

Science DesCartes: Physical Science

Skills: Nature of Matter

Students:	DesCartes Skills: (Highlight the skills related to your chosen standard/concept)	
	RIT Above 260: • Analyzes data about phase changes in matter	
	RIT 241-250: • Describes ductility • Distinguishes between acids and bases based on their molecular composition • Gives examples of acids and bases, using scientific names (e.g., sodium hydroxide) • Describes the properties shared by specific families or groups of elements • Utilizes classification systems for elements • Recognizes that in a closed system, the total number of atoms always remains the same, regardless of how the atoms are arranged into molecules • Explains that when an acid is combined in equal molar quantities with a base, a neutral solution of salt in water is obtained	<ul style="list-style-type: none"> • Evaluates to determine the best substance for a given application based on data describing physical properties of substances • Makes inferences about appropriate uses of materials from results of tests of properties (e.g., hardness, tensile strength, conductivity) • Describes objects in terms of mass • Recognizes that mass is measured in grams • Identifies the tools needed to determine the volume of an irregularly shaped object • Identifies tools needed to calculate the density of an irregularly-shaped object • Calculates density of objects, using supplied data • Recognizes that conductivity of a substance depends on the freedom of electrons to move from ion to ion of the substance • Performs metric conversions (e.g., milliliters to microliters) • Describes physical changes in matter (e.g., changes in size, shape, freezing, melting, dissolving) • Explains how the addition or loss of heat changes matter (e.g., physical change) • Describes examples of physical change • Gives examples of chemical change • Infers that a chemical change has occurred • Describes chemical properties of substances • Describes properties of acids (e.g., sour taste, one or more hydrogen atoms, turns blue litmus red) • Describes properties of bases (e.g., slippery, bitter tasting, contain oxygen and hydrogen, turn litmus paper blue) • Gives examples of acids & bases, using household liquids (e.g., bleach, vinegar) • Compares pH of strong and weak acids and bases • Draws conclusion from data related to indicators and pH of household acids, bases and neutral substances • Explains that removing heat will cause a substance to change from gas to liquid or from liquid to solid form • Describes the relative spacing of particles in solids, liquids, and gases • Recognizes that atomic number represents the number of protons found in the nucleus of a particular type of element • Describes the relationship between atomic number and atomic mass • Determines the number of protons in an atom of an element when given that atom's atomic number • Determines the number of neutrons in an atom of an element given the atomic mass of the element • Determines the atomic mass of an atom, given the number of protons, electrons and neutrons for this atom • Predicts properties of elements using
	RIT 231-240: • Selects the appropriate relationship to convert units using dimensional analysis strategies • Describes constancy of mass during a physical or chemical change in a system • Defines chemical property • Distinguishes among examples of physical and chemical properties • Compares strength of strong and weak acids and bases • Describes properties of bases (e.g., slippery, bitter tasting, contain oxygen and hydrogen, turn litmus paper blue) • Draws conclusion from data related to indicators and pH of household acids, bases and neutral substances • Determines the number of neutrons in an atom of an element given the atomic mass of the element • Relates trends seen in the periodic table to bonding of elements • Describes the properties shared by specific families or groups of elements • Describes how atoms with similar numbers of valence electrons are grouped together on the periodic chart • Interprets data related to electron configuration • Recognizes characteristics of compounds • Understands how conservation of mass is expressed in chemical formulas and equations • Makes inferences from data about the formation of ionic compounds • Identifies reactants and products of a combustion reaction • Describes factors that can increase or decrease reaction rates	
	RIT 221-230: • Understands that air and other gases have mass	

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	<p>information about their classification (e.g., metals, non-metals)</p> <ul style="list-style-type: none"> • Understands that elements are grouped according to similarities in their properties • Describes the properties shared by specific families or groups of elements • Describes the electron cloud (quantum) model of atomic structure • Makes predictions of reactivity based on electron configuration • Determines the electrical charge of an atom or ion • Describes physical properties of metals • Describes the law of conservation of mass • Recognizes that the mass of a material remains the same when the material is divided or changes shape • Understands how conservation of mass is expressed in chemical formulas and equations • Balances equations to reflect conservation of mass • Describes the forces which hold together the components of an ionic substance • Recognizes that compounds contain two or more types of atoms bonded together • Explains that coefficients may be adjusted to balance chemical equations • Defines inert chemical • Infers that a new compound has been formed when new properties result after combining reagents 	
	<p>RIT 211-220:</p> <ul style="list-style-type: none"> • Identifies the tools and units used to measure weight • Makes inferences about the relative mass of objects based on data • Recognizes that on a given planet, objects with the same weight will also have the same mass • Recognizes that volume is measured in milliliters or liters • Measures the volume of liquid in a graduated cylinder • Understands that in the SI system, length is measured in meters, kilometers, centimeters • Estimates length of common objects using metric units • Recognizes that base unit for length in the SI system is the meter • Predicts how changes in temperature will affect the density of an object • Predicts how objects of differing density will behave when combined • Explains that objects of differing density will layer when combined • Defines melting point • Defines boiling point • Describes characteristics of physical change • Describes characteristics of a chemical change • Gives examples of chemical change • Describes properties of acids (e.g., sour taste, one or more hydrogen atoms, turns blue litmus red) 	<ul style="list-style-type: none"> • Describes properties of bases (e.g., slippery, bitter tasting, contain oxygen and hydrogen, turn litmus paper blue) • Describes how litmus paper is used to determine whether a substance is an acid or a base • Defines pH as a measurement of acidity • Describes properties of gases • Classifies unknown substances as liquids, based on their properties • Recognizes properties of gases • Describes the process of condensation • Describes the process of freezing in terms of phase changes • Explains that removing heat will cause a substance to change from gas to liquid or from liquid to solid form • Gives examples of substances which have undergone a change of state • Describes the relative freedom of motion of particles in solids, liquids, and gases • Explains that as heat is applied to a substance, the particles making up the substance move farther apart • Recognizes that as heat is applied to a solid, its molecules move farther and farther apart • Interprets diagrams showing the relative spacing and movement of matter in different phases • Describes how elements are ordered by atomic number in the periodic table • Determines the number of neutrons in an atom of an element given the atomic mass of the element • Names contributions of scientists to the development of the periodic table of the elements • Recognizes the subatomic structure of the atom • Describes the locations where each atomic particle may be found • Understands that the nucleus consists of protons and neutrons • Explains that all matter is made of tiny particles called atoms • Uses models to show the structure of the atom • Recognizes that elements do not break down under normal lab conditions • Describes characteristics of elements • Gives an example of an element • Recognizes symbols for elements and compounds • Understands the rules of scientific nomenclature of elements and compounds • Determines the number of atoms in a compound when given its formula • Describes characteristics of compounds • Describes how intermolecular forces affect the chemical properties of covalently bonded compounds • Recognizes that products formed by chemical reactions have different properties from the reactants • Recognizes that atoms interact by transferring or sharing valence electrons • Defines reactant

