

# Correlation to Hawaii Content and Performance Standards: Physical Science and Inquiry

## Foundations of Physical Science with Earth and Space Science

### Student Text and Investigation Manual

| Standard #:                      | Content Standard            | Grade Level | Benchmark  | student text | detail  | investigation | detail  |
|----------------------------------|-----------------------------|-------------|--|--------------|---|---------------|---|
| I.01.01<br>Science as<br>Inquiry | Doing Scientific<br>Inquiry | 9 - 12      | Develop and clarify questions and hypotheses that guide scientific investigations. | 7            | experimentation begins with a question  | 6             | how do we ask questions and get answers from nature?        |
|                                  |                             |             |  | 9            | steps in the scientific method  | 6             | predict which car will move fastest                         |
|                                  |                             |             |  | 10           | the research question and hypothesis  | 7             | test the effect of one other variable                       |
|                                  |                             |             |  | 10           | forming a hypothesis  | 7             | compare results with hypothesis                             |
|                                  |                             |             |  | 19           | design your own experiment  | 7             | perform your own experiment                                 |
|                                  |                             |             |  | 19           | design your own experiment  | 7             | design your own experiment                                  |
|                                  |                             |             |  | 42           | devise an experiment  | 9             | devise a hypothesis   |
|                                  |                             |             |  | 429          | why haven't we run out of water   | 9             | design three experiments using car and ramp                 |
|                                  |                             |             |  | 434          | what is in your tap water   | 10            | conduct car/ramp experiment                                 |
|                                  |                             |             |  | 437          | what is acid rain   | 16            | investigate Newton's 2nd law                                |
|                                  |                             |             |  | 441          | why are oceans salty  | 16            | decide how to vary the force on the car for this experiment |
|                                  |                             |             |  | 448          | describe steps you would take to determine whether pH affects frog population | 26            | what variables can be changed?                              |
|                                  |                             |             |  | 451          | what is temperature   | 27            | think about the variables                                   |
|                                  |                             |             |  | 456          | asking questions pertaining to specific heat and heat flow                    | 34            | where does the marble move the fastest?                     |
|                                  |                             |             |  | 472          | why is Earth's atmosphere different from other planets                        |               |   |
|                                  |                             |             |  | 473          | why do ears pop   |               |   |

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|-------------|------------------|-------------|-----------|--------------|--|---------------|---|
|             |                  |             |           | 492          | why does Earth have seasons                | 34            | investigate motion on a rollercoaster   |
|             |                  |             |           | 501          | how does rain form                         | 43            | how did A and B tapes acquire different charge?                                     |
|             |                  |             |           | 509          | how do animals survive in the desert       | 75            | investigate variables that affect the period of a pendulum                          |
|             |                  |             |           | 515          | what is a carbon sink                      |               |   |
|             |                  |             |           | 530          | proving hypotheses for sea-floor spreading | 75            | perform self-designed experiment  |
|             |                  |             |           | 534          | why doesn't Earth get bigger and bigger    | 75            | plan three experiments to determine which variable affects the period of a pendulum |
|             |                  |             |           | 580          | form a hypothesis (#7)                     |               |   |
|             |                  |             |           | 588          | what causes eclipses                       |               |   |
|             |                  |             |           | 621          | is Pluto a planet                          | 75            | design pendulum experiment  |
|             |                  |             |           |              |  | 151           | explain how hypothesis compares to results  |
|             |                  |             |           |              |  | 151           | design experiment to find out if mass is conserved                                  |
|             |                  |             |           |              |  | 151           | perform the experiment you designed   |
|             |                  |             |           |              |  | 170           | which method will give fastest dissolving rate?                                     |
|             |                  |             |           |              |  | 170           | devise hypothesis and explain   |
|             |                  |             |           |              |  | 170           | which factor will produce fastest dissolving rate?                                  |
|             |                  |             |           |              |  | 170           | what three factors influence dissolving rate?                                       |

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|             |                  |             |           |              |        | 170           | devise hypothesis and explain  |
|             |                  |             |           |              |        | 182           | formulate hypothesis   |
|             |                  |             |           |              |        | 182           | simulating the effect of acid rain on daphnia  |
|             |                  |             |           |              |        | 188           | conducting investigation of efficiency of immersion heater                             |
|             |                  |             |           |              |        | 193           | conducting experiments on heat transfer  |
|             |                  |             |           |              |        | 205           | investigating how specific heat of water regulates Earth's temperature                 |
|             |                  |             |           |              |        | 208           | formulate a hypothesis about why the seasons occur                                     |
|             |                  |             |           |              |        | 208           | testing hypothesis of why seasons occur against your observations in the investigation |
|             |                  |             |           |              |        | 233           | identifying how the earthquake model represents an earthquake                          |
|             |                  |             |           |              |        | 237           | develop a research plan for studying volcanoes   |

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|----------------------------------|-----------------------------|-------------|---|--------------|--|---------------|---|
| I.01.02<br>Science as<br>Inquiry | Doing Scientific<br>Inquiry | 9 - 12      | Design and<br>conduct scientific<br>investigations to<br>test hypotheses. | 7            | experimentation begins<br>with a question  | 7             | compare results with<br>hypothesis                                |
|                                  |                             |             |   | 9            | steps in the scientific<br>method  | 7             | perform your own<br>experiment                                    |
|                                  |                             |             |   | 10           | forming a hypothesis   | 7             | design your own<br>experiment                                     |
|                                  |                             |             |   | 19           | design your own<br>experiment  | 9             | design three experiments<br>and choose equipment                  |
|                                  |                             |             |   | 19           | design your own<br>experiment  | 9             | design three experiments<br>and choose technology                 |
|                                  |                             |             |   | 42           | devise an experiment   | 9             | design three experiments<br>using car and ramp                    |
|                                  |                             |             |   | 288          | find the thickness of a<br>single card   | 9             | conduct three<br>experiments with<br>appropriate equipment        |
|                                  |                             |             |   | 448          | describe steps you would<br>take to determine<br>whether pH affects frog<br>population | 10            | conduct car/ramp<br>experiment                                    |
|                                  |                             |             |   |              |  | 10            | selecting ramp and<br>photogates                                  |
|                                  |                             |             |   |              |  | 12            | select equipment and set<br>up experiment                         |
|                                  |                             |             |   |              |  | 16            | investigate Newton's 2nd<br>law                                   |
|                                  |                             |             |   |              |  | 16            | decide how to vary the<br>force on the car for this<br>experiment |
|                                  |                             |             |   |              |  | 26            | what variables can be<br>changed?                                 |
|                                  |                             | 30          | rigging block and tackle  |              |  |               |   |

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|             |                  |             |           |              |        | 34            | investigate motion on a rollercoaster   |
|             |                  |             |           |              |        | 40            | choose circuit parts to light a bulb  |
|             |                  |             |           |              |        | 75            | plan three experiments to determine which variable affects the period of a pendulum |
|             |                  |             |           |              |        | 75            | perform self-designed experiment  |
|             |                  |             |           |              |        | 75            | design pendulum experiment  |
|             |                  |             |           |              |        | 145           | plan a procedure and select necessary equipment                                     |
|             |                  |             |           |              |        | 145           | carry out procedure and select equipment  |
|             |                  |             |           |              |        | 151           | plan procedures and select materials  |
|             |                  |             |           |              |        | 151           | select materials from list  |
|             |                  |             |           |              |        | 151           | design experiment to find out if mass is conserved                                  |
|             |                  |             |           |              |        | 170           | which factor will produce fastest dissolving rate?                                  |
|             |                  |             |           |              |        | 170           | what three factors influence dissolving rate?                                       |
|             |                  |             |           |              |        | 178           | visit local water supply and perform testing  |
|             |                  |             |           |              |        | 182           | simulating the effect of acid rain on daphnia                                       |

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|-------------|------------------|-------------|-----------|--------------|--------|---------------|---|
|             |                  |             |           |              |        | 188           | conducting investigation of efficiency of immersion heater                                    |
|             |                  |             |           |              |        | 193           | conducting experiments on heat transfer   |
|             |                  |             |           |              |        | 194           | design and construct an aneroid barometer   |
|             |                  |             |           |              |        | 198           | making qualitative observations of the amount of ozone present in the school environment      |
|             |                  |             |           |              |        | 205           | investigating how specific heat of water regulates Earth's temperature                        |
|             |                  |             |           |              |        | 209           | measuring the intensity of light using an electric meter and solar cell and light bulb        |
|             |                  |             |           |              |        | 233           | identifying how the earthquake model represents an earthquake                                 |
|             |                  |             |           |              |        | 237           | develop a research plan for studying volcanoes  |
|             |                  |             |           |              |        | 252           | identifying the parts of a refracting telescope and making observations of the moon's surface |

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| I.01.03<br>Science as<br>Inquiry | Doing Scientific<br>Inquiry | 9 - 12      | Organize, analyze, validate and display data/information in ways appropriate to scientific investigations, using technology and mathematics. | 24           | making a graph                                      |               |  |
|                                  |                             |             |  | 26           | creating graphs                                     |               |  |
|                                  |                             |             |  | 41           | make a graph  |               |  |
|                                  |                             |             |  | 42           | interpreting distance/time graph                    | 6             | compare results with other groups                          |
|                                  |                             |             |  | 42           | analyze a speed/distance graph                      | 9             | construct a data table                                     |
|                                  |                             |             |  | 459          | heat equation                                       | 11            | graph speed vs. position                                   |
|                                  |                             |             |  | 485          | what percentage comes from this source? (problem 4) | 11            | analyze speed change of car                                |
|                                  |                             |             |  | 543          | determining distance to an epicenter                | 11            | calculate % error  |
|                                  |                             |             |  | 547          | average density (#5)                                | 12            | understand and use data table                              |
|                                  |                             |             |  | 547          | what explains the difference in density? (#5)       | 13            | graph distance vs. time                                    |
|                                  |                             |             |  | 605          | how big is Earth?                                   | 15            | construct a quantitative graphical model                   |
|                                  |                             |             |  | 618          | average distance from the sun                       | 17            | record results in data table                               |
|                                  |                             |             |  | 645          | inverse square law                                  | 18            | study data table for relationship between force and motion |
|                                  |                             |             |  |              |   | 18            | organize different combinations of data                    |
|                                  |                             |             |  |              |   | 21            | think about percent change                                 |
|                                  |                             | 24          | use data table to record results   |              |   |               |  |
|                                  |                             | 25          | analyze block and tackle data  |              |   |               |  |

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|-------------|------------------|-------------|-----------|--------------|--------|---------------|--|
|             |                  |             |           |              |        | 25            | create a mathematical model                    |
|             |                  |             |           |              |        | 27            | use data table to record results               |
|             |                  |             |           |              |        | 27            | find math rule for lever equilibrium           |
|             |                  |             |           |              |        | 27            | analyze lever equilibrium data                 |
|             |                  |             |           |              |        | 28            | derive a math formula                          |
|             |                  |             |           |              |        | 30            | record ropes and pulley data in table          |
|             |                  |             |           |              |        | 35            | does data support hypothesis?                  |
|             |                  |             |           |              |        | 36            | organize data into a table                     |
|             |                  |             |           |              |        | 37            | organize data into a graph of speed vs. height |
|             |                  |             |           |              |        | 45            | did battery voltage change?                    |
|             |                  |             |           |              |        | 51            | graph voltage vs. current                      |
|             |                  |             |           |              |        | 75            | create data table for self-designed experiment |
|             |                  |             |           |              |        | 76            | analyze pendulum data                          |
|             |                  |             |           |              |        | 76            | calculate % error                              |
|             |                  |             |           |              |        | 121           | graph mass vs. volume                          |
|             |                  |             |           |              |        | 147           | students analyze chemical change lab results   |

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|-------------|------------------|-------------|-----------|--------------|--------|---------------|---|
|             |                  |             |           |              |        | 147           | organize observations into a category table                         |
|             |                  |             |           |              |        | 151           | does your experiment agree with law of conservation of mass?        |
|             |                  |             |           |              |        | 151           | design a data table   |
|             |                  |             |           |              |        | 171           | average dissolving rate   |
|             |                  |             |           |              |        | 171           | use data table for observations                                     |
|             |                  |             |           |              |        | 181           | organize water quality data into a table                            |
|             |                  |             |           |              |        | 185           | constructing a graph of drops of acid vs pH                         |
|             |                  |             |           |              |        | 187           | construct a graphical model   |
|             |                  |             |           |              |        | 187           | find equation for trend line  |
|             |                  |             |           |              |        | 189           | construct a temperature vs. time graph                              |
|             |                  |             |           |              |        | 197           | calculating error between your barometer and a commercial barometer |
|             |                  |             |           |              |        | 197           | constructing a graph from atmospheric pressure data                 |
|             |                  |             |           |              |        | 199           | importance of good record keeping in order to avoid error           |
|             |                  |             |           |              |        | 203           | graphing water and ice temperature readings                         |

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|             |                  |             |           |              |        | 206           | constructing a graph of time vs. temperature       |
|             |                  |             |           |              |        | 231           | evaluating your completed bathymetric map          |
|             |                  |             |           |              |        | 247           | evaluate your ability to interpret rock formations |
|             |                  |             |           |              |        | 257           | inverse square law                                 |

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|----------------------------------|-----------------------------|-------------|--|--------------|---|---------------|--|
| I.01.04<br>Science as<br>Inquiry | Doing Scientific<br>Inquiry | 9 - 12      | Formulate scientific explanations and conclusions and models using logic and evidence. | 24           | making a graph                                  | 13            | graph distance vs. time  |
|                                  |                             |             |  | 24           | interpretations of patterns in data             | 15            | construct a quantitative graphical model                         |
|                                  |                             |             |  | 26           | creating graphs                                 | 15            | interpret a speed vs. time graph                                 |
|                                  |                             |             |  | 27           | reading a graph                                 | 21            | construct reasonable explanation based on data                   |
|                                  |                             |             |  | 41           | make a graph                                    | 21            | think about percent change                                       |
|                                  |                             |             |  | 42           | interpreting distance/time graph                | 25            | create a mathematical model                                      |
|                                  |                             |             |  | 78           | analyze lever diagram                           | 27            | find math rule for lever equilibrium                             |
|                                  |                             |             |  | 459          | heat equation                                   | 28            | derive a math formula  |
|                                  |                             |             |  | 476          | atmospheric pressure at various altitudes graph | 35            | study data and determine importance of height on speed of marble |
|                                  |                             |             |  | 645          | inverse square law                              | 37            | organize data into a graph of speed vs. height                   |
|                                  |                             |             |  | 645          | apparent brightness vs. distance graph          | 45            | analyze data and explain a rule                                  |
|                                  |                             |             |  | 651          | use the diagram to answer the questions (#4)    | 51            | graph voltage vs. current  |
|                                  |                             |             |  | 651          | arrange the items in the table (#3)             | 121           | graph mass vs. volume  |
|                                  |                             |             |  | 651          | use the diagram to answer the questions (#2)    | 147           | organize observations into a category table                      |
|                                  |                             |             |  |              |   | 151           | does your experiment agree with law of conservation of mass?     |

