RIALTO UNIFIED SCHOOL DISTRICT
CURRICULUM PROPOSAL

Name of Course:	Integrated Science 2 (APEX)	Grade Level(s):	10-12

Brief Course Description:

This is a 2nd year customized online/hybrid course using APEX libraries of high school science in the disciplines of physics, chemistry, biology and earth and spatial sciences. It looks at matter both with a physical science and a chemistry lens where students learn the physical properties of matter as well as how elements are arranged in a periodic table and how atoms are comprised of electrons, protons and neutrons and the various models of the atom that have been composed over the centuries. it then looks at energy and energy transfer of that matter with a biological lens and how matter and energy are important parts of our universe using an earth science and environmental science lens. This class is a hybrid class as the labs have to be done on scheduled days with a science teacher.

Proposed By:	Ed D'Souza/ Juanita Chan	School:	Educational Services	Date:	4/20/2020

The Following is Proposed for this Course:

☒	Addition	☐	Revision	☒	A – G "D" area	☐	Deletion
☒	Required Course	☐	Content	☐	Honors	☐	Name of Course
☐	Elective	☐	Name Change	☐	Career Tech. Ed.		

The Following *Maximum* Credits are Proposed for this Course:

10 Units of Credit in (Subject Area): **Integrated Science 2** or in:

The Following Schools will Offer this Course:

☒ Carter High	☒ Eisenhower High	☒ Rialto High	☒ Milor/Zupanic

The Proposed Course will have the Following Budget Implication:

Individual School Site:	
District Level:	
Total Estimated Cost:	

Approval Signatures for the Proposed Course:

Printed Name	Signature	Title	Yes/No	Date
Lance Atkinson		Submitting School Department Chair	☒ Yes ☐ No	4/28/2020
Dr. Greg Anderson		Carter High School Principal	☒ Yes ☐ No	5/14/2020
Frank Camacho		Eisenhower High School Principal	☒ Yes ☐ No	5/14/2020
Dr. Caroline Sweeney		Rialto High School Principal	☒ Yes ☐ No	5/14/2020
Kayla Griffin		Milor/Zupanic High School Principal	☒ Yes ☐ No	5/14/2020
Ed D'Souza/ Juanita Chan (Science Chair)		District Curriculum Committee Chair	☒ Yes ☐ No	5/14/2020
Dr. Patricia Chavez		Curriculum Council Chair	☒ Yes ☐ No	5/14/2020

Approved by Juanita Chan/ Ed D'Souza Curriculum Committee on (Date) 4/28/2020

Approved by Curriculum Council on (Date): 5/14/2020

Approved by Rialto Unified School Board on (Date): 06/10/20

Approved by UC (or N/A) on (Date):

Integrated Science 2

Rialto Unified School District

Submitted: May 7, 2020

Decision: Pending

⚠ Pending UC review

asic Course Information

hool(s) Offering This Course:

School Name	Course Learning Environment	Transcript Code(s)	
isenhower High School (052622)	Online	Abbreviation APEXINT2	Course Code
ialto High School (052629)	Online	Abbreviation APEXINT2	Course Code
r. John H. Milor High School (052642)	Online	Abbreviation APEXINT2	Course Code
Vilmer Carter High School (053855)	Online	Abbreviation APEXINT2	Course Code

Title:	Integrated Science 2
Length of course:	Full Year
Subject area:	Science (D) / Integrated Science 2
UC honors designation?	No
Prerequisites:	Integrated Science 1 (Recommended)
Co-requisites:	Math 1 or above (Recommended)
Integrated (Academics / CTE)?	No
Grade levels:	10th, 11th, 12th

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ıurse overview:

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ıurse content:

Unit 1: Its' Elementary

In this unit students will cover the basics of Physical Science which are part of the high school NGSS standards. This includes the different forms of matter, the smallest part of matter called an atom and the sub-atomic particles contained in it. They learn the various models of the atom. They also learn how each element consists of atoms that differ by atomic mass and atomic number. Students learn how elements are organized in what is called the periodic table. They learn the characteristics of elements in the same row and elements in the same column

Unit Assignment(s):

Throughout this unit, you've learned about the patterns that have been discovered in the physical properties of the elements. As you've seen, there are many ways that one might arrange the elements into groups. Use the knowledge and insight you've gained to participate in this discussion about organizing the elements. Discuss the following: Suppose you had come along before Mendeleev and were tasked with organizing the elements into a pattern others could understand. Describe your arrangement and how you would determine where elements would be placed. Can you think of any problems your design might create?

Unit Lab Activities:

Braving the Elements

You already know that every element on the periodic table has an atomic number and an atomic mass. The atomic number tells you the number of protons and electrons in an atom, and the atomic mass helps you identify the number of neutrons. In this lab, you'll be able to observe the relationship between atomic number and atomic mass by creating a graph of the elements' atomic numbers (x) versus their atomic masses (y). Predict what type of graph you should get. Do your observations support your prediction? Explain how they do, or why they do not. Describe the shape of your graph. Does it

look as you expected? Does your graph maintain a consistent pattern? Identify any changes you notice in the pattern. How would you describe the relationship between the atomic number and atomic mass of an element? Describe any challenges you encountered when making your graph. Could you have done anything differently?