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<p>RIT 201-210:</p> <ul style="list-style-type: none"> • Defines matter as anything that takes up space and has mass • Recognizes that a magnifier allows one to see details that are not otherwise visible • Compares objects in terms of mass • Determines the volume of an object using the displacement method • Estimates length of common objects using metric units • Compares objects in terms of density • Predicts how changes in temperature will affect the density of an object • Defines density • Recognizes that when one divides mass by volume, one is calculating density • Infers that an object is more dense than an object with the same volume, based on differences in mass (as measured by a double-pan balance) • Gives examples of changes in which new substances with new chemical properties are produced • Describes properties of acids (e.g., sour taste, one or more hydrogen atoms, turns blue litmus red) • Describes how litmus paper is used to determine whether a substance is an acid or a base • Recognizes properties of acids (e.g., sour taste, turns blue litmus paper red, contains one or more hydrogen atoms) • Predicts which household substance will turn blue litmus paper red • Names the three different states of matter • Describes how water exists in three states • Recognizes that water expands as it freezes • Describes the process of evaporation • Recognizes that evaporation changes a liquid to a gas • Gives examples of evaporation • Relates surface area to evaporation • Describes the process of evaporation in terms of the changes to the molecules involved • Describes the process of freezing • Describes applications of differential expansion of metals • Explains that heating or cooling materials can cause their state to change • Explains that matter can change from one physical state to another • Explains that as heat is applied to a substance, the particles making up the substance increase their motion • Explains that the periodic table is organized into rows and columns • Describes characteristics of each subatomic particle • Explains that all matter is made of tiny particles called atoms • Recognizes that atoms are composed of smaller particles (e.g., protons, neutrons, and electrons) 	<ul style="list-style-type: none"> • Describes characteristics of elements • Identifies elements based on their physical characteristics • Recognizes symbols for elements and compounds • Determines the number of atoms in a compound when given its formula • Recognizes signs of a chemical reaction (e.g., formation of gas, color change, precipitate) • Infers that a chemical reaction has occurred
	<p>RIT 191-200:</p> <ul style="list-style-type: none"> • Generalizes that all physical objects are made of matter • Infers that the more matter in an object, the greater the mass of that object • Classifies materials according to their magnetism • Determines the volume of an object using the displacement method • Recognizes that adding an object to a container of water will raise the water level within the container • Relates density to the ability to sink or float • Infers the mass of objects with identical volume, based on their buoyancy • Distinguishes between chemical and physical changes • Names the three different states of matter • Describes basic properties of solids, liquids, and gases • Gives examples of solids • Classifies objects as solids, liquids, or gases • Recognizes that water can undergo changes in state (e.g., solid, liquid, gas) • Recognizes that ice is the solid form of water • Describes the process of evaporation • Describes the process of melting • Makes inferences about phase changes in matter • Gives examples of forms of matter which have undergone a change from liquid to solid form • Explains that all matter is made of tiny particles called atoms • Describes the shape of crystals
	<p>RIT 181-190:</p> <ul style="list-style-type: none"> • Classifies materials according to their magnetism • Recognizes that physical properties can be measured using tools • Identifies tools used to measure length • Recognizes that temperature is measured in degrees • Gives examples of gases • Classifies objects as liquids • Classifies objects as gases • Gives examples of water in each state of matter • Explains that the amount of water in an open container will decrease because it goes into the air, but the amount of water in a closed container will remain the

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	same
	<ul style="list-style-type: none">• Interprets data related to freezing
	RIT Below 181: <ul style="list-style-type: none">• Sorts natural and manufactured materials by weight• Classifies objects as liquids

Lesson Title:

Standard/Concept for All:

Introduction: (Get Attention; Connect to Prior Knowledge)

For Students Ready for a Challenge:

Lesson/Activity:

Resources:

Means of Assessment:

For Most Students:

Lesson/Activity:

Resources:

Means of Assessment:

For Students Needing Extra Support:

Lesson/Activity:

Resources:

Means of Assessment:

Closure/Summary for All: