

Roller Coaster Standards and Benchmarks, Grades 6-12:

Primary Subject(s)

Content of Science

Standard 1

**Content of Science Standard 1 5-8 2**

**Content of Science Standard 1 5-8 2 i** (6th Grade)

identify various types of energy (e.g., heat, light, mechanical, electrical, chemical, nuclear);

**Content of Science Standard 1 5-8 2 iii** (6th Grade)

know that there are many forms of energy transfer, but the total amount of energy is conserved (i.e., that energy is neither created nor destroyed);

**Content of Science Standard 1 5-8 2 ii** (8th Grade)

know that kinetic energy is a measure of the energy of an object in motion and potential energy is a measure of an object's position or composition, including transformation of gravitational potential energy of position into kinetic energy of motion by a falling object;

**Content of Science Standard 1 5-8 3**

**Content of Science Standard 1 5-8 3 i** (6th Grade)

know that every object exerts gravitational force on every other object, dependent on the masses and distance of separation (e.g., motions of celestial objects, tides);

**Content of Science Standard 1 5-8 3 ii** (6th Grade)

know that gravitational force is hard to detect unless one of the objects (e.g., earth) has a lot of mass;

**Content of Science Standard 1 5-8 3 i** (8th Grade)

know that there are fundamental forces in nature (e.g., gravity, electromagnetic forces, nuclear forces);

**Content of Science Standard 1 5-8 3 iii** (8th Grade)

analyze the separate forces acting on an object at rest or in motion (e.g., gravity, elastic forces, friction), including how multiple forces reinforce or cancel one another to result in a net force that acts on an object;

**Content of Science Standard 1 5-8 3 vii** (8th Grade)

know that an object's motion is always described relative to some other object or point (i.e., frame of reference);

**Content of Science Standard 1 5-8 3 viii (8th Grade)**

understand and apply Newton's laws of motion: objects in motion will continue in motion, and objects at rest will remain at rest, unless acted upon by an unbalanced force (inertia). If a greater force is applied to an object, a proportionally greater acceleration will occur; if an object has more mass, the effect of an applied force is proportionally less.

**Content of Science Standard 1 9-12 2**

**Content of Science Standard 1 9-12 2 i (9<sup>th</sup>-12<sup>th</sup> Grade)**

identify different forms of energy, including kinetic, gravitational (potential), chemical, thermal, nuclear and electromagnetic;

**Content of Science Standard 1 9-12 2 iii (9<sup>th</sup>-12<sup>th</sup> Grade)**

understand that energy can change from one form to another (e.g., changes in kinetic and potential energy in a gravitational field, heats of reaction, hydroelectric dams) and know that energy is conserved in these changes;

**Content of Science Standard 1 9-12 3**

**Content of Science Standard 1 9-12 3 ii (9<sup>th</sup>-12<sup>th</sup> Grade)**

know that every object exerts gravitational force on every other object and describe how this force depends on the masses of the objects and the distance between them;

**Content of Science Standard 1 9-12 3 viii (9<sup>th</sup>-12<sup>th</sup> Grade)**

apply Newton's laws to describe and analyze the behavior of moving objects, including: displacement, velocity and acceleration of a moving object, Newton's second law ( $F = ma$ ), e.g., momentum and its conservation, the motion of an object falling under gravity, the independence of a falling object's motion on mass); circular motion and centripetal force;

Scientific Thinking and Practice

Standard 1

**Scientific Thinking and Practice Standard 1 5-8 1**

**Scientific Thinking and Practice Standard 1 5-8 2**

**Scientific Thinking and Practice Standard 1 9-12 1**

Secondary Subject(s)

Mathematics

Standard 2

**Mathematics Standard 2 5-8 3**

**Mathematics Standard 2 5-8 3 i (6th Grade)**

Develop and use mathematical models to represent and justify mathematical relationships found in a variety of situations.

**Mathematics Standard 2 9-12 1**

**Mathematics Standard 2 9-12 1 viii**

Solve formulas for specified variables.

**Mathematics Standard 2 9-12 3**

**Mathematics Standard 2 9-12 3 i**

Model real-world phenomena using linear equations and linear inequalities, interpret resulting solutions and use estimation to detect errors.

Content of Science

Standard 1

**Content of Science Standard 1 5-8 2**

**Content of Science Standard 1 5-8 3**

**Content of Science Standard 1 9-12 2**

**Content of Science Standard 1 9-12 3**

Scientific Thinking and Practice

Standard 1

**Scientific Thinking and Practice Standard 1 5-8 1**

**Scientific Thinking and Practice Standard 1 5-8 2**

**Scientific Thinking and Practice Standard 1 9-12 1**