Subject: Regents Chemistry	Grade: 9-12	Unit #: 1	Title: Movie Special Effects

UNIT OVERVIEW

<table>
<tr><th colspan="4">STAGE ONE: Identify Desired Results</th></tr>
<tr><td rowspan="7">Established Goals/Standards</td><td rowspan="7">NYS Chemistry Standards:

3.2l, 3.3a, 3.1cc, 3.1kk, 4.2a, 4.2b, 4.2c, 3.1s, 3.1w, 3.1v, 3.2c, 3.1k, 3.1ff, 3.1gg</td><td colspan="2">Long-Term Transfer Goal</td></tr>
<tr><td colspan="2">At the end of this unit, students will use what they have learned to independently…
● Describe how physical and chemical properties of matter can be used productively in real-world applications to solve problems.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>Enduring Understandings
Students will understand that…

• Chemistry concepts are used for special effects in movies.

• Elements and compounds undergo changes of state and re-arrangements of atoms that accompany changes in energy. Their behaviors correspond to the nature of each element involved, the polarities, the arrangement of atoms in compounds and molecules, and the amounts of energy added to or removed from the system.</td><td>Essential Questions
Students will consider such questions as…

• How does chemistry relate to moviemaking?

• How can you predict the behavior of elements, compounds and molecules in order to use them in special effects?</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>What knowledge will students learn as part of this unit?

• Electrolysis of water is a technique that uses electricity to decompose water into 2 parts of hydrogen gas and 1 part of oxygen gas.</td><td>What skills will students learn as part of this unit?

Section 1: Categorize; predict; observe; follow diagrams to set up equipment; using equations to represent a reaction.</td></tr>
</table>

East High School, Rochester, NY

		• The law of conservation of mass states that the number and type of atoms on the reactant side must be the same as the atoms on the product side of a reaction. • The subscripts in the chemical formula for a substance, such as Al_2O_3, give the number of atoms of each element in that substance. • The three states of matter are solid, liquid, and gas. • During any phase change from solid to liquid, and from liquid to gas, heat energy is required but the temperature does not change. • An energy curve of Temperature vs. Heat can be plotted using time in the x-axis if a constant source of heat is used. • As heat energy is added to a substance, the average kinetic energy of its particles increases. Kinetic energy (KE) = $1/2\ mv^2$. • During a phase change, energy is absorbed to overcome the intermolecular attractive forces which hold the substance in the solid or liquid phase. • When the vapor pressure of a liquid equals the atmospheric pressure, a liquid will boil. At STP this temperature is called the normal boiling point of a liquid.	Section 2: Organize data in a table; use lab equipment for temperature measurement; Construct graph from data collected; create illustrations to describe particle motion; observations Section 3: Observe and classify Section 4: follow directions; make observations; compare and contrast physical properties of mixtures; Section 5: Use laboratory equipment to measure mass and volume; create line graphs using data; explain accuracy and precision; perform density calculations; analyze data to reach conclusions (identify unknowns); predict results of an experiment based on density Section 6: construct electrical circuit for conductivity testing; observe and describe material samples; classify materials as metallic or non-metallic Section 7: Follow directions to prepare a polymer; observe and describe; use drawings to represent chemical reactions

		• Fog is an example of a colloidal dispersion or colloid. The observation that a beam of light passing through a colloid is visible is called the Tyndall effect. • Density is a physical property of all substances that is determined by mass and volume. The mathematical expression is: D = m/V. • Precision of measurements is a term used to show the reproducibility of a measurement. • Accuracy is the term used to show how close the measurements are to the true value. • Scientific notation uses powers of ten to simplify working with very large and very small numbers. • All of the elements of the periodic table fall into one of three groups: metals, nonmetals, and metalloids. • Alloys are solutions of one (or more) metal in another. The alloy, such as brass, has superior properties to any of the components. • Polymers are very large molecules which are built from repeating units of monomers. Starch and plastics are common polymers used on a daily basis.	Section 8: Identify metal ions based on flame tests (color) Section 9: observe and describe combustion; use equations to represent combustion; use structural diagrams to represent bonding **NYS Process Skills- Analysis, Inquiry, and Design** M1.1 Use algebraic and geometric representations to describe and compare data. • organize, graph, and analyze data gathered from laboratory activities or other sources • measure and record experimental data and use data in calculations • use knowledge of geometric arrangements to predict particle properties or behavior M2.1 Use deductive reasoning to construct and evaluate conjectures and arguments, recognizing that patterns and relationships in mathematics assist them in arriving at these conjectures and arguments. • interpret a graph constructed from experimentally obtained data