Unit 2: Atomic Structure

The concept of "unity and diversity" is considered a common theme of all the fields of scientific study .Living things are unified by the fact that they are all made from cells. For example, biologists study living things. There is a unity to living things — they are all made of cells. But there is also a diversity to living things — those cells combine to form millions of different kinds of organisms. Similarly students learn that matter is made of atoms and there are many different atoms and that they all have some common characteristics in their structure but that they differ in terms of their protons, electrons and neutrons. They learn about the history of atomic theory; understand the Bohr atom and the differences between neutrons, protons, and electrons. Learn how to navigate the periodic table and use it to find numbers of protons, electrons, and neutrons. They learn about the history of the periodic table; the information in the periodic table; and how the table shows the unity, diversity, and organization of matter. Finally they learn about the law of conservation of matter, and the forces that act on matter.

Unit Assignment(s):

How could understanding the unified structure of atoms help you to better understand an element that was unfamiliar to you? Answer in two or three paragraphs. *If you think about similarities between elements instead of differences, how can that make understanding matter a little bit easier?*

Unit Lab Activities:

Mass, Volume and Density

In this lab, students will be measuring samples of materials that are about the same size. If you have many students, you may compare the final data and speculate as to where any differences arose. The emphasis of this lab is on determining densities of solids and liquids, and to appreciate that even air (a fluid) has a density. This lab time also allows students in volume-measurement skills and readily lends itself to making rough estimates of densities before they actually do the lab and seeing the difference between theoretical density using linear measurements and formulas and experimental density-water displacement.

Unit 3: Bonding in Matter

Students learn that the electrons in an atom are in energy levels and orbitals. Atomic properties follow periodic trends on the periodic table such as the direction of ionization energy, electronegativity increase and atomic radius decrease and how ionic radius and atomic mass are related. Bonds form between atoms Students describe the elements that form covalent and ionic bonds and describe the electrons in the bond. They describe if the bond is a single, double or triple and the electronegativity differences between bonds. They write formulas of the compounds and name them and learn how to write the four steps to describe a molecule using the Lewis model. Students learn that molecules can be polar or non-polar and learn the difference between the two different types of covalent bonds. They further learn the conditions necessary for a molecule to be polar,

Unit Assignment(s):

Intermolecular Forces and You

Imagine that you need to take a medicine that the doctor has prescribed for you. Explain why scientists who developed that medicine would need to know whether or not the compound in that medicine is polar. How might a polar medicine behave differently as it dissolved in the body than a nonpolar medicine would? Answer in 1 to 2 paragraphs. *Think about how polar and nonpolar compounds might behave differently in the watery environment of your stomach or bloodstream.*

Unit Lab Activities:

Periodic Properties

All samples tested are in what is called Group 14; elements are placed in the same group because they share similar features and structure. In observing the samples, what similar features do you notice in the samples? What differences do you notice? How can you explain these similarities and differences in light of these samples' periodic properties (for example, atomic number and group number)? Record any instances where you may have seen or heard about these samples being used in everyday life.

Unit 4: Chemical Reactions

In this unit. students will learn how to convert the mass of a compound from grams to moles by unit conversion. They will also learn to determine the molarity of a solution. They will learn how to describe a molecule by its molar mass, percent composition, its empirical formula, and its molecular formula. They also learn how to balance inorganic reactions by balancing net ionic equations. They learn how to draw three different models of hydrocarbons – ball and stick model, structural model and the simple stick model. Finally they learn to apply combustion to apply to fuels, engines and green design.

Unit Assignment(s):

Reactions Around You

List 10 chemical reactions that have benefited your life today. Include the reasons you think each was indeed a chemical reaction and not just a physical change. Think about processes in your body, processes in the atmosphere, or chemical reactions that may be involved with any materials or products you have used.

Unit Lab Activities:

Precipitation Reactions

In this lab, you'll be putting what you've learned in this unit to work as you observe whether or not a chemical reaction has occurred. You'll be mixing different pairs of aqueous solutions of ions and checking to see if a solid ionic compound (a precipitate) forms. If it does, then a reaction has taken place. But what if you don't see a solid? This would mean that no reaction (NR) had taken place because all possible products had been soluble.

Unit 5: The Chemistry of Biology

In this unit, students learn about the structure of an atom, and the six main elements living things are made from. They apply what they have learned about covalent and ionic bonds and apply these principles to the chemical reactions that occur in living things and reflect on the role of chemistry in the study of biology. They learn more about the structure and function of carbohydrates, DNA, RNA and lipid molecules

Unit Assignment(s):

Chemistry in Biology - Humpback Whales

The video shows a humpback whale spitting water out its blow hole and breaking the surface of the water and diving.