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|-------------|------------------|-------------|-----------|--------------|--------|---------------|--|
|             |                  |             |           |              |        | 185           | constructing a graph of drops of acid vs pH  |
|             |                  |             |           |              |        | 187           | find equation for trend line   |
|             |                  |             |           |              |        | 187           | construct a graphical model  |
|             |                  |             |           |              |        | 189           | construct a temperature vs. time graph   |
|             |                  |             |           |              |        | 197           | constructing a graph from atmospheric pressure data                                  |
|             |                  |             |           |              |        | 203           | graphing water and ice temperature readings  |
|             |                  |             |           |              |        | 206           | constructing a graph of time vs. temperature   |
|             |                  |             |           |              |        | 217           | determining relationship between temperature of the atmosphere and relative humidity |
|             |                  |             |           |              |        | 218           | interpreting Doppler radar images  |
|             |                  |             |           |              |        | 231           | evaluating your completed bathymetric map  |
|             |                  |             |           |              |        | 237           | finding a pattern of volcanoes on a bathymetric map                                  |
|             |                  |             |           |              |        | 247           | evaluate your ability to interpret rock formations                                   |
|             |                  |             |           |              |        | 257           | inverse square law   |

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|----------------------------------|-----------------------------|--------------------|--|---------------------|------------------------|----------------------|---|
| I.01.05<br>Science as<br>Inquiry | Doing Scientific<br>Inquiry | 9 - 12             | Communicate and<br>defend scientific<br>explanations and<br>conclusions. | 20                  | explain your reasoning | 9                    | present conclusions to<br>the class                           |
|                                  |                             |                    |  |                     |                        | 9                    | reporting on an<br>experiment                                 |
|                                  |                             |                    |  |                     |                        | 37                   | describe the flow of<br>energy based on<br>experimental graph |
|                                  |                             |                    |  |                     |                        | 39                   | give a brief presentation<br>to the class                     |
|                                  |                             |                    |  |                     |                        | 47                   | present and defend an<br>explanation                          |
|                                  |                             |                    |  |                     |                        | 145                  | present findings and<br>methods used                          |
|                                  |                             |                    |  |                     |                        | 145                  | present findings to the<br>class                              |
|                                  |                             |                    |  |                     |                        | 151                  | present results to the<br>class                               |
|                                  |                             |                    |  |                     |                        | 179                  | create water quality report                                   |
|                                  |                             |                    |  |                     |                        | 181                  | write paragraph to<br>explain results                         |
|                                  |                             |                    |  |                     |                        | 183                  | write summary of findings                                     |

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|----------------------------------|-----------------------------|--------------------|---|---------------------|---|----------------------|---|
| I.01.06<br>Science as<br>Inquiry | Doing Scientific<br>Inquiry | 9 - 12             | Identify and<br>analyze alternative<br>explanations and<br>conclusions and<br>models. | 20                  | finding variability in data                                     | 6                    | predict which car will<br>move fastest                            |
|                                  |                             |                    |   | 79                  | look at force data and<br>decide the usefulness of<br>a machine | 7                    | test the effect of one<br>other variable                          |
|                                  |                             |                    |   | 524                 | Kelvin's calculations of<br>Earth's age                         | 9                    | devise a hypothesis   |
|                                  |                             |                    |   |                     |   | 18                   | use data to describe<br>relationship between<br>force and motion  |
|                                  |                             |                    |   |                     |   | 19                   | use data to infer correct<br>relationship between<br>variables    |
|                                  |                             |                    |   |                     |   | 27                   | think about the variables   |
|                                  |                             |                    |   |                     |   | 30                   | interpret block and tackle<br>data                                |
|                                  |                             |                    |   |                     |   | 34                   | where does the marble<br>move the fastest?                        |
|                                  |                             |                    |   |                     |   | 39                   | analyze energy<br>transformations in<br>different scenarios       |
|                                  |                             |                    |   |                     |   | 43                   | how did A and B tapes<br>acquire different charge?                |
|                                  |                             |                    |   |                     |   | 75                   | investigate variables that<br>affect the period of a<br>pendulum  |
|                                  |                             |                    |   |                     |   | 77                   | compare law of<br>conservation of energy to<br>motion of pendulum |
|                                  |                             |                    |   |                     |   | 141                  | build models of Na and<br>Cl and use them to<br>explain bonding   |

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|             |                  |             |           |              |        | 151           | do the data support the hypothesis   |
|             |                  |             |           |              |        | 151           | explain how hypothesis compares to results   |
|             |                  |             |           |              |        | 151           | perform the experiment you designed  |
|             |                  |             |           |              |        | 170           | devise hypothesis and explain  |
|             |                  |             |           |              |        | 171           | what was happening at molecular level?   |
|             |                  |             |           |              |        | 182           | making hypotheses and testing them against observations                                |
|             |                  |             |           |              |        | 185           | analyzing the results of the buffered acid experiment                                  |
|             |                  |             |           |              |        | 193           | explaining efficiency of heat transfer based on data                                   |
|             |                  |             |           |              |        | 208           | testing hypothesis of why seasons occur against your observations in the investigation |
|             |                  |             |           |              |        | 224           | reconstruct a series of events from clues  |
|             |                  |             |           |              |        | 235           | interpreting how the drumming affects the intensity of the earthquake in the model     |

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|----------------------------------|-----------------------------|--------------------|--|---------------------|---------------|----------------------|---|
| I.01.07<br>Science as<br>Inquiry | Doing Scientific<br>Inquiry | 9 - 12             | Revise scientific<br>explanations and<br>conclusions based<br>on additional<br>information/data<br>gathered. |                     |               | 157                  | add new rules to list<br>based on findings  |
|                                  |                             |                    |  |                     |               | 197                  | evaluating your aneroid<br>barometer design |

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|---------------------------|---|--------------------|---|---------------------|---|----------------------|--|
| I.02.01<br>Habits of Mind | Living the Values, Attitudes, and Commitments of the Inquiring Mind | 9 - 12             | Report findings accurately without alterations and draw conclusions from unaltered. | 20                  | how will speed change?  |                      | students are encouraged to keep a lab notebook                   |
|                           |   |                    |   | 24                  | predicting speed from a graph                                       | 9                    | construct a data table   |
|                           |   |                    |   | 42                  | predict the speed of a car  | 9                    | reporting on an experiment                                       |
|                           |   |                    |   | 435                 | making observations and asking questions                            | 12                   | understand and use data table                                    |
|                           |   |                    |   | 486                 | observing an aurora   | 14                   | record three different time intervals                            |
|                           |   |                    |   | 630                 | what evidence was used to predict the existence of the Kuiper Belt? | 17                   | record results in data table                                     |
|                           |   |                    |   | 630                 | use the data to answer the questions                                | 18                   | organize different combinations of data                          |
|                           |   |                    |   | 652                 | analysis with a spectrometer (#4)                                   | 21                   | construct reasonable explanation based on data                   |
|                           |   |                    |   |                     |   | 24                   | use data table to record results                                 |
|                           |   |                    |   |                     |   | 25                   | collect force data   |
|                           |   |                    |   |                     |   | 27                   | use data table to record results                                 |
|                           |   |                    |   |                     |   | 27                   | write down the number of weights you use                         |
|                           |   |                    |   |                     |   | 30                   | record ropes and pulley data in table                            |
|                           |   |                    |   |                     |   | 35                   | study data and determine importance of height on speed of marble |
|                           |   |                    |   |                     |   | 36                   | organize data into a table                                       |

**Correlation to Hawaii Content and Performance Standards: Physical Science and Inquiry**

***Foundations of Physical Science with Earth and Space Science***

**Student Text and Investigation Manual**

| Standard #: | Content Standard | Grade Level | Benchmark | student text | detail | investigation | detail  |
|-------------|------------------|-------------|-----------|--------------|--------|---------------|---|
|             |                  |             |           |              |        | 45            | analyze data and explain a rule                             |
|             |                  |             |           |              |        | 75            | create data table for self-designed experiment              |
|             |                  |             |           |              |        | 76            | use data to predict best string length for a pendulum clock |
|             |                  |             |           |              |        | 121           | use graph to predict mass of six objects                    |
|             |                  |             |           |              |        | 146           | record detailed observations                                |
|             |                  |             |           |              |        | 150           | record data as you perform experiment                       |
|             |                  |             |           |              |        | 151           | design a data table   |
|             |                  |             |           |              |        | 156           | make predictions about solubility                           |
|             |                  |             |           |              |        | 171           | use data table for observations                             |
|             |                  |             |           |              |        | 179           | create water quality report                                 |
|             |                  |             |           |              |        | 181           | organize water quality data into a table                    |
|             |                  |             |           |              |        | 181           | write paragraph to explain results                          |
|             |                  |             |           |              |        | 182           | observing daphnia and recording movements and behavior      |
|             |                  |             |           |              |        | 183           | write summary of findings                                   |
|             |                  |             |           |              |        | 183           | writing up a lab report                                     |

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|-------------|------------------|-------------|-----------|--------------|--------|---------------|---|
|             |                  |             |           |              |        | 199           | collecting Schönbein strips for detecting ozone   |
|             |                  |             |           |              |        | 201           | predicting areas with high ozone concentration based on your data                               |
|             |                  |             |           |              |        | 202           | collecting data of temperature and sensations   |
|             |                  |             |           |              |        | 204           | predicting what would happen if you place your ice/water test tube into a hot cup or a cold cup |
|             |                  |             |           |              |        | 206           | collecting temperature and time data  |
|             |                  |             |           |              |        | 210           | collecting qualitative data of light intensity at scale distance from the sun                   |
|             |                  |             |           |              |        | 217           | collecting wet and dry bulb temperature readings  |
|             |                  |             |           |              |        | 239           | estimating the number of meteor collisions on Earth during the last 3.5 billion years           |
|             |                  |             |           |              |        | 242           | predicting the results of the crystal-growing experiment  |
|             |                  |             |           |              |        | 243           | recording observations of crystal growing   |
|             |                  |             |           |              |        | 251           | recording the changes in the moon over a month  |

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|---------------------------|---|--------------------|---|---------------------|--|----------------------|--|
| I.02.02<br>Habits of Mind | Living the Values, Attitudes, and Commitments of the Inquiring Mind | 9 - 12             | Acknowledge references, contributions, and work done by others. | 400                 | research the Clean Air Act of 1970 and 1990  | 177                  | research pH indicators   |
|                           |   |                    |   | 448                 | research local water supply history          | 179                  | create water quality report  |
|                           |   |                    |   | 468                 | research the history of heat and temperature | 180                  | researching where your water comes from                                |
|                           |   |                    |   | 627                 | research space solar power                   | 181                  | write paragraph to explain results                                     |
|                           |   |                    |   |                     |  | 183                  | write summary of findings  |
|                           |   |                    |   |                     |  | 201                  | researching the causes of ozone  |
|                           |   |                    |   |                     |  | 207                  | researching how bodies of water affect climate                         |
|                           |   |                    |   |                     |  | 222                  | researching an animal that is adapted to live in the biome you studied |
|                           |   |                    |   |                     |  | 227                  | researching forensic science   |

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***Foundations of Physical Science with Earth and Space Science***

**Student Text and Investigation Manual**

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|---------------------------|---|--------------------|--|---------------------|--------------------------------------|----------------------|--|
| I.02.03<br>Habits of Mind | Living the Values, Attitudes, and Commitments of the Inquiring Mind | 9 - 12             | Evaluate the logic and validity of evidence, conclusions, and explanations against current scientific knowledge. | 19                  | which group did the best experiment? | 13                   | graph distance vs. time  |
|                           |   |                    |  | 24                  | making a graph                       | 15                   | construct a quantitative graphical model                                       |
|                           |   |                    |  | 26                  | creating graphs                      | 18                   | evaluate graphs as to whether or not they show relationships between variables |
|                           |   |                    |  | 41                  | make a graph                         |                      |  |
|                           |   |                    |  | 524                 | Kelvin's calculations of Earth's age | 21                   | evaluate percent change for data collected                                     |
|                           |   |                    |  |                     |                                      | 37                   | organize data into a graph of speed vs. height                                 |
|                           |   |                    |  |                     |                                      | 39                   | analyze energy transformations in different scenarios                          |
|                           |   |                    |  |                     |                                      | 51                   | graph voltage vs. current  |
|                           |   |                    |  |                     |                                      | 75                   | evaluate statistical significance  |
|                           |   |                    |  |                     |                                      | 77                   | compare law of conservation of energy to motion of pendulum                    |
|                           |   |                    |  |                     |                                      | 121                  | graph mass vs. volume  |
|                           |   |                    |  |                     |                                      | 147                  | organize observations into a category table                                    |
|                           |   |                    |  |                     |                                      | 151                  | do the data support the hypothesis   |
|                           |   |                    |  |                     |                                      | 151                  | does your experiment agree with law of conservation of mass?                   |
|                           |   |                    |  |                     |                                      | 171                  | what was happening at molecular level?   |

