



California College Preparatory Academy

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Phone: (510) 658-2900

December 1, 2006

Dear Parents and Families,

As we approach 2007 and the horizon to Grade 9, it is time for the 8th Grade students to begin their exhibition project. This project fulfills California Science Standards on Force and Motion. The project will be worked on both at home and in school. We will be devoting approximately 100 minutes per week across subjects to focus on this project.

The science exhibition is a requirement for promotion to 9th Grade. Detailed information will be made available at the ASC/CAL Prep Community Association Parent Meeting on Saturday, December 9, 2006 from 9:00 AM to 12:00 PM.

The students will be creating a Rube Goldberg Contraption where they use three energy transfers (kinetic and potential in at least two different forms) and complete the contraption circuit to an end of NO motion. Students will be required to research the principles of force and motion, construct and test their contraption and make necessary adjustments to fulfill the requirements of the project prior to the oral presentation to a panel. Once they have done the research they must create a series of sketches which clearly demonstrate adjustments for testing.

I will be teaching lessons that build and develop the skills necessary for this project throughout the months of January and February. During winter break, students will begin the first step of their project by starting on research which may include the attached sources.

I am looking forward to seeing the ***final presentations during March 2007.***

Thank you in advance for your support on this project.

Respectfully,

Ms. Natalie Berkowitz

Grade 8 Physical Science Exhibitions

Room 202/Ms. Berkowitz

The topic for **Grade 8 Physical Science Exhibitions** is to create a contraption using **potential energy and kinetic energy** to move a marble through a maze.

Students have had and will continue to have class lectures and labs on the topic as related to the California State Science Standards for Grade 8. Students will have at least ten days of class time (between Science and Language Arts) to do research as well as a couple months to do research after school, during weekends and during vacation to go to libraries and bookstores and use the internet. Students are encouraged to continue researching and rewriting their project up until presentation as they will be making alterations throughout the project and this is what scientists do in the real world.

Students will prepare a display board, give an oral presentation to a panel of judges and answer questions. Exhibitions take place in March 2007. Exhibition practice will start the second half of February 2007.

Students will be required to explain in great detail the following concepts through their understanding of the Grade 8 California State Standards for Physical Science:

Force and Motion

Energy to create force and motion is used to do everything in the physical world and is related to all the ways in which the human body works. It is important to know how energy is used (food intake, gasoline, nuclear, solar, wind), how energy transfers create a loss of energy during transformation and how it impacts our lives, all the time. There are many social implications related to energy use and health.

Students will be expected to know and explain/demonstrate their understanding of the following Grade 8 California State Standards. Words in **BOLD** vocabulary used in class and for this project. There may be additional vocabulary added for individual students based on the needs of their contraption.

California Science Standards Grade 8

- I. The **velocity** of an object is the **rate** of change of its position. As a basis for understanding this concept:
 - a. Students know **position** is defined in relation to some choice of a standard **reference point** and a set of reference directions.
 - b. Students know that **average speed** is the total **distance** traveled divided by the total time elapsed and that the speed of an object along the path traveled can vary.
 - c. Students know how to solve problems involving distance, **time**, and average speed.
 - d. Students know the **velocity** of an object must be described by specifying both the **direction** and the **speed** of the **object**.
 - e. Students know changes in velocity may be due to changes in speed, direction, or both.
 - f. Students know how to **interpret graphs** of position versus time and graphs of speed versus time for **motion** in a **single direction**.

- II. **Unbalanced forces** cause changes in velocity. As a basis for understanding this concept:
 - a. Students know a **force** has both direction and **magnitude**.
 - b. Students know when an object is subject to two or more forces at once, the result is the **cumulative effect** of all the forces.
 - c. Students know when the forces on an object are **balanced**, the motion of the object does not change.
 - d. Students know how to identify separately the two or more forces that are acting on a single **static** object, including **gravity**, **elastic forces** due to **tension** or **compression** in **matter**, and **friction**.
 - e. Students know that when the forces on an object are unbalanced, the object will change its velocity (that is, it will **speed up**, **slow down**, or change direction).
 - f. Students know the **greater the mass** of an object, the **more force** is needed to achieve the same rate of change in motion.

