



# Straw Rockets

This unit contains lessons that will give students a chance to practice the engineering design process and have a better understanding of STEM by using straw rockets. Lessons are written for 5<sup>th</sup> through 12<sup>th</sup> grades.

All supplies needed for the lessons are provided in the trunk, including master copies of worksheets, data sheets, etc. Class sets will need to be printed by the teacher prior to the lesson.

**Straw Rockets Master TEKS Alignment Grades 5 – 12**

**§112.16. Science, Grade 5, Adopted 2017**

(2) Scientific investigation and reasoning. The student uses scientific methods during laboratory and outdoor investigations. The student is expected to:

- (A) describe, plan, and implement simple experimental investigations testing one variable;
- (B) ask well-defined questions, formulate testable hypotheses, and select and use appropriate equipment and technology;
- (C) collect and record information using detailed observations and accurate measuring;
- (D) analyze and interpret information to construct reasonable explanations from direct observable evidence;
- (E) demonstrate that repeated investigations may increase the reliability of results;
- (F) communicate valid conclusions in both written and verbal forms; and
- (G) construct appropriate simple graphs, tables, maps, and charts using technology, including computers, to organize, examine, and evaluate information.

(3) Scientific investigation and reasoning. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to:

- (A) analyze, evaluate, and critique scientific explanations by using evidence, logical reasoning, and experimental and observational testing.

(6) Force, motion, and energy. The student knows that energy occurs in many forms and can be observed in cycles, patterns, and systems. The student is expected to:

- (D) design a simple experimental investigation that tests the effect of force on an object.

**§112.18. Science, Grade 6, Adopted 2017**

(2) Scientific investigation and reasoning. The student uses scientific practices during laboratory and field investigations. The student is expected to:

- (A) plan and implement comparative and descriptive investigations by making observations, asking well defined questions, and using appropriate equipment and technology;
- (B) design and implement experimental investigations by making observations, asking well defined questions, formulating testable hypotheses, and using appropriate equipment and technology;
- (C) collect and record data using the International System of Units (SI) and qualitative means such as labeled drawings, writing, and graphic organizers;
- (D) construct tables and graphs, using repeated trials and means, to organize data and identify patterns; and
- (E) analyze data to formulate reasonable explanations, communicate valid conclusions supported by the data, and predict trends.

(3) Scientific investigation and reasoning. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions and knows the contributions of relevant scientists. The student is expected to:

- (A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;
- (B) use models to represent aspects of the natural world such as a model of Earth's layers;
- (C) identify advantages and limitations of models such as size, scale, properties, and materials; and

- (8) Force, motion, and energy. The student knows force and motion are related to potential and kinetic energy. The student is expected to:
- (A) compare and contrast potential and kinetic energy;
  - (B) identify and describe the changes in position, direction, and speed of an object when acted upon by unbalanced forces;
  - (C) calculate average speed using distance and time measurements;
  - (D) measure and graph changes in motion;

**§112.19. Science, Grade 7, Adopted 2017**

- (2) Scientific investigation and reasoning. The student uses scientific practices during laboratory and field investigations. The student is expected to:
- (A) plan and implement comparative and descriptive investigations by making observations, asking well defined questions, and using appropriate equipment and technology;
  - (B) design and implement experimental investigations by making observations, asking well defined questions, formulating testable hypotheses, and using appropriate equipment and technology;
  - (C) collect and record data using the International System of Units (SI) and qualitative means such as labeled drawings, writing, and graphic organizers;
  - (D) construct tables and graphs, using repeated trials and means, to organize data and identify patterns; and
  - (E) analyze data to formulate reasonable explanations, communicate valid conclusions supported by the data, and predict trends.
- (3) Scientific investigation and reasoning. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions and knows the contributions of relevant scientists. The student is expected to:
- (A) analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, so as to encourage critical thinking by the student;
  - (C) identify advantages and limitations of models such as size, scale, properties, and materials.

**§112.20. Science, Grade 8, Adopted 2017.**

- (2) Scientific investigation and reasoning. The student uses scientific practices during laboratory and field investigations. The student is expected to:
- (A) plan and implement comparative and descriptive investigations by making observations, asking well defined questions, and using appropriate equipment and technology;
  - (B) design and implement experimental investigations by making observations, asking well defined questions, formulating testable hypotheses, and using appropriate equipment and technology;
  - (C) collect and record data using the International System of Units (SI) and qualitative means such as labeled drawings, writing, and graphic organizers;
  - (D) construct tables and graphs, using repeated trials and means, to organize data and identify patterns; and
  - (E) analyze data to formulate reasonable explanations, communicate valid conclusions supported by the data, and predict trends.
- (3) Scientific investigation and reasoning. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions and knows the contributions of relevant scientists. The student is expected to:

- (A) analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, so as to encourage critical thinking by the student.
- (6) Force, motion, and energy. The student knows that there is a relationship between force, motion, and energy. The student is expected to:
- (A) demonstrate and calculate how unbalanced forces change the speed or direction of an object's motion;
  - (B) differentiate between speed, velocity, and acceleration; and
  - (C) investigate and describe applications of Newton's three laws of motion such as in vehicle restraints, sports activities, amusement park rides, Earth's tectonic activities, and rocket launches.

**§112.39. Physics (One Credit), Adopted 2017.**

- (2) Scientific processes. The student uses a systematic approach to answer scientific laboratory and field investigative questions. The student is expected to:
- (D) design and implement investigative procedures, including making observations, asking well defined questions, formulating testable hypotheses, identifying variables, selecting appropriate equipment and technology, evaluating numerical answers for reasonableness, and identifying causes and effects of uncertainties in measured data;
  - (G) make measurements with accuracy and precision and record data using scientific notation and International System (SI) units;
  - (H) organize, evaluate, and make inferences from data, including the use of tables, charts, and graphs;
  - (I) communicate valid conclusions supported by the data through various methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports; and
  - (J) express relationships among physical variables quantitatively, including the use of graphs, charts, and equations.
- (3) Scientific processes. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:
- (A) analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, so as to encourage critical thinking by the student;
- (4) Science concepts. The student knows and applies the laws governing motion in a variety of situations. The student is expected to:
- (B) describe and analyze motion in one dimension using equations and graphical vector addition with the concepts of distance, displacement, speed, average velocity, instantaneous velocity, frames of reference, and acceleration;
  - (D) calculate the effect of forces on objects, including the law of inertia, the relationship between force and acceleration, and the nature of force pairs between objects using methods, including free-body force diagrams.