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| Standard #: | Content Standard | Grade Level | Benchmark | student text | detail | investigation | detail  |
|-------------|------------------|-------------|-----------|--------------|--------|---------------|---|
|             |                  |             |           |              |        | 171           | evaluate method based on data                       |
|             |                  |             |           |              |        | 185           | constructing a graph of drops of acid vs pH         |
|             |                  |             |           |              |        | 187           | construct a graphical model                         |
|             |                  |             |           |              |        | 189           | construct a temperature vs. time graph              |
|             |                  |             |           |              |        | 197           | constructing a graph from atmospheric pressure data |
|             |                  |             |           |              |        | 200           | evaluating your qualitative ozone strips            |
|             |                  |             |           |              |        | 203           | graphing water and ice temperature readings         |
|             |                  |             |           |              |        | 206           | constructing a graph of time vs. temperature        |
|             |                  |             |           |              |        | 231           | evaluating your completed bathymetric map           |
|             |                  |             |           |              |        | 247           | evaluate your ability to interpret rock formations  |

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|---------------------------|---|--------------------|--|--|---|---------------------------------------|---|
| I.02.04<br>Habits of Mind | Living the Values, Attitudes, and Commitments of the Inquiring Mind | 9 - 12             | Evaluate various perspectives and their implications before drawing conclusions.                   | 10<br>521<br>528<br>563<br>566<br>611<br>647 | process of reviewing hypothesis explained<br>relative dating and modern geology based on Steno's theories<br>theory of plate tectonics<br>Darwin's theories of the Andes formation<br>what causes ice ages<br>theories of origin of the moon<br>Big Bang theory | 39<br>151<br>171                      | review energy theory in context of everyday scenarios<br>review your hypothesis<br>did you prove or disprove your hypothesis?   |
| I.02.05<br>Habits of Mind | Living the Values, Attitudes, and Commitments of the Inquiring Mind | 9 - 12             | When appropriate, modify ideas, explanations, and hypotheses, based on empirical data or evidence. |  |   | 71<br>151<br>157<br>197<br>231<br>247 | testing a motor for performance<br>does your experiment agree with law of conservation of mass?<br>add new rules to list based on findings<br>evaluating your aneroid barometer design<br>evaluating your completed bathymetric map<br>evaluate your ability to interpret rock formations |

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|---------------------------|---|--------------------|---|---------------------|--|----------------------|--|
| I.02.06<br>Habits of Mind | Living the Values, Attitudes, and Commitments of the Inquiring Mind | 9 - 12             | Ask questions to clarify or validate purpose, perspective, assumptions, interpretations, and implications of a problem, situation, or solution. | 10                  | the research question and hypothesis                       | 6                    | how do we ask questions and get answers from nature? |
|                           |   |                    |   | 429                 | why haven't we run out of water                            |                      |  |
|                           |   |                    |   | 434                 | what is in your tap water                                  |                      |  |
|                           |   |                    |   | 437                 | what is acid rain  |                      |  |
|                           |   |                    |   | 441                 | why are oceans salty                                       |                      |  |
|                           |   |                    |   | 456                 | asking questions pertaining to specific heat and heat flow |                      |  |
|                           |   |                    |   | 472                 | why is Earth's atmosphere different from other planets     |                      |  |
|                           |   |                    |   | 473                 | why do ears pop  |                      |  |
|                           |   |                    |   | 492                 | why does Earth have seasons                                |                      |  |
|                           |   |                    |   | 501                 | how does rain form   |                      |  |
|                           |   |                    |   | 509                 | how do animals survive in the desert                       |                      |  |
|                           |   |                    |   | 515                 | what is a carbon sink                                      |                      |  |
|                           |   |                    |   | 534                 | why doesn't Earth get bigger and bigger                    |                      |  |
|                           |   |                    |   | 588                 | what causes eclipses                                       |                      |  |
|                           |   |                    |   | 621                 | is Pluto a planet  |                      |  |

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|---------------------------|---|--------------------|---|---------------------|--|----------------------|--|
| I.02.07<br>Habits of Mind | Living the Values, Attitudes, and Commitments of the Inquiring Mind | 9 - 12             | Use research techniques and a variety of resources to complete a report on a project of one's choice.   | 110                 | research Franklin's electricity experiments  | 9                    | reporting on an experiment   |
|                           |   |                    |   | 370                 | research Lavoisier's contributions   | 177                  | research pH indicators   |
|                           |   |                    |   | 400                 | research the Clean Air Act of 1970 and 1990  | 179                  | create water quality report  |
|                           |   |                    |   | 448                 | research local water supply history  | 180                  | researching where your water comes from                                |
|                           |   |                    |   | 468                 | research the history of heat and temperature   | 181                  | write paragraph to explain results                                     |
|                           |   |                    |   | 627                 | research space solar power   | 183                  | write summary of findings  |
|                           |   |                    |   |                     |  | 201                  | researching the causes of ozone  |
|                           |   |                    |   |                     |  | 207                  | researching how bodies of water affect climate                         |
|                           |   |                    |   |                     |  | 222                  | researching an animal that is adapted to live in the biome you studied |
|                           |   |                    |   |                     |  | 227                  | researching forensic science   |
| I.02.08<br>Habits of Mind | Living the Values, Attitudes, and Commitments of the Inquiring Mind | 9 - 12             | Ask questions, explain, and elaborate how science is a way of thinking and knowing the world around us. | 473                 | why do ears pop  | 6                    | asking questions and learning about natural world                      |
|                           |   |                    |   | 504                 | meteorologists use atmospheric pressure data to understand movement of weather systems | 215                  | the food paradox of the oceans   |
|                           |   |                    |   | 648                 | evidence for Big Bang theory   |                      |  |

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|---------------------------|------------------------------------|--------------------|--|---|---|----------------------|---|
| I.03.01<br>Habits of Mind | Using Unifying Concepts and Themes | 9 - 12             | Explain the function of a given system and its relationship to other systems in the natural world. | 80<br>429<br>435<br>438<br>509<br>512                                   | form and function of wheelbarrow and sailboat and human jaw<br>the water cycle<br>pond ecosystem and water quality<br>acid rain formation system<br>how do animals survive in the desert?<br>how do savanna animals survive the periodic fires?   | 68<br>108            | form and function of different electric motor configurations<br>form and function of human eye, prism, and lenses |
| I.03.02<br>Habits of Mind | Using Unifying Concepts and Themes | 9 - 12             | Explain the effect of large and small disturbances on systems in the natural world.                | 51<br>59<br>164<br>261<br>415<br>415<br>422<br>429<br>435<br>438<br>460 | what is equilibrium?<br>equilibrium/action reaction<br>electromagnets reverse current and switch polarity<br>change in optical systems<br>solubility equilibrium<br>equilibrium and solubility<br>change in pH values<br>the water cycle<br>pond ecosystem and water quality<br>acid rain formation system<br>thermal equilibrium | 87                   | changing frequency in standing waves  |

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|---------------------------|------------------------------------|--------------------|--|---------------------|---|----------------------|--|
| I.03.03<br>Habits of Mind | Using Unifying Concepts and Themes | 9 - 12             | Report how large changes in scale typically change the way things work in physical, biological, or social systems. | 23                  | why make models?                                | 202                  | modeling the effect of greenhouse gases on Earth's temperature |
|                           |                                    |                    |  | 24                  | what is a scientific model?                     |                      |  |
|                           |                                    |                    |  | 24                  | scientific models                               | 212                  | modeling underwater rivers and waterfalls and springs          |
|                           |                                    |                    |  | 485                 | computer modeling to predict greenhouse effects | 232                  | construct a model that simulates an earthquake                 |
|                           |                                    |                    |  | 494                 | modeling air currents                           |                      |  |
|                           |                                    |                    |  | 518                 | create a model (#1)                             | 258                  | setting up a scale model of the solar system                   |
|                           |                                    |                    |  | 524                 | model of Earth's history                        |                      |  |
|                           |                                    |                    |  | 533                 | modeling plate boundaries                       |                      |  |
|                           |                                    |                    |  | 576                 | rock cycle model                                |                      |  |
|                           |                                    |                    |  | 614                 | solar system modeling                           |                      |  |
|                           |                                    |                    |  | 624                 | model of the sun's anatomy                      |                      |  |

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|---------------------------|------------------------------------|-------------|---|--------------|---|---------------|--|
| I.03.04<br>Habits of Mind | Using Unifying Concepts and Themes | 9 - 12      | Design or create a model to represent a device, a plan, an equation, or a mental image. | 23           | why make models?                                | 13            | graph distance vs. time  |
|                           |                                    |             |   | 24           | what is a scientific model?                     | 15            | construct a quantitative graphical model                       |
|                           |                                    |             |   | 24           | making a graph                                  | 25            | create a mathematical model                                    |
|                           |                                    |             |   | 24           | scientific models                               | 27            | find math rule for lever equilibrium                           |
|                           |                                    |             |   | 26           | creating graphs                                 | 28            | derive a math formula  |
|                           |                                    |             |   | 41           | make a graph                                    | 37            | organize data into a graph of speed vs. height                 |
|                           |                                    |             |   | 42           | interpreting distance/time graph                | 51            | graph voltage vs. current                                      |
|                           |                                    |             |   | 459          | heat equation                                   | 121           | graph mass vs. volume  |
|                           |                                    |             |   | 485          | computer modeling to predict greenhouse effects | 147           | organize observations into a category table                    |
|                           |                                    |             |   | 494          | modeling air currents                           | 185           | constructing a graph of drops of acid vs pH                    |
|                           |                                    |             |   | 518          | create a model (#1)                             | 187           | construct a graphical model                                    |
|                           |                                    |             |   | 524          | model of Earth's history                        | 187           | find equation for trend line                                   |
|                           |                                    |             |   | 533          | modeling plate boundaries                       | 189           | construct a temperature vs. time graph                         |
|                           |                                    |             |   | 576          | rock cycle model                                | 197           | constructing a graph from atmospheric pressure data            |
|                           |                                    |             |   | 614          | solar system modeling                           | 202           | modeling the effect of greenhouse gases on Earth's temperature |
|                           |                                    |             |   | 624          | model of the sun's anatomy                      | 203           | graphing water and ice temperature readings                    |
|                           |                                    |             |   | 645          | inverse square law                              |               |  |

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|-------------|------------------|-------------|-----------|--------------|--------|---------------|---|
|             |                  |             |           |              |        | 206           | constructing a graph of time vs. temperature          |
|             |                  |             |           |              |        | 212           | modeling underwater rivers and waterfalls and springs |
|             |                  |             |           |              |        | 232           | construct a model that simulates an earthquake        |
|             |                  |             |           |              |        | 257           | inverse square law                                    |
|             |                  |             |           |              |        | 258           | setting up a scale model of the solar system          |

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| Standard #:       | Content Standard | Grade Level | Benchmark   | student text | detail  | investigation | detail                                     |
|-------------------|------------------|-------------|---|--------------|---|---------------|--|
| I.04.01<br>Safety | Doing Safety     | 9 - 12      | Apply school, classroom, laboratory, and field trip rules, as appropriate, to maintain a safe learning environment. | 120          | ground fault circuit interrupter                  | 20            | safety tip for car/ramp setup              |
|                   |                  |             |   | 128          | find and investigate circuit breakers in the home | 24            | ropes and pulley safety                    |
|                   |                  |             |   |              |   | 26            | safety tip for hanging weights from lever  |
|                   |                  |             |   | 452          | safety caution on heating jar                     | 40            | electrical safety                          |
|                   |                  |             |   |              |   | 44            | short circuit safety warning               |
|                   |                  |             |   |              |   | 56            | short circuit safety warning               |
|                   |                  |             |   |              |   | 58            | short circuit safety warning               |
|                   |                  |             |   |              |   | 146           | safety in the lab                          |
|                   |                  |             |   |              |   | 150           | chemistry safety                           |
|                   |                  |             |   |              |   | 158           | wear goggles and apron                     |
|                   |                  |             |   |              |   | 168           | safety equipment                           |
|                   |                  |             |   |              |   | 172           | hot water safety                           |
|                   |                  |             |   |              |   | 179           | safety tip for testing local surface water |
|                   |                  |             |   |              |   | 180           | safety tip for water testing               |
|                   |                  |             |   |              |   | 182           | safety tips for observing Daphnia          |
|                   |                  |             |   |              |   | 186           | thermometer safety                         |
|                   |                  |             |   |              |   | 188           | heat safety                                |
|                   |                  |             |   |              |   | 192           | heat safety                                |
|                   |                  |             |   |              |   | 202           | safety in greenhouse gas investigation     |

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|-------------|------------------|-------------|-----------|--------------|--------|---------------|---------------------------------|
|             |                  |             |           |              |        | 210           | safety using light bulbs        |
|             |                  |             |           |              |        | 216           | safety in swinging thermometers |
|             |                  |             |           |              |        | 256           | safety in lab                   |

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|-------------------|------------------|-------------|--|--------------|---|---------------|--|
| I.04.02<br>Safety | Doing Safety     | 9 - 12      | Identify potentially unsafe conditions prior to the activity and explain how accidents can be prevented. | 120          | ground fault circuit interrupter                  | 20            | safety tip for car/ramp setup              |
|                   |                  |             |  | 128          | find and investigate circuit breakers in the home | 24            | ropes and pulley safety                    |
|                   |                  |             |  |              |   | 26            | safety tip for hanging weights from lever  |
|                   |                  |             |  | 452          | safety caution on heating jar                     | 40            | electrical safety                          |
|                   |                  |             |  |              |   | 44            | short circuit safety warning               |
|                   |                  |             |  |              |   | 56            | short circuit safety warning               |
|                   |                  |             |  |              |   | 58            | short circuit safety warning               |
|                   |                  |             |  |              |   | 146           | safety in the lab                          |
|                   |                  |             |  |              |   | 150           | chemistry safety                           |
|                   |                  |             |  |              |   | 158           | wear goggles and apron                     |
|                   |                  |             |  |              |   | 168           | safety equipment                           |
|                   |                  |             |  |              |   | 172           | hot water safety                           |
|                   |                  |             |  |              |   | 179           | safety tip for testing local surface water |
|                   |                  |             |  |              |   | 180           | safety tip for water testing               |
|                   |                  |             |  |              |   | 182           | safety tips for observing Daphnia          |
|                   |                  |             |  |              |   | 186           | thermometer safety                         |
|                   |                  |             |  |              |   | 188           | heat safety                                |
|                   |                  |             |  |              |   | 192           | heat safety                                |
|                   |                  |             |  |              |   | 202           | safety in greenhouse gas investigation     |

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|-------------|------------------|-------------|-----------|--------------|--------|---------------|---------------------------------|
|             |                  |             |           |              |        | 210           | safety using light bulbs        |
|             |                  |             |           |              |        | 216           | safety in swinging thermometers |
|             |                  |             |           |              |        | 256           | safety in lab                   |

