</li> <li>Uses relevant and accurate information</li> <li>Properly cites all sources of information using MLA formatting</li> <li>Click here to review MLA formatting</li> <li>Task Specific Criteria:</li> <li>Is one page in length</li> </ul>			
21	Technology or supplies required	Contains explanations written in your own words			
22	Task 3 Title (if needed)	Design Your Own Coaster			
23	Purpose (formerly overview)	You will use your list of design and safety elements to design your own roller coaster. You will use computer-aided design software to create a scale model of your roller coaster. You will present your model to the chief operating officer of the amusement park.			
24	Directions (formerly steps)	If this task requires additional research, please click here [insert link to Task 1 specifications] for notetaking guidelines.			



1 2 3 0 4 5 6 7 8		<ol> <li>Brainstorm some ideas for an exciting new roller coaster for your favorite amusement park.</li> <li>Sketch out some of the top ideas to explore how the coaster might be organized.</li> <li>Use your list of design elements and information from your research to select specific components of your roller coaster.</li> <li>Make a final paper and pencil drawing of your chosen design.</li> <li>Include labels of heights, grades and angles, and other important measurements.</li> <li>Select a (free) computer-assisted design (CAD) software from those available for download.</li> <li>Use the CAD program to create a scale drawing of your roller coaster design.</li> <li>Make sure that all measurements are represented correctly and labeled appropriately</li> <li>Prepare an oral presentation of your roller coaster design. You will need to talk about:         <ul> <li>why you designed your roller coaster as you did</li> <li>how your roller coaster takes advantage of physics concepts</li> <li>how you are ensuring that your roller coaster is safe</li> </ul> </li> </ol>		
25	Duration (1 week = ~7 hrs)	1 week		
26	Deliverables	<ul> <li>Computer-generated scale drawing of your roller coaster design</li> <li>Oral presentation of your roller coaster design</li> <li>Discussion Based Assessment</li> </ul>		
27	Specifications	<ul> <li>Roller Coaster Design Drawing</li> <li>Is detailed, clear, and easy to understand</li> <li>Includes easily identifiable labels</li> <li>Includes a title and your name</li> <li>Is created using paper and pencil and then scanned, or by using computer software</li> <li>Displays appropriately sized text that is concise and easy to read</li> <li>Uses color, white space, and visuals appropriately to make your work visually appealing</li> <li>Is appropriate for your intended audience</li> </ul>		

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	<ul> <li>Uses correct grammar, capitalization, punctuation, and spelling</li> <li>Uses relevant and accurate information</li> <li>Properly cites all sources of information using MLA formatting         <ul> <li><u>Click here to review MLA formatting</u></li> </ul> </li> <li>Task Specific Criteria:         <ul> <li>Is drawn to scale</li> <li>Uses computer-assisted design software</li> </ul> </li> </ul>
	<ul> <li>Oral Presentation</li> <li>You exhibit professionalism during your presentation by: <ul> <li>Varying your speaking volume appropriately (avoid monotone)</li> <li>Avoiding filler words (such as "umm" and "uhhh")</li> <li>Enunciating</li> <li>Using appropriate emphasis and pause</li> <li>Using consistent pacing (not too fast or too slow)</li> <li>Using correct grammar</li> <li>Not reading the text directly off your slides</li> <li>Dressing appropriately for a business audience</li> <li>Exuding proper body language: <ul> <li>Standing up straight</li> <li>Facing the audience with an open, welcoming stance</li> <li>Maintaining direct eye contact</li> <li>Avoiding crossing your arms</li> <li>Displaying confidence and enthusiasm</li> </ul> </li> </ul></li></ul>
	<ul> <li>Displaying an excellent working knowledge of material</li> </ul>

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		<ul> <li>Being fully prepared to answer questions from audience</li> <li>Practicing your presentation in advance</li> <li>Task Specific Criteria:         <ul> <li></li></ul> </li> </ul>
28 Technology or supplies required		<ul> <li>A free, downloadable computer-assisted design (CAD) program, such as TigerCad or DeltaCad</li> <li>A presentation program such as Prezi or Powerpoint or Google Presentation</li> </ul>

## PACE CHART

	Week #	Week of:	Deliverables
21	1		<ul> <li>Written research notes and works cited page</li> <li>Progress review meeting with your instructor</li> </ul>
22	2		A list of design and safety elements to consider when designing a roller coaster
23	3		<ul> <li>Computer-generated scale drawing of your roller coaster design</li> <li>Oral presentation of your roller coaster design</li> <li>Discussion Based Assessment</li> </ul>
24	4		

	(Copy from row 6)	Exceeds	Competent	Approaching	Notes
25		a. I can examine a system's use of power and suggest	a. I can accurately explain the relationship among work, power,	a. I can define and give examples of work, power,	

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	work, power, and	improvements for energy efficiency	and energy	and energy	
	energy				
26	types of energy	a. I can discuss how an object can have several types of energy at one time and how those energies can be changing.	a. I can explain how gravitational potential energy and kinetic energy are transformed from one to the other	<ul> <li>a. I can use the gravitational potential energy formula to calculate potential energy</li> <li>b. I can use the kinetic energy formula to calculate kinetic energy</li> <li>c. I can give examples of specific forms of energy</li> </ul>	Specific forms of energy might include electrical, mechanical, thermal, light, sound, chemical
27	energy transformations	a. I can discuss how and why every energy transformation decreases the amount of energy available to do work	a. I can examine an unfamiliar system and deduct how it uses and changes energy to produce useful work	a. I can describe how energy changes from one form to another within a common energy system like a battery- powered flashlight	
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## **STANDARDS & CROSS-CUTTING COMPETENCIES ALIGNMENT**

32	Cross-cutting competencies - see <u>http:///goo.gl/w3h185</u> , rows 2-82, column E. For exampe: problem forumlation, research, communication, etc.	Problem Formation Interpretation Communication
33	Common Core State Standards - see http://www.corestandards.org/the- standards	CCSS.ELA-Literacy.SL.9-10.4 Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
34	National Standards other than ELA or Mathematics (list source)	Next Generation Science Standards: HS-PS3-3 Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.
35	Grade Level Expectations: see <u>http://</u>	S:PS2:11:3.1 Explain that all energy can be considered to be either kinetic energy, potential