- III. Each of the more than 100 **elements of matter** has distinct **properties** and a distinct atomic structure. All forms of matter are composed of one or more of the elements. As a basis for understanding this concept:
 - d. Students know the **states of matter (solid, liquid, gas)** depend on **molecular motion**.
 - e. Students know that in solids the atoms are closely locked in position and can only vibrate; in liquids the atoms and molecules are more loosely connected and can collide with and move past one another; and in gases the atoms and molecules are free to move independently, colliding frequently.

California Science Standards Grade 8

- IV. **Chemical reactions** are processes in which atoms are rearranged into different combinations of molecules. As a basis for understanding this concept:
- Students know chemical reactions usually **liberate heat energy** or **absorb heat energy**.
 - Students know **physical processes** include **freezing** and **boiling**, in which a material changes form with no **chemical reaction**.
- VIII. All objects experience a **buoyant force** when **immersed** in a fluid. As a basis for understanding this concept:
- Students know **density** is mass per unit of **volume**.
 - Students know how to calculate the density of substances (**regular and irregular solids and liquids**) from measurements of mass and volume.
 - Students know the buoyant force on an object in a fluid is an **upward force** equal to the weight of the fluid the object has **displaced**.
 - Students know how to **predict** whether an object will **float or sink**.
- IX. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands of science, students should develop their own questions and perform **investigations**. Students will:
- Plan** and **conduct** scientific investigation to test a **hypothesis**.
 - Evaluate** the **accuracy** and **reproducibility** of **data**.
 - Construct appropriate **graphs** from data and develop **quantitative** statements about the **relationships between variables**.
 - Apply simple mathematical relationships to determine a missing quantity in a **mathematic expression**, given the two remaining terms (including **speed=distance/time, density=mass/volume, force= pressure X area, volume= area X height**).
 - Distinguish between **linear and non-linear** relationships on a graph of data.

Schoolwide Exhibitions

Grade 8: Science

Quality of a Social Entrepreneur #1: PERSONAL RESPONSIBILITY

	Exceeding the Standard	Meeting the Standard	Approaching the Standard	Emerging Competency	No Evidence
Be Punctual <i>Attendance/tardies</i>	Student is present, on time and has supplies and materials ready to go before the scheduled time to begin.	Student is present and on time, and has supplies and materials ready to go.	Student is present, arrives late but quickly begins the presentation upon arrival.	Student is late and disorganized and loses time in beginning the presentation.	

Quality of a Social Entrepreneur #2: SOCIAL RESPONSIBILITY

	Exceeding the Standard	Meeting the Standard	Approaching the Standard	Emerging Competency	No Evidence
Build Community <i>Community Interactions</i>	Student is dressed professionally and neatly, greets the panel confidently, and clearly establishes a professional and manner and attitude.	Student is dressed appropriately, greets the panel, and expresses a professional manner and attitude.	Student is dressed casually, is uncomfortable with the panel, and carries him/herself in a less than professional manner	Student is dressed inappropriately, makes inappropriate comments, and behaves in an unprofessional manner.	

Quality of a Social Entrepreneur #3: CRITICAL AND CREATIVE THINKING

	Exceeding the Standard	Meeting the Standard	Approaching the Standard	Emerging Competency	No Evidence
Connect <i>Make connections and implications</i>	Student makes deep connections between his work and himself, his community AND the world.	Student makes deep connections between her work and either herself, his/her community OR the world.	Student makes surface connections between his work and either himself, his community or the world.	Student needs to make connections between her work and either herself, his/her community or the world.	
<i>For This Exhibition It Means</i>	Student presents a clear, thoughtful answer that makes the panel think about the topic in a new way.	Student clearly and thoughtfully answers the "Connection Question."	Student makes some connection to him/herself and world, but parts of the answer are unclear.	Student struggles to answer the "Connection Question."	

