# Correlation to District of Columbia Science Standards: Essential Skills
## *Foundations of Physical Science* Student Text and Investigation Manual

| Standard #: Grade | Subject | Content Standard | Essential Skills | student text pg | detail | investigation pg | detail |
|---|---|---|---|---|---|---|---|
| PS.3.01<br>8 | Physical Science | Each student describes the structure of matter, the physical and chemical changes it undergoes, and its energy sources and transformations. | The student draws models that show the structure and parts of an atom | 311<br>311<br>315<br>318<br>388 | location/size/charge of subatomic particles<br>protons/neutrons/electrons<br>atoms of same element have same atomic number<br>proton/electron attraction<br>showing valence electrons in a diagram | 132<br>132<br>133<br>133<br>136<br>137<br>137<br>140<br>140 | atomic number determines what element that atom is<br>building atom models<br>location of electrons in atom<br>protons and neutrons<br>model stable and neutral atoms<br>importance of atomic number<br>build atomic models<br>find the number of electrons in outermost level<br>review subatomic particles |

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|---|---|---|---|---|---|---|---|
| PS.3.02<br>8 | Physical Science | Each student describes the structure of matter, the physical and chemical changes it undergoes, and its energy sources and transformations. | The student observes, describes, and measures physical properties of matter including melting point, boiling point, solubility, mass, volume and density | 278 | mixtures can be separated by physical means | 114 | separating a homogeneous mixture |
| | | | | 281 | volume and mass contrasted | 116 | mass and volume measurements |
| | | | | 284 | melting and boiling point explained | 118 | observe melting process and study quantitatively |
| | | | | 284 | changes of state | 119 | melting point of ice |
| | | | | 284 | melting and boiling points | 119 | create a temperature vs. time graph of phase change |
| | | | | 285 | table of melting and boiling points | 119 | energy and phase changes |
| | | | | 285 | characteristics of matter related to its state | 124 | build a density column |
| | | | | 291 | density is independent of amount of substance | 126 | investigating buoyancy with clay boats |
| | | | | 291 | density explained | 128 | use CPO viscometer to study viscosity |
| | | | | 292 | elasticity is a physical property of matter | 166 | design experiments to explore dissolving rate |
| | | | | 292 | hardness is a physical property of matter | 167 | what happened at the molecular level? |
| | | | | 293 | brittleness is a physical property of matter | 167 | investigate the dissolving process |
| | | | | 294 | development of Kevlar brand fiber | 168 | investigate solubility of sugar |
| | | | | 294 | malleability is a physical property of matter | 170 | solubility and temperature |
| | | | | 294 | tensile strength is a physical property of matter | | |

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|---|---|---|---|---|---|---|---|
| | | | | 295 | relationship between mass volume and density | | |
| | | | | 296 | density of liquid water vs. ice | | |
| | | | | 297 | buoyancy explained | | |
| | | | | 298 | sinking and floating | | |
| | | | | 302 | viscosity of motor oils | | |
| | | | | 305 | viscosity of glue mixtures | | |
| | | | | 406 | molecular motion and dissolving rate | | |
| | | | | 406 | molecular motion and dissolving rate | | |
| | | | | 407 | surface area and dissolving rate | | |
| | | | | 411 | effect of temperature on solubility | | |
| | | | | 421 | why water is a nearly universal solvent | | |
| | | | | 423 | polar solutes | | |
| PS.3.03 8 | Physical Science | Each student describes the structure of matter, the physical and chemical changes it undergoes, and its energy sources and transformations. | The student differentiates mass and weight | 47 | weight vs. mass | 20 | weight vs. mass |
| | | | | 53 | how to calculate weight | 24 | measure force in newtons |
| | | | | 69 | newtons and pounds | | |