		• Metal cations can be identified by the color that they emit when they are excited in a flame. • Carbon has unique bonding capabilities which leads to the enormous field of organic chemistry, the study of the molecular compounds of carbon. • The simplest family of compounds in organic chemistry, hydrocarbons, are used for combustion.	S1.1 Elaborate on basic scientific and personal explanations of natural phenomena, and develop extended visual models and mathematical formulations to represent thinking. • use theories and/or models to represent and explain observations • use theories and/or principles to make predictions about natural phenomena • develop models to explain observations S3.1 Use various means of representing and organizing observations (e.g., diagrams, tables, charts, graphs, equations, and matrices) and insightfully interpret the organized data. • organize observations in a data table, analyze the data for trends or patterns, and interpret the trends or patterns, using scientific concepts **Interconnectedness: Common Themes** Through systems thinking, people can recognize the commonalities that exist among all systems and how parts of a system interrelate and combine to perform specific functions. Examples include:

			• use the concept of systems and surroundings to describe heat flow in a chemical or physical change, e.g., dissolving process Models are simplified representations of objects, structures, or systems used in analysis, explanation, interpretation, or design. 2.2 Collect information about the behavior of a system and use modeling tools to represent the operation of the system. 2.3 Find and use mathematical models that behave in the same manner as the processes under investigation. 2.4 Compare predictions to actual observations, using test models. Identifying patterns of change is necessary for making predictions about future behavior and conditions. Examples include: • use graphs to make predictions, e.g., half-life, solubility • use graphs to identify patterns and interpret experimental data, e.g., heating and cooling curves

			Interdisciplinary Problem Solving Solving interdisciplinary problems involves a variety of skills and strategies, including effective work habits; gathering and processing information; generating and analyzing ideas; realizing ideas; making connections among the common themes of mathematics, science, and technology; and presenting results. If students are asked to do a project, then the project would require students to: • work effectively • gather and process information • generate and analyze ideas • observe common themes • realize ideas • present results **NYS Regents Chemistry Reference Tables-** Table E Table T (density, combined gas law) Table P Table Q Table S (density)

Subject: Regents Chemistry	Grade: 9-12	Unit #: 1	Title: Movie Special Effects

STAGE TWO: Determine Acceptable Evidence	
	Assessment Evidence
Criteria for to assess understanding: *(This is used to build the scoring tool.)* • Demonstration • Safety • Quality • Interest and appeal to an audience • Supporting documentation • Script—creativity • Procedure—clarity, safety, accuracy • Chemistry explanation — accuracy and quantity of chemical principles incorporated.	Performance Task focused on Transfer: Your challenge is to create a storyline and produce special effects based on the chemistry you have learned in your Active Chemistry class. You will need to demonstrate the special effects you created. Your special effects will be evaluated on their quality, entertainment, and the knowledge of chemistry you exhibited in putting them together. • Develop a script for a simple scene in a movie. • Choose some special effects to include as part of your scene. • Write a procedure on how your special effect is done. • Demonstrate the special effect to the "producer." • Write an explanation of how the special effect works, including the chemistry behind the demonstration.
	Other Assessment Evidence: Journaling What do you see? What do you think? What do you think now? Chem Essential Questions Chem to Go questions Chapter Mini-challenge Section quizzes Chapter test

Subject: Regents Chemistry	Grade: 9-12	Unit #: 1	Title: Movie Special Effects

Subject: Regents Chemistry Grade: 9-12 Unit #: 1 Title: Movie Special Effects

T, M, A *(Code for Transfer, Meaning Making and Acquisition)*	**STAGE THREE: Plan Learning Experiences**	
	Learning Events:	Evidence of learning: *(formative assessment)*
A	Section 1: Students conduct an experiment using electrolysis to separate water into hydrogen and oxygen, and test the gases to determine behavior of the different substances. Demonstration of "eggsplosions" stimulates thinking about how this reaction might be used to create a movie special effect.	Students are able to make electrolysis proceed and isolate hydrogen and oxygen products. Glowing splint reignites in presence of oxygen. Burning splint lights hydrogen on fire.
	Read ChemTalk to learn the chemistry of what happened in the investigation: chemical formulas; types of matter, chemical symbols; diatomic elements; conservation of mass; balanced equations	Answers to Checking Up questions.
	Section 2: Students observe changes of state of water and describe the process graphically.	Students collect data and correctly graph a heating curve for water.
	Students describe the behavior of gas particles, based on observations of how the temperature, pressure and volume of the gas are affected as heat is transferred to or away from the gas.	Students are able to explain how the addition of heat changes the volume of air and why the piston moves.