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| Standard #:       | Content Standard | Grade Level | Benchmark  | student text | detail  | investigation | detail                                     |
|-------------------|------------------|-------------|--|--------------|---|---------------|--|
| I.04.03<br>Safety | Doing Safety     | 9 - 12      | Follow most recent protocols established by the International Science and Engineering Fair when conducting any investigations on living and non-living organisms and under teacher/mentor supervision. | 120          | ground fault circuit interrupter                  | 20            | safety tip for car/ramp setup              |
|                   |                  |             |  | 128          | find and investigate circuit breakers in the home | 24            | ropes and pulley safety                    |
|                   |                  |             |  | 452          | safety caution on heating jar                     | 26            | safety tip for hanging weights from lever  |
|                   |                  |             |  |              |   | 40            | electrical safety                          |
|                   |                  |             |  |              |   | 44            | short circuit safety warning               |
|                   |                  |             |  |              |   | 56            | short circuit safety warning               |
|                   |                  |             |  |              |   | 58            | short circuit safety warning               |
|                   |                  |             |  |              |   | 146           | safety in the lab                          |
|                   |                  |             |  |              |   | 150           | chemistry safety                           |
|                   |                  |             |  |              |   | 158           | wear goggles and apron                     |
|                   |                  |             |  |              |   | 168           | safety equipment                           |
|                   |                  |             |  |              |   | 172           | hot water safety                           |
|                   |                  |             |  |              |   | 179           | safety tip for testing local surface water |
|                   |                  |             |  |              |   | 180           | safety tip for water testing               |
|                   |                  |             |  |              |   | 182           | safety tips for observing Daphnia          |
|                   |                  |             |  |              |   | 186           | thermometer safety                         |
|                   |                  |             |  |              |   | 188           | heat safety                                |
|                   |                  |             |  |              |   | 192           | heat safety                                |
|                   |                  |             |  |              |   | 202           | safety in greenhouse gas investigation     |

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| Standard #:       | Content Standard | Grade Level | Benchmark   | student text                            | detail | investigation  | detail |
|-------------------|------------------|-------------|---|---|--------|--|--------|
|                   |                  |             |   |   |        | 210 safety using light bulbs<br>216 safety in swinging thermometers<br>256 safety in lab |        |
| I.04.04<br>Safety | Doing Safety     | 9 - 12      | Operate emergency equipment, such as eyewash, shower, and fire blanket when needed. | featured throughout CPO Science program |        | featured throughout CPO Science program  |        |
| I.04.05<br>Safety | Doing Safety     | 9 - 12      | Assist teacher as requested in case of emergency.                                   | featured throughout CPO Science program |        | featured throughout CPO Science program  |        |

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|-------------------|------------------|-------------|--|--------------|---|---------------|--|
| I.04.06<br>Safety | Doing Safety     | 9 - 12      | Document and apply appropriate safety protocols when conducting scientific activities in and out of the classroom. | 120          | ground fault circuit interrupter                  | 20            | safety tip for car/ramp setup              |
|                   |                  |             |  | 128          | find and investigate circuit breakers in the home | 24            | ropes and pulley safety                    |
|                   |                  |             |  |              |   | 26            | safety tip for hanging weights from lever  |
|                   |                  |             |  | 452          | safety caution on heating jar                     | 40            | electrical safety                          |
|                   |                  |             |  |              |   | 44            | short circuit safety warning               |
|                   |                  |             |  |              |   | 56            | short circuit safety warning               |
|                   |                  |             |  |              |   | 58            | short circuit safety warning               |
|                   |                  |             |  |              |   | 146           | safety in the lab                          |
|                   |                  |             |  |              |   | 150           | chemistry safety                           |
|                   |                  |             |  |              |   | 158           | wear goggles and apron                     |
|                   |                  |             |  |              |   | 168           | safety equipment                           |
|                   |                  |             |  |              |   | 172           | hot water safety                           |
|                   |                  |             |  |              |   | 179           | safety tip for testing local surface water |
|                   |                  |             |  |              |   | 180           | safety tip for water testing               |
|                   |                  |             |  |              |   | 182           | safety tips for observing Daphnia          |
|                   |                  |             |  |              |   | 186           | thermometer safety                         |
|                   |                  |             |  |              |   | 188           | heat safety                                |
|                   |                  |             |  |              |   | 192           | heat safety                                |
|                   |                  |             |  |              |   | 202           | safety in greenhouse gas investigation     |

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|--|--|-------------|--|--------------|--|---------------|--|
|  |  |             |  |              |  | 210           | safety using light bulbs                                 |
|  |  |             |  |              |  | 216           | safety in swinging thermometers                          |
|  |  |             |  |              |  | 256           | safety in lab  |
| I.05.01<br>Science and<br>Technology in<br>Society | Relating the Nature<br>of Technology to<br>Science | 9 - 12      | Identify and explain<br>current issues or<br>problems based on<br>evidence found in<br>available<br>information. | 110          | study appliance labels<br>and instructions             | 76            | analyze watch<br>manufacturer's claims                   |
|  |  |             |  | 142          | create pamphlet on utility'<br>s energy saver programs | 162           | inferences from<br>promotional materials for<br>vehicles |
|  |  |             |  | 448          | study claims made by<br>bottled water companies        | 181           | study water filtration<br>device claims                  |

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| <b>Standard #:</b>                                 | <b>Content Standard</b>                            | <b>Grade Level</b> | <b>Benchmark</b>   | <b>student text</b> | <b>detail</b>   | <b>investigation</b> | <b>detail</b>                                   |
|--|--|--------------------|--|---------------------|---|----------------------|---|
| I.05.02<br>Science and<br>Technology in<br>Society | Relating the Nature<br>of Technology to<br>Science | 9 - 12             | Collect, organize,<br>and analyze<br>information from<br>reliable sources to<br>identify alternative<br>solutions. | 12                  | importance of reliable<br>and accurate data<br>collection                 | 4                    | difference between<br>precise and accurate data |
|  |  |                    |  | 435                 | making observations and<br>asking questions                               | 6                    | electronic timer and<br>release technique       |
|  |  |                    |  | 486                 | observing an aurora   | 7                    | record time interval                            |
|  |  |                    |  | 547                 | average density (#5)  | 9                    | collect speed data                              |
|  |  |                    |  | 618                 | average distance from<br>the sun  | 14                   | record three different<br>time intervals        |
|  |  |                    |  | 630                 | what evidence was used<br>to predict the existence<br>of the Kuiper Belt? | 17                   | record times                                    |
|  |  |                    |  | 630                 | use the data to answer<br>the questions                                   | 24                   | collect weight data                             |
|  |  |                    |  | 652                 | analysis with a<br>spectrometer (#4)                                      | 25                   | collect force data                              |
|  |  |                    |  |                     |   | 27                   | write down the number of<br>weights you use     |
|  |  |                    |  |                     |   | 36                   | collect precise speed and<br>height data        |
|  |  |                    |  |                     |   | 75                   | collect mass and<br>amplitude data              |
|  |  |                    |  |                     |   | 146                  | record detailed<br>observations                 |
|  |  |                    |  |                     |   | 150                  | record data as you<br>perform experiment        |
|  |  |                    |  |                     |   | 171                  | average dissolving rate                         |
|  |  |                    |  |                     |   | 171                  | collect time data and<br>record observations    |
|  |  |                    |  |                     |   | 182                  | making detailed<br>observations                 |

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| Standard #: | Content Standard | Grade Level | Benchmark | student text | detail | investigation | detail  |
|-------------|------------------|-------------|-----------|--------------|--------|---------------|---|
|             |                  |             |           |              |        | 182           | observing daphnia and recording movements and behavior                        |
|             |                  |             |           |              |        | 184           | collecting pH readings while adding carbon dioxide                            |
|             |                  |             |           |              |        | 186           | collecting temperature data   |
|             |                  |             |           |              |        | 189           | collecting time and temperature data  |
|             |                  |             |           |              |        | 193           | collecting and recording time and temperature data                            |
|             |                  |             |           |              |        | 199           | collecting Schönbein strips for detecting ozone                               |
|             |                  |             |           |              |        | 202           | collecting data of temperature and sensations                                 |
|             |                  |             |           |              |        | 206           | collecting temperature and time data  |
|             |                  |             |           |              |        | 210           | collecting qualitative data of light intensity at scale distance from the sun |
|             |                  |             |           |              |        | 217           | collecting wet and dry bulb temperature readings                              |
|             |                  |             |           |              |        | 243           | recording observations of crystal growing                                     |
|             |                  |             |           |              |        | 249           | using your sundial to collect accurate data                                   |

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|-------------|------------------|-------------|-----------|--------------|--------|---------------|--|
|             |                  |             |           |              |        | 251           | recording the changes in the moon over a month |
|             |                  |             |           |              |        | 253           | calibrating your telescope                     |

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|--|--|--------------------|--|---------------------|-----------------|----------------------|--|
| I.05.03<br>Science and<br>Technology in<br>Society | Relating the Nature<br>of Technology to<br>Science | 9 - 12             | Evaluate<br>alternative<br>solutions for<br>effectiveness<br>based on<br>appropriate criteria. | 24                  | making a graph  | 13                   | graph distance vs. time  |
|  |  |                    |  | 26                  | creating graphs | 15                   | construct a quantitative<br>graphical model                        |
|  |  |                    |  | 41                  | make a graph    | 37                   | organize data into a<br>graph of speed vs. height                  |
|  |  |                    |  |                     |                 | 51                   | graph voltage vs. current  |
|  |  |                    |  |                     |                 | 121                  | graph mass vs. volume  |
|  |  |                    |  |                     |                 | 147                  | organize observations<br>into a category table                     |
|  |  |                    |  |                     |                 | 151                  | does your experiment<br>agree with law of<br>conservation of mass? |
|  |  |                    |  |                     |                 | 185                  | constructing a graph of<br>drops of acid vs pH                     |
|  |  |                    |  |                     |                 | 187                  | construct a graphical<br>model                                     |
|  |  |                    |  |                     |                 | 189                  | construct a temperature<br>vs. time graph                          |
|  |  |                    |  |                     |                 | 197                  | constructing a graph from<br>atmospheric pressure<br>data          |
|  |  |                    |  |                     |                 | 203                  | graphing water and ice<br>temperature readings                     |
|  |  |                    |  |                     |                 | 206                  | constructing a graph of<br>time vs. temperature                    |
|  |  |                    |  |                     |                 | 231                  | evaluating your<br>completed bathymetric<br>map                    |

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| Standard #:  | Content Standard                                   | Grade Level | Benchmark   | student text | detail                        | investigation | detail  |
|--|--|-------------|---|--------------|-------------------------------|---------------|---|
|  |  |             |   |              |                               | 247           | evaluate your ability to interpret rock formations  |
| I.05.04<br>Science and<br>Technology in<br>Society | Relating the Nature<br>of Technology to<br>Science | 9 - 12      | Predict<br>consequences or<br>implications of<br>proposed decisions<br>and related actions. | 20           | how will speed change?        | 76            | use data to predict best string length for a pendulum clock                                     |
|  |  |             |   | 24           | predicting speed from a graph | 121           | use graph to predict mass of six objects  |
|  |  |             |   | 42           | predict the speed of a car    | 156           | make predictions about solubility   |
|  |  |             |   |              |                               | 201           | predicting areas with high ozone concentration based on your data                               |
|  |  |             |   |              |                               | 204           | predicting what would happen if you place your ice/water test tube into a hot cup or a cold cup |
|  |  |             |   |              |                               | 239           | estimating the number of meteor collisions on Earth during the last 3.5 billion years           |
|  |  |             |   |              |                               | 242           | predicting the results of the crystal-growing experiment  |

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|--|--|-------------|--|--------------|--|---------------|---|
| I.05.05<br>Science and<br>Technology in<br>Society | Relating the Nature<br>of Technology to<br>Science | 9 - 12      | Select and carry<br>out actions for the<br>alternative solution<br>selected. | 7            | experimentation begins<br>with a question  | 7             | compare results with<br>hypothesis                                |
|  |  |             |  | 9            | steps in the scientific<br>method  | 7             | perform your own<br>experiment                                    |
|  |  |             |  | 10           | forming a hypothesis   | 7             | design your own<br>experiment                                     |
|  |  |             |  | 19           | design your own<br>experiment  | 9             | design three experiments<br>and choose equipment                  |
|  |  |             |  | 19           | design your own<br>experiment  | 9             | design three experiments<br>and choose technology                 |
|  |  |             |  | 42           | devise an experiment   | 9             | design three experiments<br>using car and ramp                    |
|  |  |             |  | 288          | find the thickness of a<br>single card   | 9             | conduct three<br>experiments with<br>appropriate equipment        |
|  |  |             |  | 448          | describe steps you would<br>take to determine<br>whether pH affects frog<br>population | 10            | conduct car/ramp<br>experiment                                    |
|  |  |             |  |              |  | 10            | selecting ramp and<br>photogates                                  |
|  |  |             |  |              |  | 12            | select equipment and set<br>up experiment                         |
|  |  |             |  |              |  | 16            | investigate Newton's 2nd<br>law                                   |
|  |  |             |  |              |  | 16            | decide how to vary the<br>force on the car for this<br>experiment |
|  |  |             |  |              |  | 26            | what variables can be<br>changed?                                 |
|  |  | 30          | rigging block and tackle   |              |  |               |   |

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|-------------|------------------|-------------|-----------|--------------|--------|---------------|---|
|             |                  |             |           |              |        | 34            | investigate motion on a rollercoaster   |
|             |                  |             |           |              |        | 40            | choose circuit parts to light a bulb  |
|             |                  |             |           |              |        | 75            | plan three experiments to determine which variable affects the period of a pendulum |
|             |                  |             |           |              |        | 75            | perform self-designed experiment  |
|             |                  |             |           |              |        | 75            | design pendulum experiment  |
|             |                  |             |           |              |        | 145           | plan a procedure and select necessary equipment                                     |
|             |                  |             |           |              |        | 145           | carry out procedure and select equipment  |
|             |                  |             |           |              |        | 151           | plan procedures and select materials  |
|             |                  |             |           |              |        | 151           | select materials from list  |
|             |                  |             |           |              |        | 151           | design experiment to find out if mass is conserved                                  |
|             |                  |             |           |              |        | 170           | which factor will produce fastest dissolving rate?                                  |
|             |                  |             |           |              |        | 170           | what three factors influence dissolving rate?                                       |
|             |                  |             |           |              |        | 178           | visit local water supply and perform testing  |
|             |                  |             |           |              |        | 182           | simulating the effect of acid rain on daphnia                                       |