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|---|---|---|---|---|---|---|---|
| PS.3.04<br>8 | Physical Science | Each student describes the structure of matter, the physical and chemical changes it undergoes, and its energy sources and transformations. | The student explains how temperature affects the average kinetic energy of atoms | 451<br>452 | temperature and kinetic energy<br>temperature scales | 119 | investigate temperature and energy transfer in melting process |
| PS.3.05<br>8 | Physical Science | Each student describes the structure of matter, the physical and chemical changes it undergoes, and its energy sources and transformations. | The student illustrates how changes in energy causes change in phase | 284<br>284 | states of matter and arrangement of molecules<br>changes of state | 118<br>118<br>119<br>119<br>119 | molecules in a liquid<br>investigate melting<br>investigate melting and create a graph<br>create a temperature vs. time graph of phase change<br>energy and phase changes |
| PS.3.06<br>8 | Physical Science | Each student describes the structure of matter, the physical and chemical changes it undergoes, and its energy sources and transformations. | The student differentiates physical and chemical changes in matter | 294<br>353<br>355<br>372 | development of Kevlar brand fiber<br>physical and chemical changes and digestion<br>physical and chemical changes in tire recycling<br>determine if changes are chemical or physical | 146 | investigate and observe chemical and physical changes in the lab |

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|---|---|---|---|---|---|---|---|
| PS.3.07 8 | Physical Science | Each student describes the structure of matter, the physical and chemical changes it undergoes, and its energy sources and transformations. | The student determines relationships between mass and volume | 78 | use and understand mass measurements | 18 | use a balance to find mass of car |
| | | | | 280 | measuring volume of solids | 116 | measuring mass |
| | | | | 280 | measuring volume of liquids | 116 | mass and volume measurements |
| | | | | 281 | volume and mass contrasted | 117 | measuring volume |
| | | | | 295 | relationship between mass volume and density | | |

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|---|---|---|---|---|---|---|---|
| PS.3.08 8 | Physical Science | Each student describes the structure of matter, the physical and chemical changes it undergoes, and its energy sources and transformations. | The student compares and contrasts the properties of particles and waves | 195 | waves transmit energy | 94 | does sound behave like other waves? |
| | | | | 222 | effect of medium on speed of sound wave | 132 | comparing atoms |
| | | | | 222 | effect of temperature on speed of sound wave | 140 | find the number of electrons in outermost level |
| | | | | 311 | all matter is formed from atoms | 141 | modeling a chemical bond |
| | | | | 311 | all matter is formed from atoms | | |
| | | | | 324 | use the periodic table to predict chemical formulas | | |
| | | | | 324 | which element is more likely to combine with other elements? | | |
| | | | | 335 | chemical bonding and the periodic table | | |
| | | | | 388 | showing valence electrons in a diagram | | |
| | | | | 474 | energy and radiation relationships | | |

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|---|---|---|---|---|---|---|---|
| PS.3.09 8 | Physical Science | Each student describes the structure of matter, the physical and chemical changes it undergoes, and its energy sources and transformations. | The student describes the general properties of atoms and how these properties change when electrons are transferred from one substance to another | 315 | atoms of same element have same atomic number | 132 | atomic number determines what element that atom is |
| | | | | 324 | use the periodic table to predict chemical formulas | 136 | ions |
| | | | | 324 | which element is more likely to combine with other elements? | 137 | importance of atomic number |
| | | | | 330 | Lewis Dot diagrams | 141 | whan an atom ionizes |
| | | | | 335 | chemical bonding and the periodic table | 141 | modeling a chemical bond |
| | | | | 354 | new substances are formed when a chemical change occurs | 157 | predict the products of double displacement reactions |
| | | | | 357 | chemical reactions involve rearrangement of atoms | 161 | research pros and cons of uses for radioactive elements |
| | | | | 364 | carbon chains | 162 | carbon reactions and the environment |
| | | | | 393 | carbon dating | | |
| | | | | 393 | radioisotopes in science and medicine | | |
| | | | | 400 | research pros and cons of nuclear technology | | |