Quality of a Social Entrepreneur #4: APPLICATION OF KNOWLEDGE

	Exceeding the Standard	Meeting the Standard
Understand Content	Student clearly and confidently explains and demonstrates 3 of the standards listed below:	Student explains and demonstrates the 3 required standards for their topic listed below:

<p>CA Science Standards</p>	<p>I. The velocity of an object is the rate of change of its position. As a basis for understanding this concept:</p> <ul style="list-style-type: none"> a. Students know position is defined in relation to some choice of a standard reference point and a set of reference directions. b. Students know that average speed is the total distance traveled divided by the total time elapsed and that the speed of an object along the path traveled can vary. c. Students know how to solve problems involving distance, time, and average speed. d. Students know the velocity of an object must be described by specifying both the direction and the speed of the object. e. Students know changes in velocity may be due to changes in speed, direction, or both. f. Students know how to interpret graphs of position versus time and graphs of speed versus time for motion in a single direction. <p>II. Unbalanced forces cause changes in velocity. As a basis for understanding this concept:</p> <ul style="list-style-type: none"> a. Students know a force has both direction and magnitude. b. Students know when an object is subject to two or more forces at once, the result is the cumulative effect of all the forces. c. Students know when the forces on an object are balanced, the motion of the object does not change. d. Students know how to identify separately the two or more forces that are acting on a single static object, including gravity, elastic forces due to tension or compression in matter, and friction. e. Students know that when the forces on an object are unbalanced, the object will change its velocity (that is, it will speed up, slow down, or change direction). f. Students know the greater the mass of an object, the more force is needed to achieve the same rate of change in motion. <p>III. Each of the more than 100 elements of matter has distinct properties and a distinct atomic structure. All forms of matter are composed of one or more of the elements. As a basis for understanding this concept:</p> <ul style="list-style-type: none"> d. Students know the states of matter (solid, liquid, gas) depend on molecular motion. e. Students know that in solids the atoms are closely locked in position and can only vibrate; in liquids the atoms and molecules are more loosely connected and can collide with and move past one another; and in gases the atoms and molecules are free to move independently, colliding frequently. <p>IV. Chemical reactions are processes in which atoms are rearranged into different combinations of molecules. As a basis for understanding this concept:</p> <ul style="list-style-type: none"> c. Students know chemical reactions usually liberate heat energy or absorb heat energy. d. Students know physical processes include freezing and boiling, in which a material changes form with no chemical reaction. <p>VIII. All objects experience a buoyant force when immersed in a fluid. As a basis for understanding this concept:</p> <ul style="list-style-type: none"> a. Students know density is mass per unit of volume. b. Students know how to calculate the density of substances (regular and irregular solids and liquids) from measurements of mass and volume. c. Students know the buoyant force on an object in a fluid is an upward force equal to the weight of the fluid the object has displaced. d. Students know how to predict whether an object will float or sink.
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IX.

Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands of science, students should develop their own questions and perform investigations. Students will:

a. Plan and conduct scientific investigation to test a hypothesis.

b. Evaluate the accuracy and reproducibility of data.

e. Construct appropriate graphs from data and develop quantitative statements about the relationships between variables.

f. Apply simple mathematical relationships to determine a missing quantity in a mathematic expression, given the two remaining terms (including $\text{speed} = \text{distance}/\text{time}$, $\text{density} = \text{mass}/\text{volume}$, $\text{force} = \text{pressure} \times \text{area}$, $\text{volume} = \text{area} \times \text{height}$).

g. Distinguish between linear and non-linear relationships on a graph of data.