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|-------------|------------------|-------------|-----------|--------------|--------|---------------|---|
|             |                  |             |           |              |        | 188           | conducting investigation of efficiency of immersion heater                                    |
|             |                  |             |           |              |        | 193           | conducting experiments on heat transfer   |
|             |                  |             |           |              |        | 194           | design and construct an aneroid barometer   |
|             |                  |             |           |              |        | 198           | making qualitative observations of the amount of ozone present in the school environment      |
|             |                  |             |           |              |        | 205           | investigating how specific heat of water regulates Earth's temperature                        |
|             |                  |             |           |              |        | 209           | measuring the intensity of light using an electric meter and solar cell and light bulb        |
|             |                  |             |           |              |        | 233           | identifying how the earthquake model represents an earthquake                                 |
|             |                  |             |           |              |        | 237           | develop a research plan for studying volcanoes  |
|             |                  |             |           |              |        | 252           | identifying the parts of a refracting telescope and making observations of the moon's surface |

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|--|--|--------------------|--|---------------------|---|------------------------------|---|
| I.05.06<br>Science and<br>Technology in<br>Society | Relating the Nature<br>of Technology to<br>Science | 9 - 12             | Evaluate the<br>effectiveness of the<br>actions taken to<br>resolve the<br>problem or issue<br>and its overall<br>effect on self,<br>others, and the<br>environment. | 19                  | which group did the best<br>experiment? | 18<br>21<br>75<br>171<br>200 | evaluate graphs as to<br>whether or not they show<br>relationships between<br>variables<br>evaluate percent change<br>for data collected<br>evaluate statistical<br>significance<br>evaluate method based<br>on data<br>evaluating your<br>qualitative ozone strips |

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|--|--|--------------------|--|---------------------|---|----------------------|--|
| II.01.01<br>Historical<br>Perspectives | Understanding<br>Scientific Inquiry<br>and the Character<br>of Scientific<br>Knowledge | 9 - 12             | Critique a scientific<br>investigation for<br>logic and validity<br>based on evidence. | 7                   | experimentation begins<br>with a question                           | 7                    | variables in an<br>experiment  |
|  |  |                    |  | 19                  | design your own<br>experiment                                       | 7                    | design your own<br>experiment  |
|  |  |                    |  | 42                  | devise an experiment  | 9                    | design three experiments<br>using car and ramp                             |
|  |  |                    |  | 448                 | forming a hypothesis and<br>testing through<br>experimentation (#5) | 16                   | decide how to vary the<br>force on the car for this<br>experiment          |
|  |  |                    |  | 529                 | critiquing Wegener's<br>theories of continental<br>drift            | 26                   | what variables can be<br>changed?  |
|  |  |                    |  | 602                 | identify question,<br>hypothesis, procedure,<br>and results (#1)    | 35                   | what evidence is there in<br>support of your<br>hypothesis?                |
|  |  |                    |  | 612                 | early theories of the solar<br>system                               | 39                   | critique group's<br>explanation of energy<br>transformations               |
|  |  |                    |  |                     |   | 75                   | design pendulum<br>experiment  |
|  |  |                    |  |                     |   | 77                   | show how energy loss<br>data could be applied to<br>designing a real clock |
|  |  |                    |  |                     |   | 151                  | design experiment to find<br>out if mass is conserved                      |
|  |  | 170                | what three factors<br>influence dissolving rate?                                       |                     |   |                      |  |
|  |  | 233                | identifying how the<br>earthquake model<br>represents an earthquake                    |                     |   |                      |  |

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|-------------------------------------|--|--------------------|---|---|---|----------------------|--|
| II.01.02<br>Historical Perspectives | Understanding Scientific Inquiry and the Character of Scientific Knowledge | 9 - 12             | Examine and elaborate how ethics and integrity play important roles in scientific research. | 312<br>313<br>324<br>393<br>400<br>448<br>468       | contributions of Fermi<br>development of atomic theory<br>research and create a poster to illustrate development of atomic model<br>contributions of Marie and Pierre Curie<br>research the Clean Air Act of 1970 and 1990<br>research local water supply history<br>research the history of heat and temperature | 130<br>163           | investigate Rutherford's gold foil experiment<br>evaluating choice of favorite car |
| II.01.03<br>Historical Perspectives | Understanding Scientific Inquiry and the Character of Scientific Knowledge | 9 - 12             | Explain how scientists prevent biases in research.  | 73<br>320<br>391<br>583<br>585<br>586<br>589<br>594 | impact of Da Vinci's work<br>the quests of alchemists<br>scientific discovery and the atomic age<br>history of calendars<br>counting the days in a year<br>the history of clocks and the division of time<br>ancient beliefs about solar eclipses<br>history of the telescope                                     | 163<br>198           | evaluating choice of favorite car<br>contributions of Schönbein                    |

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|--|--|-------------|--|--------------|---|---------------|--|
| II.01.04<br>Historical<br>Perspectives | Understanding<br>Scientific Inquiry<br>and the Character<br>of Scientific<br>Knowledge | 9 - 12      | Compare and<br>contrast the<br>different science<br>disciplines in terms<br>of areas of study,<br>techniques used,<br>outcomes sought,<br>purpose and<br>philosophy. | 58           | Newton on a skateboard  | 39            | study energy<br>transformations in daily<br>life scenarios             |
|  |  |             |  | 78           | describe a problem that<br>would be solved by an<br>engineer                  | 177           | chemistry and<br>photography   |
|  |  |             |  | 120          | circuits in your house  | 178           | water quality testing  |
|  |  |             |  | 452          | balloons expands or<br>contracts due to thermal<br>expansion                  | 179           | researching and<br>preparing for a field trip<br>to test surface water |
|  |  |             |  | 454          | temperature vs. thermal<br>energy for a cup or pot of<br>soup                 | 201           | suggesting ways that<br>ozone concentrations<br>could be reduced       |
|  |  |             |  | 461          | understanding thermal<br>energy through cocoa<br>example                      | 204           | connecting the latent<br>heat investigation to Earth                   |
|  |  |             |  | 465          | examples of reflectors<br>and absorbers                                       | 218           | understanding Doppler<br>radar   |
|  |  |             |  | 473          | why do ears pop   |               |  |
|  |  |             |  | 476          | atmospheric pressure in<br>Denver   |               |  |
|  |  |             |  | 490          | using the North Star to<br>estimate your latitude                             |               |  |
|  |  |             |  | 509          | how do animals survive<br>in the desert                                       |               |  |
|  |  |             |  | 536          | analogy of plate<br>movements   |               |  |
|  |  |             |  | 548          | describe the work of a<br>geologist and<br>paleontologist and<br>seismologist |               |  |

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|--|--|-------------|---|--------------|---|---------------|--|
| II.01.05<br>Historical<br>Perspectives | Understanding<br>Scientific Inquiry<br>and the Character<br>of Scientific<br>Knowledge | 9 - 12      | Generalize that the human need to satisfy curiosity results in scientific knowledge and expanded ideas about the world. | 58           | Newton on a skateboard                                  | 6             | asking questions and learning about natural world                    |
|  |  |             |   | 78           | describe a problem that would be solved by an engineer  | 39            | study energy transformations in daily life scenarios                 |
|  |  |             |   | 120          | circuits in your house                                  | 179           | researching and preparing for a field trip to test surface water     |
|  |  |             |   | 312          | contributions of Fermi                                  | 197           | evaluating the relationship between atmospheric pressure and weather |
|  |  |             |   | 321          | contributions of Mendeleev                              | 201           | suggesting ways that ozone concentrations could be reduced           |
|  |  |             |   | 393          | contributions of Marie and Pierre Curie                 | 204           | connecting the latent heat investigation to Earth                    |
|  |  |             |   | 452          | balloons expands or contracts due to thermal expansion  | 215           | the food paradox of the oceans                                       |
|  |  |             |   | 454          | temperature vs. thermal energy for a cup or pot of soup | 218           | understanding Doppler radar  |
|  |  |             |   | 461          | understanding thermal energy through cocoa example      |               |  |
|  |  |             |   | 463          | convection and sea breezes                              |               |  |
|  |  |             |   | 465          | examples of reflectors and absorbers                    |               |  |
|  |  |             |   | 473          | why do ears pop   |               |  |
|  |  |             |   | 473          | why do ears pop   |               |  |
|  |  |             |   | 476          | atmospheric pressure in Denver                          |               |  |
|  |  |             |   | 489          | patterns of heating and cooling on Earth                |               |  |

**Correlation to Hawaii Content and Performance Standards: Physical Science and Inquiry**

***Foundations of Physical Science with Earth and Space Science***

**Student Text and Investigation Manual**

| Standard #: | Content Standard | Grade Level | Benchmark | student text | detail   | investigation | detail |
|-------------|------------------|-------------|-----------|--------------|--|---------------|--------|
|             |                  |             |           | 490          | using the North Star to estimate your latitude   |               |        |
|             |                  |             |           | 504          | meteorologists use atmospheric pressure data to understand movement of weather systems |               |        |
|             |                  |             |           | 508          | patterns in storm activity across the globe  |               |        |
|             |                  |             |           | 509          | how do animals survive in the desert   |               |        |
|             |                  |             |           | 533          | patterns of earthquakes and volcanoes  |               |        |
|             |                  |             |           | 536          | analogy of plate movements   |               |        |
|             |                  |             |           | 540          | boundaries of tectonic plates  |               |        |
|             |                  |             |           | 553          | the Ring of Fire   |               |        |
|             |                  |             |           | 584          | lunar cycles   |               |        |
|             |                  |             |           | 609          | tides  |               |        |
|             |                  |             |           | 637          | categorizing stars with H-R diagrams   |               |        |
|             |                  |             |           | 648          | evidence for Big Bang theory   |               |        |

## Correlation to Hawaii Content and Performance Standards: Physical Science and Inquiry

### *Foundations of Physical Science with Earth and Space Science*

#### Student Text and Investigation Manual

| Standard #:                            | Content Standard                                    | Grade Level | Benchmark   | student text | detail  | investigation | detail   |
|--|---|-------------|---|--------------|---|---------------|--|
| II.02.01<br>Historical<br>Perspectives | Interdependence of Science, Technology, and Society | 9 - 12      | Analyze, conclude, and defend how technology and science impacted the social, cultural, legal, political, economic, and / or ecological systems locally or globally and vice versa. | 368          | limiting reactants  | 52            | the cost of using electrical appliances                                      |
|  |   |             |   | 379          | research economic impact of fuel cells                                  | 163           | economic impact of end-product of combustion reaction                        |
|  |   |             |   | 379          | research fuel cells   | 163           | too much CO <sub>2</sub>   |
|  |   |             |   | 379          | research environmental impact of fuel cells                             | 163           | research how trees offset accumulation of CO <sub>2</sub>                    |
|  |   |             |   | 379          | hydrogen-powered cars and the environment                               | 178           | actions to take to improve water quality                                     |
|  |   |             |   | 379          | research fuel cells   | 178           | predict the quality of surface water to be tested and justify your answer    |
|  |   |             |   | 391          | nuclear vs. fossil fuels  | 201           | research the causes of ozone in the lower atmosphere                         |
|  |   |             |   | 391          | impact of nuclear energy  | 262           | solar energy can be used to generate electricity without producing pollution |
|  |   |             |   | 395          | fossil fuels  |               |  |
|  |   |             |   | 400          | clean air act of 1970   |               |  |
|  |   |             |   | 400          | problems caused by airborne pollutants                                  |               |  |
|  |   |             |   | 400          | economic impact of pollution  |               |  |
|  |   |             |   | 400          | reducing pollution  |               |  |
|  |   |             |   | 400          | economic impact of reducing air pollution                               |               |  |
|  |   |             |   | 414          | effect of electrical generating facilities on dissolved oxygen in water |               |  |
|  |   |             |   | 414          | effect of electrical generating facilities on dissolved oxygen in water |               |  |

**Correlation to Hawaii Content and Performance Standards: Physical Science and Inquiry**

***Foundations of Physical Science with Earth and Space Science***

**Student Text and Investigation Manual**

| Standard #: | Content Standard | Grade Level | Benchmark | student text | detail   | investigation | detail |
|-------------|------------------|-------------|-----------|--------------|--|---------------|--------|
|             |                  |             |           | 414          | environmental impact of electrical generating facilities           |               |        |
|             |                  |             |           | 429          | governments managing water resources                               |               |        |
|             |                  |             |           | 433          | the clean water act  |               |        |
|             |                  |             |           | 436          | effect of excess nitrates on environment                           |               |        |
|             |                  |             |           | 437          | effects of acid rain on natural environments                       |               |        |
|             |                  |             |           | 438          | impact of using fossil fuels                                       |               |        |
|             |                  |             |           | 439          | catalytic converters and scrubbing reduce acid rain                |               |        |
|             |                  |             |           | 439          | illustration of acid rain formation                                |               |        |
|             |                  |             |           | 443          | impact of increased CO2 in oceans                                  |               |        |
|             |                  |             |           | 448          | how is the government addressing the problem of acid rain?         |               |        |
|             |                  |             |           | 448          | is acid rain a problem in your community?                          |               |        |
|             |                  |             |           | 448          | research economic impact of producing gases that cause acid rain   |               |        |
|             |                  |             |           | 448          | what is the history of your community's water supply and treatment |               |        |
|             |                  |             |           | 471          | nitrogen cycle   |               |        |

