**4th Grade Physical Science Unit overview**

 **Time Frame:** Unit AHeat,Electricity,& Magnetism- (Dec-Feb)

 Unit B Properties & Changes of Matter- (Feb-March)

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| **Unit Essential Questions:*** **How is energy transformed and changed in our environment?**
* **How is energy changed from one form to another?**
* **How is heat energy transferred and transformed?**
* **How is electrical energy transferred and transformed?**
* **How is energy transfer used to solve problems?**
* **What are the basic properties of all matter?**
* **How is mass related to an object’s weight?**
* **How does matter change states?**
* **How does energy affect the states of matter?**

**Big ideas:*** **Heat and electricity are forms of energy.**
* **Evidence of energy is chang3e.**
* **Electrical circuits demonstrate a transfer of energy.**
* **Magnetism is a physical property of matter.**
* **Heat can be transferred from one substance or object to another.**
* **All objects have physical properties that can be measured.**
* **Matter exists in different states.**
* **Matter can change from one state to another by heating and cooling.**
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| **Essential Concepts/Skills/****GLCE’s:*** **P.EN.04.12 Identify heat and electricity as forms of energy.**
* **P.EN.04.41 Demonstrate how temperature can be increased in a substance by adding energy.**
* **P.EN.04.42 Describe heat as the energy produced when substances burn, certain kinds of materials rub against each other, and when electricity flows through wire.**
* **P.EN.04.43 Describe how heat is produced through electricity, rubbing and burning.**
* **P.EN.04.51 Demonstrate how electrical energy is transferred and changed through the use of a simple circuit.**
* **P.EN.04.52 Demonstrate magnetic effects in a simple electric circuit.**
* **P.PM.04.53 Identify objects that are good conductors or poor conductors of heat and electricity.**
* **P.PM.04.33 Demonstrate magnetic field by observing the patterns formed with iron filings using a variety of magnets.**
* **P.PM.04.34 Demonstrate that magnetic objects are affected by the strength of the magnet and the distance from the magnet.**
* **P.PM.04.16 Measure the weight (spring scale) and mass (balances) in grams or kilograms of objects.**
* **P.PM.04.17 Measure the volume of liquids in milliliters and liters.**
* **P.PM.04.23 Compare and contrast the states (solid, liquid, and gas) of matter.**
* **P.CM.04.11 Explain how matter can change from one state (solid, liquid, and gas) to another by heating and cooling.**