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|---|---|---|---|---|---|---|---|
| PS.3.10 8 | Physical Science | Each student describes the structure of matter, the physical and chemical changes it undergoes, and its energy sources and transformations. | The student describes forms of radiant, light and thermal energy and their applications to everyday life | 91 | following an energy transformation | 39 | make an energy flow chart |
| | | | | 91 | understand basic forms of energy | 39 | identify type of energy involved |
| | | | | 195 | waves transmit energy | 119 | investigate temperature and energy transfer in melting process |
| | | | | 468 | heat transfer through air | 147 | feel the heat generated by chemical reaction |
| | | | | 468 | densely packed solids are good conductors of heat | 190 | investigate conduction through all states of matter |
| | | | | 470 | convection currents and weather | 192 | investigate convection in liquids |
| | | | | 470 | warming hands over candle | 194 | investigate radiation emitted by solids |
| | | | | 472 | convection currents in water | 194 | investigate radiation emitted by liquids |
| | | | | 474 | energy and radiation relationships | | |
| | | | | 476 | solid road surface emits radiation | | |
| | | | | 478 | apply knowledge of heat transfer to different situations | | |
| | | | | 481 | global warming and heat transfer by radiation | | |

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| Standard #: Grade | Subject | Content Standard | Essential Skills | student text pg | detail | investigation pg | detail |
|---|---|---|---|---|---|---|---|
| PS.3.11<br>8 | Physical Science | Each student describes the structure of matter, the physical and chemical changes it undergoes, and its energy sources and transformations. | The student gives examples of how different types of energy can be transferred by radiation, conduction and convection | 468<br>468<br>470<br>470<br>472<br>476<br>478<br>481 | heat transfer through air<br>densely packed solids are good conductors of heat<br>convection currents and weather<br>warming hands over candle<br>convection currents in water<br>solid road surface emits radiation<br>apply knowledge of heat transfer to different situations<br>global warming and heat transfer by radiation | 190<br>192<br>194<br>194 | investigate conduction through all states of matter<br>investigate convection in liquids<br>investigate radiation emitted by solids<br>investigate radiation emitted by liquids |
| PS.3.12<br>8 | Physical Science | Each student describes the structure of matter, the physical and chemical changes it undergoes, and its energy sources and transformations. | The student explains how the principle of conservation of energy is applied during an energy transfer | 88<br>90<br>91<br>92<br>93<br>96 | potential and kinetic energy explained<br>conservation of energy explained<br>energy conversions<br>energy transformations and conservation<br>different forms of energy described<br>prove that energy is conserved | 36<br>37<br>38<br>38<br>188 | energy conservation and the roller coaster<br>investigating conservation of energy with rollercoaster<br>explore energy transformations<br>conservation of energy and energy transformations<br>specific heat and conservation of energy |

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| Standard #: Grade | Subject | Content Standard | Essential Skills | student text pg | detail | investigation pg | detail |
|---|---|---|---|---|---|---|---|
| PS.3.13<br>8 | Physical Science | Each student describes the structure of matter, the physical and chemical changes it undergoes, and its energy sources and transformations. | The student explains properties and parts of waves, and the effects of different media on waves | 179 | what is a cycle? | 83 | measure speed of a wave pulse |
| | | | | 182 | concept of period explained | 83 | find speed of a wave |
| | | | | 182 | concept of frequency explained | 85 | observing reflection in water waves |
| | | | | 192 | analyze systems to find cycle/period/frequency | 86 | investigate frequency and wavelength |
| | | | | 195 | waves transmit energy | 86 | adjust frequency of a standing wave |
| | | | | 198 | frequency and wavelength and amplitude | 95 | interference and sound waves |
| | | | | 201 | waves and refraction | 108 | explore refraction with a prism |
| | | | | 201 | reflection in water waves and light waves | | |
| | | | | 201 | waves and reflection | | |
| | | | | 201 | waves and absorption | | |
| | | | | 202 | refraction and eyeglasses | | |
| | | | | 215 | properties of sound waves | | |
| | | | | 221 | importance of wavelength of sound waves | | |
| | | | | 242 | properties of light waves | | |
| | | | | 261 | refraction and lenses | | |
| | | | | 474 | energy and radiation relationships | | |
| | | | | 474 | electromagnetic radiation | | |