**Correlation to Hawaii Content and Performance Standards: Physical Science and Inquiry**

***Foundations of Physical Science with Earth and Space Science***

**Student Text and Investigation Manual**

| Standard #: | Content Standard | Grade Level | Benchmark | student text | detail  | investigation | detail |
|-------------|------------------|-------------|-----------|--------------|---|---------------|--------|
|             |                  |             |           | 479          | effects of CFC's on the ozone layer                                   |               |        |
|             |                  |             |           | 479          | London Agreement of 1991  |               |        |
|             |                  |             |           | 482          | changes to the oceans due to increasing global temperatures           |               |        |
|             |                  |             |           | 482          | effects of burning fossil fuels                                       |               |        |
|             |                  |             |           | 483          | should governments enforce changes for lowering greenhouse gas levels |               |        |
|             |                  |             |           | 483          | hydrogen powered cars   |               |        |
|             |                  |             |           | 515          | permafrost  |               |        |
|             |                  |             |           | 538          | what we can learn from seismographs                                   |               |        |
|             |                  |             |           | 544          | understanding earthquakes allows engineers to design safer buildings  |               |        |
|             |                  |             |           | 568          | environmental impact of urban sprawl                                  |               |        |
|             |                  |             |           | 568          | how urban sprawl changes local climate                                |               |        |
|             |                  |             |           | 627          | using photovoltaic cells  |               |        |

# Correlation to Hawaii Content and Performance Standards: Physical Science and Inquiry

## Foundations of Physical Science with Earth and Space Science Student Text and Investigation Manual

| Standard #:                            | Content Standard                                    | Grade Level | Benchmark   | student text | detail  | investigation | detail  |
|--|---|-------------|---|--------------|---|---------------|---|
| II.02.02<br>Historical<br>Perspectives | Interdependence of Science, Technology, and Society | 9 - 12      | Analyze and evaluate the uses and impact of technologies locally and / or globally and propose possible solutions to address negative issues. | 333          | problems with disposing of plastics                                     | 163           | consider a vehicle's fuel economy   |
|  |   |             |   | 355          | recycling tires   | 163           | research how trees offset accumulation of CO <sub>2</sub>                         |
|  |   |             |   | 356          | recycling discarded tires   | 164           | perform water quality tests   |
|  |   |             |   | 364          | petroleum   | 178           | predict the quality of surface water to be tested and justify your answer         |
|  |   |             |   | 379          | research fuel cells   | 178           | wise use of water supply  |
|  |   |             |   | 379          | research environmental impact of fuel cells                             | 179           | address what you can do to maintain or improve the water quality at the test site |
|  |   |             |   | 392          | storage of nuclear waste  | 179           | maintaining water supply quality  |
|  |   |             |   | 400          | problems caused by airborne pollutants                                  | 180           | save water for houseplants  |
|  |   |             |   | 411          | effects of PCB's in Great Lakes   | 180           | perform water quality tests   |
|  |   |             |   | 414          | effect of electrical generating facilities on dissolved oxygen in water | 182           | the effects of acid rain on organisms in aquatic environments                     |
|  |   |             |   | 432          | water cycle and conservation  | 182           | the effects of acid rain on organisms in aquatic environments                     |
|  |   |             |   | 433          | wise use of water   | 201           | research the causes of ozone in the lower atmosphere                              |
|  |   |             |   | 433          | The Clean Water Act   |               |   |
|  |   |             |   | 435          | water quality testing   |               |   |
|  |   |             |   | 435          | water usage and quality   |               |   |
|  |   |             |   | 436          | water quality testing   |               |   |
|  |   |             |   | 437          | acid rain   |               |   |
|  |   |             |   | 437          | effects of acid rain on the soil  |               |   |
|  |   |             |   | 437          | acid rain   |               |   |

**Correlation to Hawaii Content and Performance Standards: Physical Science and Inquiry**

***Foundations of Physical Science with Earth and Space Science***

**Student Text and Investigation Manual**

| Standard #:                         | Content Standard                    | Grade Level | Benchmark  | student text | detail                                       | investigation | detail  |
|-------------------------------------|-------------------------------------|-------------|--|--------------|--|---------------|---|
|                                     |                                     |             |  | 438          | causes and health effects of acid rain       |               |   |
|                                     |                                     |             |  | 443          | impact of increased CO2 on oceans            |               |   |
|                                     |                                     |             |  | 443          | impact of increased CO2 on oceans            |               |   |
|                                     |                                     |             |  | 444          | pollution and the ocean food chain           |               |   |
|                                     |                                     |             |  | 445          | pollution and the ocean food chain           |               |   |
|                                     |                                     |             |  | 504          | temperature inversion                        |               |   |
| II.03.01<br>Historical Perspectives | "MALAMA I KA 'AINA": Sustainability | 9 - 12      | Assess the benefits and drawbacks of biotechnology on the environment and society. | 388          | nuclear vs chemical reactions                | 138           | nuclear reactions                                       |
|                                     |                                     |             |  | 393          | carbon dating                                | 160           | how do you simulate nuclear decay?                      |
|                                     |                                     |             |  | 393          | radioisotopes in science and medicine        | 161           | research pros and cons of uses for radioactive elements |
|                                     |                                     |             |  | 400          | research pros and cons of nuclear technology |               |   |

## Correlation to Hawaii Content and Performance Standards: Physical Science and Inquiry

### *Foundations of Physical Science with Earth and Space Science*

#### Student Text and Investigation Manual

| Standard #:                            | Content Standard                          | Grade Level | Benchmark   | student text | detail  | investigation | detail  |
|--|---|-------------|---|--------------|---|---------------|---|
| II.03.02<br>Historical<br>Perspectives | "MALAMA I KA<br>'AINA":<br>Sustainability | 9 - 12      | Analyze, evaluate and propose possible solutions in sustaining life on Earth, considering the limited resources and fragile environmental conditions. | 333          | problems with disposing of plastics                                     | 163           | consider a vehicle's fuel economy   |
|  |   |             |   | 355          | recycling tires   | 163           | research how trees offset accumulation of CO <sub>2</sub>                 |
|  |   |             |   | 356          | recycling discarded tires   | 164           | perform water quality tests   |
|  |   |             |   | 364          | petroleum   | 178           | wise use of water supply  |
|  |   |             |   | 379          | research environmental impact of fuel cells                             | 178           | actions to take to improve water quality                                  |
|  |   |             |   | 379          | research fuel cells   | 178           | predict the quality of surface water to be tested and justify your answer |
|  |   |             |   | 392          | storage of nuclear waste  | 179           | maintaining water supply quality  |
|  |   |             |   | 400          | problems caused by airborne pollutants                                  | 180           | save water for houseplants  |
|  |   |             |   | 403          | a water molecule is v-shaped  | 180           | perform water quality tests   |
|  |   |             |   | 403          | water structure and its function as a solvent                           | 182           | investigate effect of acid rain on microorganisms                         |
|  |   |             |   | 409          | why water is called the universal solvent                               | 201           | research the causes of ozone in the lower atmosphere                      |
|  |   |             |   | 414          | effect of electrical generating facilities on dissolved oxygen in water |               |   |
|  |   |             |   | 414          | effect of electrical generating facilities on dissolved oxygen in water |               |   |
|  |   |             |   | 432          | water cycle and conservation  |               |   |
|  |   |             |   | 433          | wise use of water   |               |   |
|  |   |             |   | 435          | water usage and quality   |               |   |
|  |   |             |   | 437          | acid rain explained   |               |   |

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***Foundations of Physical Science with Earth and Space Science***

**Student Text and Investigation Manual**

| Standard #: | Content Standard | Grade Level | Benchmark | student text | detail  | investigation | detail |
|-------------|------------------|-------------|-----------|--------------|---|---------------|--------|
|             |                  |             |           | 437          | effects of acid rain on natural environments                |               |        |
|             |                  |             |           | 439          | illustration of acid rain formation                         |               |        |
|             |                  |             |           | 443          | impact of increased CO <sub>2</sub> in oceans               |               |        |
|             |                  |             |           | 448          | research the issue of acid rain                             |               |        |
|             |                  |             |           | 471          | nitrogen cycle  |               |        |
|             |                  |             |           | 479          | effects of CFC's on the ozone layer                         |               |        |
|             |                  |             |           | 482          | changes to the oceans due to increasing global temperatures |               |        |
|             |                  |             |           | 482          | effects of burning fossil fuels                             |               |        |
|             |                  |             |           | 515          | permafrost  |               |        |
|             |                  |             |           | 568          | how urban sprawl changes local climate                      |               |        |
|             |                  |             |           | 568          | environmental impact of urban sprawl                        |               |        |

**Correlation to Hawaii Content and Performance Standards: Physical Science and Inquiry**

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**Student Text and Investigation Manual**

| Standard #:               | Content Standard | Grade Level | Benchmark  | student text | detail  | investigation | detail  |
|---------------------------|------------------|-------------|--|--------------|---|---------------|---|
| II.05.03                  | Interdependence  | 9 - 12      | Analyze the interdependence within and between terrestrial, aquatic and atmospheric systems. | 437          | acid rain   | 182           | the effects of acid rain on organisms in aquatic environments |
| Organisms and Development |                  |             |  | 438          | causes and health effects of acid rain                      | 207           | research how large bodies of water affect climate             |
|                           |                  |             |  | 439          | illustration of acid rain formation                         | 207           | research how large bodies of water affect climate             |
|                           |                  |             |  | 440          | oceans in the water cycle                                   | 212           | investigate how the ocean's salinity affects its density      |
|                           |                  |             |  | 441          | sources of salts in the ocean                               | 215           | understanding the Atlantic gyre                               |
|                           |                  |             |  | 442          | composition of seawater                                     |               |   |
|                           |                  |             |  | 443          | impact of increased CO2 on oceans                           |               |   |
|                           |                  |             |  | 482          | changes to the oceans due to increasing global temperatures |               |   |
|                           |                  |             |  | 491          | Earth's temperature varies with latitude                    |               |   |
|                           |                  |             |  | 496          | effects of the Gulf Stream on climate of Great Britain      |               |   |
|                           |                  |             |  | 496          | descriptions of ocean currents and their effects on climate |               |   |
|                           |                  |             |  | 497          | water in the atmosphere affects weather patterns            |               |   |
|                           |                  |             |  | 504          | temperature inversion                                       |               |   |
|                           |                  |             |  | 510          | effect of cold ocean currents on formation of fog deserts   |               |   |

**Correlation to Hawaii Content and Performance Standards: Physical Science and Inquiry**

***Foundations of Physical Science with Earth and Space Science***

**Student Text and Investigation Manual**

| Standard #:                          | Content Standard | Grade Level | Benchmark  | student text | detail  | investigation | detail  |
|--------------------------------------|------------------|-------------|--|--------------|---|---------------|---|
|                                      |                  |             |  | 511          | effect of warm ocean currents on formation of tropical rainforest |               |   |
|                                      |                  |             |  | 513          | effect of large bodies of water on climate                        |               |   |
|                                      |                  |             |  | 515          | alpine tundra occurs at high altitudes                            |               |   |
|                                      |                  |             |  | 559          | volcanoes and water vapor   |               |   |
|                                      |                  |             |  | 564          | landforms shaped by water   |               |   |
|                                      |                  |             |  | 568          | how urban sprawl changes local climate                            |               |   |
| II.13.01<br>The Physical Environment | Nature of Matter | 9 - 12      | Describe and explain properties of elements and their relationships in the Periodic Table. | 320          | groups of elements  | 133           | using the periodic table  |
|                                      |                  |             |  | 321          | groups of elements and valence shells                             | 136           | building and studying the periodic table                                    |
|                                      |                  |             |  | 321          | studying the periodic table                                       | 141           | build model of Na and Cl atoms and explain why they bond to form a molecule |
|                                      |                  |             |  | 329          | periodic table columns and valence electrons                      |               |   |
|                                      |                  |             |  | 330          | bonding and periodic table position                               | 142           | arrangement of electrons and groups of elements                             |
|                                      |                  |             |  | 332          | periodic table and electronegativities                            |               |   |
|                                      |                  |             |  | 332          | metals nonmetals and metalloids                                   |               |   |
|                                      |                  |             |  | 335          | periodic table and oxidation numbers                              |               |   |

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**Student Text and Investigation Manual**

| Standard #:              | Content Standard | Grade Level | Benchmark   | student text | detail   | investigation | detail  |
|--------------------------|------------------|-------------|---|--------------|--|---------------|---|
| II.13.02                 | Nature of Matter | 9 - 12      | Analyze the interactions of molecules and their relationship to the physical properties of compounds in the context of biological, chemical, and / or physical systems. | 284          | states of matter and arrangement of molecules                | 118           | molecules in a liquid                                 |
| The Physical Environment |                  |             |   | 324          | use the periodic table to predict chemical formulas          | 118           | investigate melting                                   |
|                          |                  |             |   | 324          | which element is more likely to combine with other elements? | 141           | modeling a chemical bond                              |
|                          |                  |             |   | 330          | ionic bonds  | 143           | classify ionic compounds                              |
|                          |                  |             |   | 331          | covalent bonds   | 157           | predict the products of double displacement reactions |
|                          |                  |             |   | 332          | distinguishing between ionic and covalent bonds              | 162           | carbon reactions and the environment                  |
|                          |                  |             |   | 335          | chemical bonding and the periodic table                      | 162           | importance of fossil fuels                            |
|                          |                  |             |   | 357          | chemical reactions involve rearrangement of atoms            | 162           | structure of fossil fuels                             |
|                          |                  |             |   | 364          | carbon chains  | 171           | investigate the dissolving process                    |
|                          |                  |             |   | 394          | photosynthesis and carbon reactions                          | 171           | what happened at the molecular level?                 |
|                          |                  |             |   | 395          | fossil fuels and carbon reactions                            |               |   |
|                          |                  |             |   | 403          | a water molecule is v-shaped                                 |               |   |
|                          |                  |             |   | 403          | water structure and its function as a solvent                |               |   |
|                          |                  |             |   | 405          | molecular structure of ice                                   |               |   |
|                          |                  |             |   | 409          | dissolving an ionic compound                                 |               |   |