**NGSS:****4-PS3-2.** Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. [Assessment Boundary: Assessment does not include quantitative measurements of energy.]**ETS1.A**: Defining Engineering Problems1. Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (secondary to 4-PS3-4)
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|  ***PRE-PLANNING CONSIDERATIONS*** |
| **Misconceptions that need to be addressed:*** Heat is not energy.
* Thermometers measure heat.
* Things use up energy.
* Energy is a thing.
* Temperature is a property of a particular material or object. (Metal is naturally cooler than plastic).
* The temperature of an object depends on its size.
* Ice cannot change temperature**.**
* The magnetic and geographic poles of the earth are located at the same place.
* Gases are not matter because most are invisible.
* Melting/freezing and boiling/condensation are often understood only in terms of water.
* Measurement is only linear**.**
* You cannot measure the volume of some objects because they do not have "regular" lengths, widths, or heights.
* An objects' volume is greater in water than in air.
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| **Vocabulary** |
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| **Critically Important- Assessable*** **heat**
* **electricity**
* **energy**
* **evident**
* **temperature**
* **thermometer**
* **Celsius**
* **Fahrenheit**
* **increase**
* **decrease**
* **substance**
* **electric current**
* **friction**
* **simple circuit**
* **open circuit**
* **closed circuit**
* **battery**
* **wire**
* **bulb**
* **power source**
* **energy transfer**
* **conduct**
* **compass**
* **magnet**
 | * **magnetic field**
* **magnetic poles**
* **lines of force**
* **iron filings**
* **attract**
* **repel**
* **generator**
* **device**
* **appliance**
* **weight**
* **spring scale**
* **grams**
* **kilograms**
* **balance**
* **volume**
* **liter (L)**
* **milliliter (mL)**
* **matter/states of matter**
* **solid**
* **liquid**
* **gas**
* **definte (as related to shape)**
* **compare/contrast**
* **mass**
 |  ***Instructionally Useful**** ***conduct***
* ***conduction resistance***
* ***electromagnet***
* ***three dimensional***
* ***metric unit of measure***
* ***space (related to volume)***
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| **Supplies to gather or things that need to be done:** |
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| **·Beakers 2- capacity of at**  **least 250 mL****·electric fan****· flashlights****· hot plate****·paper circles (1 or 2 per**  **student)****·pinwheel****·plastic rulers****·radio (battery powered)****·radio (electrical)****·radiometers****·shallow pan (2, pie pan)****·thread****·toaster****·baby food jars (1 per group)****·clock or watch****·colored pencils****·foam cups****·hot water****·sealable plastic bags****·thermometers ( 2 per group)****·balloon****·bottle (1; 8 oz w/ narrow neck- small glass salad bottle works well)****·large bowl****·candle and holder****·file folders****·hair dryer****·ice cubes (6-10)****·matches or lighter****·metal cans (2 w/ one end removed)****·mirrors****·paper cups****·plastic wrap** **·rubber bands** | **·sand****·construction paper (red, black, white, blue, black)****·strip thermometers****·scissors****·glue sticks****·large © Pringles can (1 per group)****·aluminum foil****·hammer & nail****·wire hanger****·bricks or blocks of wood****·hot dogs, buns****·soil****·graph paper****·one-cup measures (3)****·cloth strips****·cotton balls****·insulating material (foam, cardboard, cotton)****·magnifying lenses (10)****·metal soup cans (10)****·shoeboxes w/ lids (10)****·masking tape****·thermos****·2 quart bottle****·carpet square****·platform scale****·paper towels (2)****·waxed paper****·fabric scraps****·batteries (D & 1.5 V)****·battery holder (for D cell)****·miniature bulbs (1 per group)****·cardboard cut-out of a battery****·cardboard cut-out of a bulb****·rope****·wire (4 per group)****·wire strippers****·paper bags (1 per group)****·buzzers****·lamp holders****·small motors (2 per group** | **· brass brads****·metric ruler****·paper clips****·magnetic compass****·sand paper****·miniature string lights****·various types of magnets****·metal washers****·string or fishing line****·toothpicks****·iron filings****·pan balance****·two gelatin boxes (1 full, 1 empty)****·empty paper towel roll****·golf ball****·centimeter/gram cubes****·gram stackers·mass sets****·calculators****·grocery bag****·gallon freezer bag****·spring scale****·Legos or K’nex set (per team)****·graduate cylinders (various sizes)****·marbles****·rain gauges****·modeling clay****·equal arm balance****·sawdust or woodchips****·wooden dowels****·spring****·popsicle sticks****·straws****·pipe cleaners****·PVC piping****·pennies****·onions****·aquarium** **·safety googles****·one-gallon plastic milk container** |

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| **Additional Resources** |
|  **Digital Resources for Students:*** [**www.flintsciencesource.weebly.com**](http://www.flintsciencesource.weebly.com)
* [**http://kids.mel.org/HomeworkHelpers**](http://kids.mel.org/HomeworkHelpers) **(Michigan elibrary- digital books)**

 **Professional Learning for Teachers:*** [**http://learningcenter.nsta.org/product\_detail.aspx?id=10.2505/7/SCB-EN.3.1**](http://learningcenter.nsta.org/product_detail.aspx?id=10.2505/7/SCB-EN.3.1) **(free 2 hour online inquiry content module about heat)**
* [**http://learningcenter.nsta.org/product\_detail.aspx?id=10.2505/7/SCB-EMF.2.1**](http://learningcenter.nsta.org/product_detail.aspx?id=10.2505/7/SCB-EMF.2.1) **(free 2 hour online inquiry content module about electricity & magnetism)**
* [**http://learningcenter.nsta.org/product\_detail.aspx?id=10.2505/4/sc09\_047\_04\_20**](http://learningcenter.nsta.org/product_detail.aspx?id=10.2505/4/sc09_047_04_20) **(Shoebox Circuits NSTA Journal Article)**
* [**http://learningcenter.nsta.org/product\_detail.aspx?id=10.2505/4/sc08\_046\_04\_56**](http://learningcenter.nsta.org/product_detail.aspx?id=10.2505/4/sc08_046_04_56) **(What Causes States of Matter NSTA Journal Article)**
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