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|---|---|---|---|---|---|---|---|
| PS.3.14 8 | Physical Science | Each student describes the structure of matter, the physical and chemical changes it undergoes, and its energy sources and transformations. | The student defines, estimates and calculates speed, velocity and acceleration of objects | 14 | how to calculate speed | 8 | calculating speed |
| | | | | 15 | compare and contrast speed and velocity | 9 | collect data and calculate speed of car |
| | | | | 20 | find speed of bumblebee | 10 | calculate speed of the car |
| | | | | 20 | calculate speed of car | 12 | calculate speed of moving car |
| | | | | 24 | accurate speed measurements | 12 | find speed of car at different positions |
| | | | | 30 | position vs. time graphs | 13 | make a position vs. time graph |
| | | | | 32 | average speed vs. instantaneous | 14 | calculate acceleration of car on ramp |
| | | | | 32 | average speed discussed | 14 | acceleration is the rate at which speed changes |
| | | | | 33 | understanding acceleration | 14 | calculate speed of car at two places on the ramp |
| | | | | 35 | how to calculate acceleration | 15 | make a speed vs. time graph |
| | | | | 36 | examples of acceleration | 17 | explore 2nd law and acceleration |
| | | | | 37 | speed vs. time graphs | 17 | caclulate speed of car |
| | | | | 41 | find acceleration of car | 36 | find speed of marble |
| | | | | 42 | calculate speed from distance/time graph | | |
| | | | | 49 | link between force and acceleration | | |
| | | | | 53 | acceleration due to gravity | | |

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|---|---|---|---|---|---|---|---|
| PS.3.15 8 | Physical Science | Each student describes the structure of matter, the physical and chemical changes it undergoes, and its energy sources and transformations. | The student measures the frequency of waves and identifies devices that use wave energy | 179 | what is a cycle? | 83 | measure speed of a wave pulse |
| | | | | 182 | concept of frequency explained | 83 | find speed of a wave |
| | | | | 182 | concept of period explained | 86 | investigate frequency and wavelength |
| | | | | 192 | analyze systems to find cycle/period/frequency | 86 | adjust frequency of a standing wave |
| | | | | 195 | waves transmit energy | | |
| | | | | 198 | frequency and wavelength and amplitude | | |
| | | | | 215 | properties of sound waves | | |
| | | | | 221 | importance of wavelength of sound waves | | |
| | | | | 242 | properties of light waves | | |
| | | | | 474 | energy and radiation relationships | | |

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|---|---|---|---|---|---|---|---|
| PS.3.16<br>8 | Physical Science | Each student describes the structure of matter, the physical and chemical changes it undergoes, and its energy sources and transformations. | The student describes the frequency of waves and identifies devices that use wave energy | 179<br>182<br>182<br>192<br>195<br>198<br>215<br>221<br>242<br>474 | what is a cycle?<br>concept of frequency explained<br>concept of period explained<br>analyze systems to find cycle/period/frequency<br>waves transmit energy<br>frequency and wavelength and amplitude<br>properties of sound waves<br>importance of wavelength of sound waves<br>properties of light waves<br>energy and radiation relationships | 83<br>83<br>86<br>86 | measure speed of a wave pulse<br>find speed of a wave<br>investigate frequency and wavelength<br>adjust frequency of a standing wave |
| PS.3.17<br>8 | Physical Science | Each student describes the structure of matter, the physical and chemical changes it undergoes, and its energy sources and transformations. | The student describes the properties of forces that act at a distance (e.g., gravitational, electrical, magnetic) | 52<br>54<br>55<br>106<br>106<br>159<br>163 | gravity depends on mass<br>Newton's law of universal gravitation<br>calculating gravitational force between objects<br>electrical force is incredibly strong!<br>electrical forces<br>magnetism explained<br>understanding magnetic fields | 62<br>64<br>66 | describing forces that magnets exert on each other<br>testing materials to see if they are affected by magnets<br>compare electromagnets and permanent magnets |