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| Standard #:                          | Content Standard | Grade Level | Benchmark   | student text | detail  | investigation | detail  |
|--------------------------------------|------------------|-------------|---|--------------|---|---------------|---|
|                                      |                  |             |   | 409          | dissolution of ionic compounds                          |               |   |
|                                      |                  |             |   | 409          | dissolution at the molecular level                      |               |   |
|                                      |                  |             |   | 409          | why water is called the universal solvent               |               |   |
|                                      |                  |             |   | 410          | solute dissolution depends on chemical bonds            |               |   |
|                                      |                  |             |   | 410          | dissolution of covalent compounds                       |               |   |
|                                      |                  |             |   | 417          | dissolution of acids in water                           |               |   |
|                                      |                  |             |   | 418          | dissolution of bases in water                           |               |   |
|                                      |                  |             |   | 419          | neutralization of acids and bases                       |               |   |
| II.13.03<br>The Physical Environment | Nature of Matter | 9 - 12      | Analyze the effects of various factors on chemical reactions.               | 364          | formation of petroleum is a very slow chemical reaction | 156           | predict products in a double displacement reaction    |
| II.13.04<br>The Physical Environment | Nature of Matter | 9 - 12      | Analyze and explain the atomic and molecular changes in chemical reactions. | 357          | chemical reactions involve rearrangement of atoms       | 157           | predict the products of double displacement reactions |

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***Foundations of Physical Science with Earth and Space Science***

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| <b>Standard #:</b>                   | <b>Content Standard</b>               | <b>Grade Level</b> | <b>Benchmark</b>  | <b>student text</b>   | <b>detail</b>  | <b>investigation</b> | <b>detail</b>  |
|--------------------------------------|---------------------------------------|--------------------|---|---|--|----------------------|--|
| II.14.01<br>The Physical Environment | Energy, Its Transformation and Matter | 9 - 12             | Explain how different energy levels are associated with different configuration of atoms and molecules. | 330<br>331<br>332<br>388<br>404<br>405<br>406<br>409<br>410 | ionic bonds<br>covalent bonds<br>distinguishing between ionic and covalent bonds<br>showing valence electrons in a diagram<br>water is a polar molecule<br>hydrogen bonding in water<br>hydrogen bonding and properties of water<br>dissolving an ionic compound<br>solute dissolution depends on chemical bonds | 140<br>143<br>143    | find the number of electrons in outermost level<br>classify ionic compounds<br>ionic compounds |
| II.14.02<br>The Physical Environment | Energy, Its Transformation and Matter | 9 - 12             | Describe waves as means of transmitting energy.   | 195<br>480<br>626   | waves transmit energy<br>energy and radiation relationships<br>the sun's energy reaches Earth in the form of electromagnetic waves   |                      |  |

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| <b>Standard #:</b>                   | <b>Content Standard</b>               | <b>Grade Level</b> | <b>Benchmark</b>   | <b>student text</b> | <b>detail</b>                           | <b>investigation</b> | <b>detail</b>   |
|--------------------------------------|---------------------------------------|--------------------|--|---------------------|---|----------------------|---|
| II.14.03<br>The Physical Environment | Energy, Its Transformation and Matter | 9 - 12             | Apply the Laws of Conservation of Energy to describe the dynamics of a system. | 60                  | conservation of momentum                | 36                   | energy conservation and the roller coaster              |
|                                      |                                       |                    |  | 88                  | potential and kinetic energy explained  | 36                   | investigate energy conservation                         |
|                                      |                                       |                    |  | 90                  | conservation of energy explained        | 37                   | investigating conservation of energy with rollercoaster |
|                                      |                                       |                    |  | 90                  | conservation of energy                  |                      |   |
|                                      |                                       |                    |  | 92                  | energy transformations and conservation | 38                   | conservation of energy and energy transformations       |
|                                      |                                       |                    |  | 93                  | different forms of energy described     | 84                   | waves in motion   |
|                                      |                                       |                    |  | 96                  | prove that energy is conserved          | 150                  | investigate conservation of mass                        |
|                                      |                                       |                    |  | 363                 | conservation of mass                    | 158                  | energy in chemical reactions                            |
|                                      |                                       |                    |  | 363                 | conservation of mass                    |                      |   |
|                                      |                                       |                    |  | 389                 | atoms and nuclear energy                | 198                  | food energy   |

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| <b>Standard #:</b>                   | <b>Content Standard</b>               | <b>Grade Level</b> | <b>Benchmark</b>                                      | <b>student text</b> | <b>detail</b>   | <b>investigation</b> | <b>detail</b>                                 |
|--------------------------------------|---------------------------------------|--------------------|---|---------------------|---|----------------------|---|
| II.14.04<br>The Physical Environment | Energy, Its Transformation and Matter | 9 - 12             | Explain what happens in the transformation of energy. | 85                  | some input work is converted to heat                              | 38                   | identify potential/kinetic energy conversions |
|                                      |                                       |                    |   | 91                  | following an energy transformation                                | 38                   | explore energy transformations                |
|                                      |                                       |                    |   | 91                  | following an energy transformation                                | 39                   | make an energy flow chart                     |
|                                      |                                       |                    |   | 91                  | energy conversions  |                      |   |
|                                      |                                       |                    |   | 92                  | where does "spent" energy go?                                     |                      |   |
|                                      |                                       |                    |   | 96                  | explain the "lost" energy   |                      |   |
|                                      |                                       |                    |   | 537                 | potential energy transformed to kinetic energy causes earthquakes |                      |   |
|                                      |                                       |                    |   | 623                 | energy from the sun   |                      |   |
|                                      |                                       |                    |   | 626                 | harnessing the sun's energy                                       |                      |   |

# Correlation to Hawaii Content and Performance Standards: Physical Science and Inquiry

## Foundations of Physical Science with Earth and Space Science

### Student Text and Investigation Manual

| Standard #:                          | Content Standard                 | Grade Level | Benchmark   | student text | detail                                      | investigation | detail  |
|--------------------------------------|----------------------------------|-------------|---|--------------|---|---------------|---|
| II.15.01<br>The Physical Environment | Forces, Motion, Sound, and Light | 9 - 12      | Analyze the forces and motions of moving objects and simple machines. | 29           | position vs. time graph discussion          | 12            | model the car's motion graphically                            |
|                                      |                                  |             |   | 37           | speed vs. time graph discussion             | 14            | exploring acceleration on a ramp                              |
|                                      |                                  |             |   | 45           | Newton's first law summarized               | 15            | make a speed vs. time graph                                   |
|                                      |                                  |             |   | 45           | Newton's third law summarized               | 16            | 2nd law   |
|                                      |                                  |             |   | 45           | Newton's second law summarized              | 16            | thinking about force  |
|                                      |                                  |             |   | 46           | force has potential to change motion        | 19            | find correct relationship between force mass and acceleration |
|                                      |                                  |             |   | 48           | Newton's first law in detail                | 19            | discover 2nd law of motion                                    |
|                                      |                                  |             |   | 48           | Newton's laws explained and applied         | 20            | force and motion with car and ramp                            |
|                                      |                                  |             |   | 49           | Newton's second law in detail               | 20            | investigate effect of gravity on motion                       |
|                                      |                                  |             |   | 49           | force is related to acceleration            | 21            | effect of friction on the car                                 |
|                                      |                                  |             |   | 50           | Newton's second law applied                 | 22            | car and ramp and Newton's 3rd law                             |
|                                      |                                  |             |   | 52           | the effect of gravity                       | 23            | using 3rd law to explain common phenomena                     |
|                                      |                                  |             |   | 56           | friction explained                          | 25            | discover mechanical advantage of ropes and pulleys            |
|                                      |                                  |             |   | 59           | Newton's third law in detail                | 27            | changing force and distance on a lever                        |
|                                      |                                  |             |   | 64           | research effect of friction on human joints | 27            | set up a lever that has mechanical advantage                  |
|                                      |                                  |             |   | 64           | solving problems using $f=ma$               |               |   |

**Correlation to Hawaii Content and Performance Standards: Physical Science and Inquiry**

***Foundations of Physical Science with Earth and Space Science***

**Student Text and Investigation Manual**

| Standard #: | Content Standard | Grade Level | Benchmark | student text | detail   | investigation | detail  |
|-------------|------------------|-------------|-----------|--------------|--|---------------|---|
|             |                  |             |           | 67           | how simple machines manipulate forces                        | 30            | exploring force and distance with ropes and pulleys |
|             |                  |             |           | 69           | how to calculate mechanical advantage                        |               |   |
|             |                  |             |           | 70           | mechanical advantage of block and tackle                     |               |   |
|             |                  |             |           | 71           | how a lever works  |               |   |
|             |                  |             |           | 71           | pliers as an example of a lever                              |               |   |
|             |                  |             |           | 71           | the human body and simple machines                           |               |   |
|             |                  |             |           | 71           | parts of a lever   |               |   |
|             |                  |             |           | 72           | mechanical advantage of a lever                              |               |   |
|             |                  |             |           | 75           | how gears work   |               |   |
|             |                  |             |           | 78           | set up a lever with MA greater than 1                        |               |   |
|             |                  |             |           | 78           | design a toothbrush  |               |   |
|             |                  |             |           | 79           | analyze pulleys with different numbers of supporting strings |               |   |
|             |                  |             |           | 79           | calculate mechanical advantage                               |               |   |
|             |                  |             |           | 79           | analyze block and tackle                                     |               |   |
|             |                  |             |           | 80           | analyze the human jaw as a simple machine                    |               |   |
|             |                  |             |           | 80           | analyzing the jaw as a lever                                 |               |   |

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|--------------------------------------|----------------------------------|-------------|---|--------------|--|---------------|---|
|                                      |                                  |             |   | 80           | analyze block and tackle machine on a sailboat         |               |   |
|                                      |                                  |             |   | 80           | analyze wheelbarrow                                    |               |   |
|                                      |                                  |             |   | 599          | Newton's first law of motion and the space shuttle     |               |   |
| II.15.02<br>The Physical Environment | Forces, Motion, Sound, and Light | 9 - 12      | Describe and explain the effects of multiple forces acting on an object.  | 51           | net force explained                                    | 16            | unbalanced forces and acceleration of car |
|                                      |                                  |             |   | 51           | balanced and unbalanced forces                         | 22            | car and ramp and Newton's 3rd law         |
| II.15.03<br>The Physical Environment | Forces, Motion, Sound, and Light | 9 - 12      | Explain how electromagnetic waves are produced.   | 237          | light waves and the electromagnetic spectrum           |               |   |
|                                      |                                  |             |   | 480          | electromagnetic radiation                              |               |   |
| II.15.04<br>The Physical Environment | Forces, Motion, Sound, and Light | 9 - 12      | Explain that the observed wavelength of a wave depends upon the relative motion of the source and the observer. | 13           | speed is relative                                      | 20            | weight vs. mass                           |
|                                      |                                  |             |   | 18           | what is the speed of an object that is standing still? |               |   |
|                                      |                                  |             |   | 25           | conceptual models of motion                            |               |   |
|                                      |                                  |             |   | 47           | weight vs. mass  |               |   |

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|--|-------------------------|--------------------|--|---------------------------------|--|----------------------|---|
| II.16.01<br>Earth Systems and the Universe | Universe                | 9 - 12             | Explain how stars produce energy from nuclear reactions and other processes that led to the formation of all the elements. | 638<br>639<br>640<br>640<br>640 | the life cycle of stars<br>description and illustration of the life cycle of stars<br>elements formed by nuclear fusion in stars<br>death of massive stars<br>birth of elements  | 255<br>264<br>267    | observe and describe the appearance of the moon and Jupiter and its moons<br>light emission and chemical composition<br>spectral lines and elements                     |
| II.16.02<br>Earth Systems and the Universe | Universe                | 9 - 12             | Compare and contrast how stars are similar, yet different from each other.   | 638<br>639<br>639<br>640<br>640 | the life cycle of stars<br>death of small to medium stars results in white dwarfs and planetary nebula and black dwarfs<br>description and illustration of the life cycle of stars<br>death of massive stars results in supernovas and neutron stars and black holes<br>elements formed by nuclear fusion in stars | 255<br>264           | observe and describe the appearance of the moon and Jupiter and its moons<br>using spectroscopy to analyze the light emitted by stars and identify most common elements |

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|--|-------------------------|--------------------|---|--|--|----------------------|--|
| II.16.03<br>Earth Systems and the Universe | Universe                | 9 - 12             | Illustrate how information about the Universe is collected and analyzed by using technology.                              | 594<br>595<br>596<br>597<br>598<br>634 | history of the telescope<br>types and uses of telescopes<br>types and uses of telescopes<br>satellites as tools of astronomy<br>spacecraft as tools of astronomy<br>the use of spectroscopy to analyze stars | 264<br>268           | understand why spectroscopy is an important tool of astronomers<br>measuring apparent brightness to calculate the distance to stars and galaxies |
| II.17.01<br>Earth Systems and the Universe | Forces of the Universe  | 9 - 12             | Create an analogy showing the relationship between gravitational force, masses of objects, and the distance between them. | 52<br>54<br>55<br>606                  | gravity depends on mass<br>Newton's law of universal gravitation<br>calculating gravitational force between objects<br>Newton's law of universal gravitation   | 257                  | relating the relationship between orbital speed and distance to the equation of universal gravitation  |

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|--|---------------------------|--------------------|--|---------------------|---|----------------------|---|
| II.17.02<br>Earth Systems<br>and the<br>Universe | Forces of the<br>Universe | 9 - 12             | Explain the<br>relationships<br>between magnetic<br>and electric forces. | 105                 | charge is a fundamental<br>property of matter | 42                   | investigate electric charge                           |
|  |                           |                    |  | 106                 | static charge discussed                       | 68                   | investigate how an<br>electric motor works            |
|  |                           |                    |  | 107                 | explanation of coulomb                        | 73                   | use magnetic induction to<br>create an electric field |
|  |                           |                    |  | 108                 | how an electroscope<br>works                  | 73                   | exploring electric<br>generators                      |
|  |                           |                    |  | 108                 | electroscopes                                 |                      |   |
|  |                           |                    |  | 159                 | magnetism explained                           |                      |   |
|  |                           |                    |  | 163                 | understanding magnetic<br>fields              |                      |   |
|  |                           |                    |  | 168                 | how electric motors work                      |                      |   |
|  |                           |                    |  | 170                 | dissecting an electric<br>motor               |                      |   |
|  |                           |                    |  | 171                 | electromagnetic induction<br>explained        |                      |   |