Subject: Regents Chemistry Grade: 9-12 Unit #: 1 Title: Movie Special Effects

	Students observe a change of state of carbon dioxide and describe the energy transformations involved. Read ChemTalk to learn the chemistry of what happened in the investigation: changes of state; temperature; melting and boiling points; heating curves <u>Section 3</u>: Students explore different ways that materials can be mixed together to make new materials. Read ChemTalk to learn the chemistry of what happened in the investigation: pure substances and different types of mixtures; Tyndall Effect. <u>Section 4</u>: Students make modeling dough from common kitchen materials. Read ChemTalk to learn the chemistry of what happened in the investigation: physical properties; composite materials <u>Section 5</u>: Students make measurements in the laboratory to the precision of the instruments used. Students determine the densities of various liquid and solid materials.	Students identify the change of state involved and correctly ascertain that heat is being added to the dry ice to effect this change. Answers to Checking Up questions. Student observations in lab write-up. Answers to Checking Up questions. Students are able to follow procedure and make modeling dough. Answers to Checking Up questions. Students are able to read mass and volume measurements to correct precision of instruments used.

Subject: Regents Chemistry Grade: 9-12 Unit #: 1 Title: Movie Special Effects

		Students make graphs correctly, graphs are close to straight lines, and slopes are close to tabulated values for densities of the materials.
	Students learn the difference between accuracy and precision in experimental measurements.	Students are able to explain the difference between accuracy and precision.
	Students retain significant figures in calculations involving experimental measurements.	Students are able to carry out calculations with correct significant figures.
	Read ChemTalk to learn the chemistry of what happened in the investigation: density as a physical property; measurements and uncertainty; calculation and significant figures; accuracy and precision	Answers to Checking Up questions.
	<u>Section 6</u>: Students observe some chemical and physical properties of various materials.	Students observations in lab reports.
	Read ChemTalk to learn the chemistry of what happened in the investigation: metals, non-metals and metalloids; alloys	Answers to Checking Up questions.
	<u>Section 7</u>: Students will make a polymer-based material that has properties different from other states of matter that you have studied.	Students are able to make “slime.”
	Read ChemTalk to learn the chemistry of what happened in the investigation: polymers	Answers to Checking Up questions.
	<u>Section 8</u>: Students produce colored flames.	

	Read ChemTalk to learn the chemistry of what happened in the investigation: production of light by excited electrons Section 9: Students combust a material present in fruit rinds. Read ChemTalk to learn the chemistry of what happened in the investigation: hydrocarbons; combustion; balanced equations	Students observe characteristic colors emitted by metal ions upon excitation. Answers to Checking Up questions. Student results in lab report. Answers to Checking Up questions.
M	Section 1-9: Student journaling: **What Do You See** and **What Do You Think** prior to starting investigations activates their prior knowledge about the topics. **What Do You Think Now** has students reflect on their pre-investigation writing after they have completed the investigation. **Chem Essential Questions** at the end of each investigation has students journal about the macro (what you observed), nano (description of what is happening at the atomic and molecular level) and symbolic (using pictures and chemical formulas and equations to represent what you saw) representations of the investigation. This includes the **How Do You Know** Questions.	Journal responses Journal responses to Chem Essential Questions.

	Chem to Go questions are used in each section to elaborate and extend the knowledge obtained through the investigation.	Answers to Chem to Go questions.
	Section 2: Students create an animation to illustrate the behavior of particles in different phases of matter, and as the material changes phase.	Students are able to create flipbooks that depict particle movement. Animations of solid and liquid match description required.
	Section 3: Students test some materials to determine what kinds of mixtures they are.	Students correctly classify tested materials.
	Section 4: Students adjust the properties of the modeling dough by adding another material to it.	Students make conclusions about the alteration of properties of dough when adding other materials to it.
	Students compare the properties of an emulsion to those of a composite material.	Student results in lab report.
	Section 5: Students use density measurements to determine the identity of a material.	Students correctly identify unknown liquid and unknown solid.
	Students locate sources of the variation in the class's experimental results.	Students' discussion on variation in class results for density addresses appropriate issues.
	Section 6: Students classify the materials tested as metals or nonmetals.	Student results in lab report.

	Section 7: Students observe the material's properties and compare them to those of solids and liquids. Students describe the process of crosslinking in polymeric materials. Section 8: Students identify the metal ions present in materials by the colors of light a material gives off when held in a flame. Section 9: Students make two-dimensional drawings showing the chemical bonding structure in simple hydrocarbons.	Student results in lab report. Students make sketches of sodium tetraborate reacting to cross-link polymer chains. Students are able to identify metal ions present in unknown solutions. Drawings resemble correct representations of the molecules.
T	Sections 1-9: Student journaling for every investigation includes "**Why do you believe?**" and "**Why should you care**?" questions in the essential questions. "Why do you believe?" has students create their own analogies to the phenomenon they observed in the investigation, or make other connections to real-world phenomena. "Why should you care?" has students journal about how what they learned can be used in their final chapter challenge. **Preparing for the Chapter Challenge** requires students to write a short paragraph describing how they might use the learning from this section to contribute to the Chapter Challenge. **Inquiring Further** is a research-based exploration of real-world applications of the phenomenon studied. Students	Journal responses Report from Inquiring Further investigation.

	will choose one of the Inquiring Further options (if more than one) for each section.	