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|---|---|---|---|---|---|---|---|
| PS.3.18<br>8 | Physical Science | Each student describes the structure of matter, the physical and chemical changes it undergoes, and its energy sources and transformations. | The student constructs an electromagnet then explains the forces at work | 164<br>166<br>166<br>171 | what is an electromagnet?<br>increased current vs. strength of magnetic field<br>building an electromagnet<br>electromagnetic induction explained | 66<br>67<br>73<br>73 | build an electromagnet<br>find out what happens to strength of electromagnet when current is increased<br>exploring electric generators<br>use magnetic induction to create an electric field |
| PS.3.19<br>8 | Physical Science | Each student describes the structure of matter, the physical and chemical changes it undergoes, and its energy sources and transformations. | The student differentiates parallel and series circuits | 145<br>145<br>145<br>145<br>146<br>147<br>151<br>155<br>156 | single path vs. branching paths<br>holiday lights as series or parallel<br>parallel circuit defined<br>series circuit defined<br>household wiring<br>current and voltage in series circuits<br>voltage and resistance in parallel circuits<br>analyze a parallel circuit<br>analyze a series circuit | 56<br>56<br>57<br>58<br>60<br>61 | build a parallel circuit<br>build a series circuit<br>compare brightness of bulbs in series vs. parallel<br>build a series circuit and find total resistance<br>parallel circuit and Ohm's law<br>compare current and voltage and resistance in each type of circuit |

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|---|---|---|---|---|---|---|---|
| PS.3.20<br>8 | Physical Science | Each student describes the structure of matter, the physical and chemical changes it undergoes, and its energy sources and transformations. | The student describes some common contact forces( e.g., buoyancy, tension, friction) | 56 | friction explained | 21 | effect of friction on the car |
| | | | | 64 | research effect of friction on human joints | 126 | investigating buoyancy with clay boats |
| | | | | 291 | density is independent of amount of substance | | |
| | | | | 292 | elasticity is a physical property of matter | | |
| | | | | 292 | hardness is a physical property of matter | | |
| | | | | 293 | brittleness is a physical property of matter | | |
| | | | | 294 | tensile strength is a physical property of matter | | |
| | | | | 294 | malleability is a physical property of matter | | |
| | | | | 297 | buoyancy explained | | |
| | | | | 298 | sinking and floating | | |
| PS.3.21<br>8 | Physical Science | Each student describes the structure of matter, the physical and chemical changes it undergoes, and its energy sources and transformations. | The student identifies forces that act on an object and the effect of the forces on the 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 |

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| PS.3.22<br>8 | Physical Science | Each student describes the structure of matter, the physical and chemical changes it undergoes, and its energy sources and transformations. | The student explains how simple machines are used to change the direction or size of a force | 67 | how simple machines manipulate forces | 12 | calculate speed of moving car |
| | | | | 69 | how to calculate mechanical advantage | 25 | discover mechanical advantage of ropes and pulleys |
| | | | | 70 | mechanical advantage of block and tackle | 27 | changing force and distance on a lever |
| | | | | 71 | the human body and simple machines | 27 | set up a lever that has mechanical advantage |
| | | | | 71 | parts of a lever | 30 | exploring force and distance with ropes and pulleys |
| | | | | 71 | how a lever works | | |
| | | | | 71 | pliers as an example 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 | calculate mechanical advantage | | |
| | | | | 79 | analyze pulleys with different numbers of supporting strings | | |
| | | | | 79 | analyze block and tackle | | |
| | | | | 80 | analyzing the jaw as a lever | | |
| | | | | 80 | analyze block and tackle machine on a sailboat | | |

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|---|---|---|---|---|---|---|---|
| | | | | 80 | analyze wheelbarrow | | |
| PS.3.23<br>8 | Physical Science | Each student describes the structure of matter, the physical and chemical changes it undergoes, and its energy sources and transformations. | The student explains how gravity is a force that every mass exerts on every other mass | 52<br>52<br>54<br>55 | the effect of gravity<br>gravity depends on mass<br>Newton's law of universal gravitation<br>calculating gravitational force between objects | 20 | investigate effect of gravity on motion |