Quality of a Social Entrepreneur #5: EFFECTIVE COMMUNICATION

	Exceeding the Standard	Meeting the Standard	Approaching the Standard	Emerging Competency	No Evidence
Present Ideas Visually	Student present key ideas in vivid, clear and unique manner.	Student present key ideas in vivid, clear manner.	Student presents key ideas.	Student needs to clarify the key ideas to present and determine how best	

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<p><i>For this Exhibition It Means</i></p>	<p>All of the elements listed under meeting, the standard plus:</p> <ul style="list-style-type: none"> ● 3D models AND/ OR ● Innovative use of color AND/OR ● Visual representations/photographs/film in addition to the display board 	<p>Clear presentation of all of the following elements:</p> <ul style="list-style-type: none"> ● Calculations of required elements ● Graphs are neatly drawn (rules and compasses clearly used) ● Specific CA 8th Grade Standards demonstrated clearly and identified ● All drawings and pictures have title/captions 	<p>Unclear presentations of 1-2 of the following elements; or missing 1 of the following elements:</p> <ul style="list-style-type: none"> ● Calculations of required elements ● Graphs are neatly drawn (rules and compasses clearly used) ● Specific CA 8th Grade Standards demonstrated clearly and identified ● All drawings and pictures have title/captions 	<p>to present those ideas.</p> <p>Unclear presentation of 3-4 of the following elements; or missing 2 or more of the following elements:</p> <ul style="list-style-type: none"> ● Calculations of required elements ● Graphs are neatly drawn (rules and compasses clearly used) ● Specific CA 8th Grade Standards demonstrated clearly and identified ● All drawings and pictures have title/captions 	
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Present Ideas Orally	<p>Student's eloquence and passion come across with his/her eye contact, body language, and voice.</p> <p>Student clearly, confidently, and thoroughly answers all the panel's questions.</p>	<p>Student uses appropriate eye contact, body language, and voice throughout presentation.</p> <p>Student clearly and confidently answers all the panel's questions.</p>	<p>Student at times uses appropriate eye contact, body language, and/or voice.</p> <p>Student answers the panel's questions, though could answer with more confidence or clarity.</p>	<p>Student needs to use appropriate eye contact, body language, and/or voice.</p> <p>Student struggles to answer the panel's questions.</p>	
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Electronic Research Resources

Rube Goldberg

www.rube-goldberg.com/

[http://en.wikipedia.org/wiki/Rube Goldberg](http://en.wikipedia.org/wiki/Rube_Goldberg)

video.google.com/videoplay?docid=8926325136071596338

rube.iscool.net/

<http://www.youtube.com/watch?v=JD8P4fE8Yn0>

<http://www.youtube.com/watch?v=l5vIPK50bTE>

<http://www.youtube.com/watch?v=LLRYo4V3HB8>

<http://www.youtube.com/watch?v=pcmd5AFIxZ0>

www.rube-goldberg.com/ please see About Rube and Artwork Gallery

<http://cre.ations.net/creation/sticks-and-stones>

<http://cre.ations.net/creation/food-reaction>

www.marquette.edu/engineering/pages/Rube/

news.uns.purdue.edu/html4ever/2005/050305.Rube05.localwin.html

www.jsd.k12.ak.us/ab/el/simplemachines.html

www.manhattanusersguide.com/archives_content.php?contentID=110106&category=info

pbskids.org/zoom/games/goldburgertogo/

<http://www.carnegiesciencecenter.org/default.aspx?pageId=70>

www.pbs.org/saf/1208/teaching/teaching3.htm

www.coe.berkeley.edu/labnotes/0102history.html

Force and Motion

http://www.en.wikipedia.org/wiki/Motion_%28physics%29

http://www.en.wikipedia.org/wiki/Newton%27s_laws_of_motion

school.discovery.com/lessonplans/programs/forcesandmotion/

classroom.jc-schools.net/sci-units/force.htm

www.bbc.co.uk/schools/scienceclips/ages/10_11/forces_action.shtml

sciencespot.net/Pages/kdzphysics.html

www.le.ac.uk/se/centres/sci/selfstudv/fam.htm

www.phy6.org/stargaze/Snewton.htm

www.pen.k12.va.us/Div/Stafford/qves/classrooms/sipple/forceandmotion.html It takes the roller coaster a bit of time to load, however, it is well worth the wait!