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|--|------------------------------|--------------------|---|---------------------|---|----------------------|---|
| II.18.01<br>Earth Systems<br>and the<br>Universe | Earth in the Solar<br>System | 9 - 12             | Evaluate the consequences of human activities on an Earth system (e.g., driving cars increase CO <sub>2</sub> emission, causing ozone depletion), and vice-versa. | 379                 | hydrogen-powered cars and the environment                               | 52                   | the cost of using electrical appliances   |
|  |                              |                    |   | 379                 | research fuel cells   | 163                  | too much CO <sub>2</sub>  |
|  |                              |                    |   | 379                 | research environmental impact of fuel cells                             | 163                  | research how trees offset accumulation of CO <sub>2</sub>                         |
|  |                              |                    |   | 391                 | impact of nuclear energy  | 178                  | actions to take to improve water quality  |
|  |                              |                    |   | 391                 | nuclear vs. fossil fuels  | 178                  | predict the quality of surface water to be tested and justify your answer         |
|  |                              |                    |   | 395                 | fossil fuels  | 178                  | predict the quality of surface water to be tested and justify your answer         |
|  |                              |                    |   | 400                 | reducing pollution  | 178                  | predict the quality of surface water to be tested and justify your answer         |
|  |                              |                    |   | 400                 | problems caused by airborne pollutants                                  | 178                  | predict the quality of surface water to be tested and justify your answer         |
|  |                              |                    |   | 411                 | effects of PCB's in Great Lakes   | 179                  | address what you can do to maintain or improve the water quality at the test site |
|  |                              |                    |   | 414                 | environmental impact of electrical generating facilities                | 182                  | the effects of acid rain on organisms in aquatic environments                     |
|  |                              |                    |   | 414                 | effect of electrical generating facilities on dissolved oxygen in water | 182                  | the effects of acid rain on organisms in aquatic environments                     |
|  |                              |                    |   | 414                 | effect of electrical generating facilities on dissolved oxygen in water | 201                  | research the causes of ozone in the lower atmosphere                              |
|  |                              |                    |   | 433                 | The Clean Water Act   |                      |   |
|  |                              |                    |   | 435                 | water quality testing   |                      |   |
|  |                              |                    |   | 436                 | water quality testing   |                      |   |
|  |                              |                    |   | 436                 | effect of excess nitrates on environment                                |                      |   |
|  |                              |                    |   | 437                 | acid rain   |                      |   |

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| Standard #: | Content Standard | Grade Level | Benchmark | student text | detail  | investigation | detail   |
|-------------|------------------|-------------|-----------|--------------|---|---------------|--|
|             |                  |             |           | 437          | effects of acid rain on natural environments                | 262           | solar energy can be used to generate electricity without producing pollution |
|             |                  |             |           | 437          | effects of acid rain on the soil                            |               |  |
|             |                  |             |           | 437          | acid rain   |               |  |
|             |                  |             |           | 438          | impact of using fossil fuels                                |               |  |
|             |                  |             |           | 438          | causes and health effects of acid rain                      |               |  |
|             |                  |             |           | 439          | illustration of acid rain formation                         |               |  |
|             |                  |             |           | 443          | impact of increased CO <sub>2</sub> in oceans               |               |  |
|             |                  |             |           | 443          | impact of increased CO <sub>2</sub> on oceans               |               |  |
|             |                  |             |           | 443          | impact of increased CO <sub>2</sub> on oceans               |               |  |
|             |                  |             |           | 444          | pollution and the ocean food chain                          |               |  |
|             |                  |             |           | 445          | pollution and the ocean food chain                          |               |  |
|             |                  |             |           | 471          | nitrogen cycle  |               |  |
|             |                  |             |           | 479          | effects of CFC's on the ozone layer                         |               |  |
|             |                  |             |           | 482          | changes to the oceans due to increasing global temperatures |               |  |
|             |                  |             |           | 482          | effects of burning fossil fuels                             |               |  |

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| Standard #: | Content Standard | Grade Level | Benchmark | student text | detail                                 | investigation | detail |
|-------------|------------------|-------------|-----------|--------------|--|---------------|--------|
|             |                  |             |           | 504          | temperature inversion                  |               |        |
|             |                  |             |           | 515          | permafrost                             |               |        |
|             |                  |             |           | 568          | environmental impact of urban sprawl   |               |        |
|             |                  |             |           | 568          | how urban sprawl changes local climate |               |        |
|             |                  |             |           | 627          | using photovoltaic cells               |               |        |

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| Standard #:                                      | Content Standard             | Grade Level | Benchmark   | student text | detail   | investigation | detail   |
|--|------------------------------|-------------|---|--------------|--|---------------|--|
| II.18.02<br>Earth Systems<br>and the<br>Universe | Earth in the Solar<br>System | 9 - 12      | Analyze energy transfer and its effects on global climate, aquatic and terrestrial processes. | 91           | following an energy transformation                       | 38            | explore energy transformations   |
|  |                              |             |   | 91           | energy conversions                                       | 39            | make an energy flow chart  |
|  |                              |             |   | 172          | generating electric power                                | 52            | the cost of using electrical appliances                                      |
|  |                              |             |   | 391          | impact of nuclear energy                                 | 262           | solar energy can be used to generate electricity without producing pollution |
|  |                              |             |   | 391          | nuclear vs. fossil fuels                                 |               |  |
|  |                              |             |   | 400          | reducing pollution                                       | 262           | determine the efficiency of a photovoltaic cell                              |
|  |                              |             |   | 414          | environmental impact of electrical generating facilities |               |  |
|  |                              |             |   | 438          | impact of using fossil fuels                             |               |  |
|  |                              |             |   | 480          | transfer of energy in and out of Earth's atmosphere      |               |  |
|  |                              |             |   | 480          | distribution of incoming solar radiation                 |               |  |
|  |                              |             |   | 481          | Earth's "energy budget"                                  |               |  |
|  |                              |             |   | 485          | Earth's internal energy                                  |               |  |
|  |                              |             |   | 560          | description of geothermal energy                         |               |  |
|  |                              |             |   | 623          | energy from the sun                                      |               |  |
|  |                              |             |   | 626          | harnessing the sun's energy                              |               |  |
|  |                              |             |   | 627          | using photovoltaic cells                                 |               |  |
|  |                              |             |   | 627          | the efficiency of photovoltaic cells                     |               |  |

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| Standard #:                                      | Content Standard             | Grade Level | Benchmark   | student text | detail  | investigation | detail  |
|--|------------------------------|-------------|---|--------------|---|---------------|---|
| II.18.03<br>Earth Systems<br>and the<br>Universe | Earth in the Solar<br>System | 9 - 12      | Justify why global<br>atmospheric<br>subsystems<br>necessitate<br>international<br>cooperation in<br>pollution control. | 437          | acid rain   | 182           | the effects of acid rain on<br>organisms in aquatic<br>environments |
|  |                              |             |   | 438          | causes and health effects<br>of acid rain             | 185           | effect of ocean on carbon<br>dioxide levels in the<br>atmosphere    |
|  |                              |             |   | 443          | impact of increased CO2<br>on oceans                  | 202           | investigate the<br>temperature effects of<br>greenhouse gases       |
|  |                              |             |   | 481          | greenhouse effect and<br>greenhouse gasses            | 213           | exploring how<br>temperature-dependent<br>layering creates currents |
|  |                              |             |   | 483          | global temperature<br>changing over time              |               |   |
|  |                              |             |   | 485          | computer modeling to<br>predict greenhouse<br>effects |               |   |
|  |                              |             |   | 493          | convection currents in the<br>atmosphere              |               |   |
|  |                              |             |   | 495          | global wind patterns                                  |               |   |
|  |                              |             |   | 502          | effects of moving air<br>masses                       |               |   |
|  |                              |             |   | 502          | cold fronts   |               |   |
|  |                              |             |   | 503          | jet streams   |               |   |
|  |                              |             |   | 503          | warm fronts   |               |   |
|  |                              |             |   | 504          | temperature inversion                                 |               |   |
|  |                              |             |   | 528          | Earth's surface is<br>changing                        |               |   |

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|--|--------------------------------|--------------------|---|---------------------|---|----------------------|--|
| II.19.01<br>Earth Systems<br>and the<br>Universe | Forces that Shape<br>the Earth | 9 - 12             | Analyze how any of<br>the Earth's<br>Systems shapes<br>the Earth. | 483                 | global temperature<br>changing over time                        | 229                  | identifying tectonic plates<br>and plate boundaries                                      |
|  |                                |                    |   | 528                 | predicting what Earth<br>might look like in 50<br>million years | 230                  | predicting plate<br>movement over 50<br>million years and the<br>resultant land features |
|  |                                |                    |   | 528                 | definition of plate<br>tectonics                                | 240                  | estimating the effects of<br>meteor impacts on Earth                                     |
|  |                                |                    |   | 528                 | Earth's surface is<br>changing                                  | 241                  | identifying which geologic<br>features on Earth were<br>caused by meteors                |
|  |                                |                    |   | 532                 | theory of plate tectonics                                       |                      |  |
|  |                                |                    |   | 533                 | describing plate<br>boundaries                                  |                      |  |
|  |                                |                    |   | 533                 | activity of Earth's crust at<br>plate boundaries                |                      |  |
|  |                                |                    |   | 534                 | divergent plate<br>boundaries                                   |                      |  |
|  |                                |                    |   | 534                 | balance of creating and<br>consuming Earth's crust              |                      |  |
|  |                                |                    |   | 534                 | land features resulting<br>from divergent plate<br>boundaries   |                      |  |
|  |                                |                    |   | 535                 | convergent plate<br>boundaries                                  |                      |  |
|  |                                |                    |   | 535                 | resulting land features<br>from subduction                      |                      |  |
|  |                                |                    |   | 536                 | transform plate<br>boundaries                                   |                      |  |
|  |                                |                    |   | 536                 | land features resulting<br>from transform plate<br>boundaries   |                      |  |

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|-------------|------------------|-------------|-----------|--------------|--|---------------|--------|
|             |                  |             |           | 547          | predict separation of North America and Europe in 75 million years |               |        |
|             |                  |             |           | 548          | predict effects of divergent plate boundaries on Great Rift Valley |               |        |
|             |                  |             |           | 555          | formation of Hawaiian Islands due to volcanic activity             |               |        |
|             |                  |             |           | 558          | volcanoes shape the Earth  |               |        |
|             |                  |             |           | 562          | constructive and destructive processes                             |               |        |
|             |                  |             |           | 562          | constructive and destructive processes                             |               |        |
|             |                  |             |           | 563          | constructive process of mountain building                          |               |        |
|             |                  |             |           | 563          | mountain-building  |               |        |
|             |                  |             |           | 564          | the destructive process of erosion                                 |               |        |
|             |                  |             |           | 564          | changes in land features due to erosion                            |               |        |
|             |                  |             |           | 564          | landforms shaped by water  |               |        |
|             |                  |             |           | 565          | wind erosion   |               |        |
|             |                  |             |           | 565          | formation of soil  |               |        |
|             |                  |             |           | 566          | effect of glaciers on land   |               |        |
|             |                  |             |           | 576          | the rock cycle   |               |        |

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|-------------|------------------|-------------|-----------|--------------|----------------|---------------|--------|
|             |                  |             |           | 576          | the rock cycle |               |        |

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|--|--------------------------------|--------------------|--|---------------------|---|----------------------|--|
| II.19.02<br>Earth Systems<br>and the<br>Universe | Forces that Shape<br>the Earth | 9 - 12             | Relate the Theory<br>of Plate Tectonics<br>to our island<br>formation, volcanic<br>activity, and/ or<br>earthquakes. | 528                 | definition of plate<br>tectonics            | 228                  | listing which kind of plate<br>boundary is associated<br>with each geologic feature  |
|  |                                |                    |  | 530                 | sea-floor spreading and<br>mid-ocean ridges | 229                  | identifying tectonic plates<br>and plate boundaries  |
|  |                                |                    |  | 531                 | magnetic patterns on the<br>sea floor       | 232                  | create a model that<br>simulates an earthquake<br>and discover some of the<br>conditions that affect its<br>timing, duration, and<br>intensity |
|  |                                |                    |  | 532                 | theory of plate tectonics                   | 232                  | create a model that<br>simulates an earthquake<br>and discover some of the<br>conditions that affect its<br>timing, duration, and<br>intensity |
|  |                                |                    |  | 533                 | describing plate<br>boundaries              |                      |  |
|  |                                |                    |  | 534                 | divergent plate<br>boundaries               | 232                  | create a model that<br>simulates an earthquake<br>and discover some of the<br>conditions that affect its<br>timing, duration, and<br>intensity |
|  |                                |                    |  | 535                 | convergent plate<br>boundaries              |                      |  |
|  |                                |                    |  | 536                 | transform plate<br>boundaries               |                      |  |
|  |                                |                    |  | 537                 | causes and descriptions<br>of earthquakes   | 236                  | understanding the<br>Volcanic Explosivity Index  |
|  |                                |                    |  | 537                 | earthquakes and plate<br>tectonics          | 237                  | finding a pattern of<br>volcanoes related to the<br>locations of plate<br>boundaries   |
|  |                                |                    |  | 539                 | earthquakes rating scales                   | 237                  | examining the magma<br>chemistry of volcanoes<br>and how it relates to a<br>volcano's location   |
|  |                                |                    |  | 552                 | formation of magma in<br>Earth's mantle     |                      |  |
|  |                                |                    |  | 552                 | geologic basis for<br>volcanic eruptions    |                      |  |
|  |                                |                    |  | 553                 | where volcanic activity<br>occurs           |                      |  |
|  |                                |                    |  | 554                 | types and shapes of<br>volcanoes            |                      |  |

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|-------------|------------------|-------------|-----------|--------------|--|---------------|--------|
|             |                  |             |           | 554          | properties of volcanically formed rock         |               |        |
|             |                  |             |           | 555          | geologic basis for shield volcanoes            |               |        |
|             |                  |             |           | 555          | formation of shield volcanoes due to hot spots |               |        |
|             |                  |             |           | 555          | shield volcanoes                               |               |        |
|             |                  |             |           | 556          | stratovolcanoes                                |               |        |
|             |                  |             |           | 556          | formation of stratovolcanoes due to subduction |               |        |
|             |                  |             |           | 556          | geologic basis for stratovolcanoes             |               |        |
|             |                  |             |           | 557          | geologic bases for cinder cone volcanoes       |               |        |
|             |                  |             |           | 559          | types of volcanic rock                         |               |        |
|             |                  |             |           | 561          | describing volcanic rock                       |               |        |