library.thinkquest.org/10796/ch5/ch5.htm

www.leqoeducation.com/content/item.aspx?CategoryID=132&art=30

www.practicalphysics.org/go/Topic_3.html

www.keystone.fi.edu/cc_fm/

www-bioc.rice.edu/precollege/k_12resources/Force%20and%20Motion%20Websites.htm

www.physics-net.com/force/sf500.htm

Books

Rube Goldberg: Inventions!

by [Maynard Frank Wolfe](#)

ISBN: 0684867249

Chain Reaction: Rube Goldberg and Contemporary Art

by [Ian Berrv](#), [Lawrence Raab](#), [Linda Sherer](#), [Rube Goldberg](#)

ISBN: 0970879008

Gizmos & Gadgets: Creating Science Contraptions That Work (& Knowing Why)

by [Jill Frankel Hauser](#), [Michael Kline](#)

ISBN: 1885593260

Eyewitness: Force & Motion

by [Peter Lafferty](#)

ISBN: 0789448823

"Whatever"

Frigits Deluxe

ASIN: B00004TXLR (see Amazon.com)

January 2007

► means "continue with last set of instructions EVERY DAY"
 Grades will be given for note cards with bibliography, drafts of research paper and contraption diary in Science and Language Arts.
 Grades will be given for drawings of contraptions, materials, testing and construction of contraption in Science.

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
1 ►	2 ►	3 ►	4 ►	5 ►	6 ►	7 ►
8 ►	9 *Minimum of 30 note cards on force and motion due 1/9/07. *Parents and students need to visit library and/or bookstores. * Students must draw three possible contraptions and begin to collect materials to make contraption. Due 1/9/07.	10 *Begin draft of Research Paper on Force and Motion in Science. *Student needs to continue work on building, testing and writing diary about contraption at home.	11 * Teacher check in on materials and testing contraption. *Student needs to continue work on building, testing and writing diary about contraption at home.	12 *Student needs to continue work on building, testing and writing diary about contraption at home.	13 ►	14 ►
15 ►	16*Check in with teacher on draft of research paper, construction and testing of contraption, writing of diary. *Student needs to continue work on building, testing and writing diary about contraption at home.	17 ►	18 ►	19 * Draft of Research Paper on Force and Motion due to Science (to be graded in Language Arts also)	20 *Student needs to continue work on building, testing and writing diary about contraption at home.	21 ►
22 ►	23 * Project Diary draft paper due.	24 ►	25 ►	26 * 2nd Draft of Force and Motion Research Paper Due.	27 ►	28 ►
29 ►	30 ►	31 ►				

February 2007

▶ means "continue with last set of instructions EVERY DAY"

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
			1 *Student needs to continue work on building, testing and writing diary about contraption at home.	2 ▶	3 ▶	4 ▶
5 ▶	6 ▶	7 ▶	8 ▶	9 ▶	10 ▶	11 ▶
12 ▶	13 ▶	14 * Contraption due at school for testing demo.	15	16 * Project diary 3 due	17 *Student needs to make final adjustments on building, testing and writing diary about contraption at home.	18 ▶
19 ▶	20 ▶	21 ▶	22 ▶	23 * Project Reflection due	24 *Student needs to make final adjustments on building, testing and writing diary about contraption at home.	25 ▶
26 ▶	27 ▶	28 ▶				

March 2007

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
					1 2 *First draft of presentation speech due (speech cards).	3 ▶	4 ▶
5 * Final draft reflection due		6 * Student should work on speech cards.	7 * Final speech cards for presentation due.	8	9	10	11
12	13 *Presentation Practice in Science and Language Arts.	14 *Presentation Practice in Science and Language Arts.	15 *Presentation Practice in Science and Language Arts.	16 *Presentation Practice in Science and Language Arts.	17	18	
19	20 EXHIBITIONS BEGIN	21	22	23	24	25	
26	27	28	29	30	31		