Watch the video, then answer the questions below.

In the video, the whale exhaled carbon dioxide, which is made of one carbon atom and two oxygen atoms. List two things a scientist might ask about the movement of carbon dioxide through the whale and its surroundings. *Make observations about the surroundings of the whale, and use information you may already know to answer the question.*

Unit Lab Activities:

Enzyme Action: How Clean Is Your Laundry?

In this lab, you will do a set of controlled experiments to determine the effectiveness of laundry detergents at removing various types of stains. The stains will be composed of different types of biological macromolecules, and you will make qualitative observations of how the detergent enzymes affect the macromolecules.

You will put different types of stains on pieces of cloth and compare the effectiveness of two detergents at removing the stains. Then you will have an opportunity to design your own experiment.

Unit 6: Energy Transfer

In this unit, students will learn that photosynthesis is a series of reactions that converts solar energy to chemical energy. It takes place in specialized structures in a plant cell and is a combination of two reactions: light reactions and the Calvin cycle. They learn that photosynthesis occurs on the thylakoid membranes of chloroplasts and light reactions consist of reactions that begin at photosystem II and photosystem I and study about ATP production. In the Calvin cycle, they learn that the ATP and NADPH made in the light reactions are used as fuel to rearrange the atoms in carbon dioxide to form glucose. They also learn how living things use respiration to get cellular energy and cellular respiration produces the energy cells need to function, in the form of ATP. They describe and apply the process of glycolysis, Krebs cycle and ETC including their reactants and products. Finally, this is applied to matter and energy flow through living systems via the feeding relationships in that ecosystem (primary consumers, tertiary consumers, and decomposers). They learn how organisms in ecosystems interact with each other in symbiotic relationships.

Unit Assignment(s):

Your Sources of Oxygen

Photosynthesis in the Earth's forests produces about half of the oxygen in the atmosphere. Photosynthesis in the Earth's oceans produces the other half of the oxygen in the atmosphere. Why do you think so much photosynthesis occurs in the oceans? *Think about what type of organisms perform photosynthesis.*

Unit Lab Activities:

Anaerobic Respiration of Yeast

In this lab, you'll prepare samples of yeast and sugar in three different temperatures of water. You'll then measure the amount of foam produced as the yeasts make carbon dioxide gas. You'll analyze your experimental data to determine how the temperature of the water affects the rate of yeast fermentation.

You will also get a chance to design your own lab to determine the effect of another variable on the rate of fermentation. Finally, you will model the chemical reaction of fermentation and count the number of atoms present before and after the reaction.

Unit 7: Chemical Physics

This unit repeats some of the main ideas in previous units, They are (1) all matter is made of atoms, which come in many different types called elements. (2) The modern atomic theory was developed over time by combining the contributions of many scientists and (3) the periodic table shows the atomic number and the average atomic mass of each element. This information can be used to find the number of each kind of subatomic particle in an atom. Students learn and apply concepts in physical chemistry such as density and elements that are important to their lives.

1.

Unit Assignment(s):

Elements in Daily Life

Identify five elements that have been important to you today. Explain why you think each element was important. Think about objects or materials that you have used at home, in school, or outside while having fun. Also consider things that have kept you alive or contributed to your health.

Unit Lab Activities:

Fluids

In this lab, you will investigate the buoyant force that acts on objects when they are submerged in a fluid.

Materials needed: Small rock (small enough to fit in beaker; large enough to cause a visible displacement of water); 200 g hanging mass; styrofoam (cut to hold a lead weight; small enough that the weight causes it to sink); lead weight; force sensor; string; 500 ml beaker; 1000 ml beaker; scale and a computer.

Procedure

Connect the force sensor to the computer. Be sure that the computer shows the force measurement. Zero the sensor before continuing.

Use the string to connect the rock to the force sensor. Hang the rock from the force sensor and record the weight of the rock in the data table.

Fill the 500 mL beaker to the brim with water. Carefully place the 500 mL beaker inside the 1000 mL beaker.

While the rock is still hanging from the force sensor, submerge the rock in the water. Water will spill from the 500 mL beaker into the 1000 mL beaker. Record the apparent weight of the rock under water in the data table.

Determine the buoyant force acting on the rock. Remember: weight of rock in air – apparent weight in water = buoyant force.

Remove the rock from the water and set it aside. Remove the 500 mL beaker from the 1000 mL beaker and set it aside.

Find the mass of the displaced water. To do this, first determine the mass of the 1000 mL beaker with the displaced water in it, and record this value in the data table. Now discard the water and find the mass of the empty 1000 mL beaker. Record this value in the data table. The mass of the displaced water is the difference between these two values.

Calculate the weight of the displaced fluid and record it in the data table. Remember: weight of displaced fluid (in N) = mass of displaced fluid (in kg) × 9.8 m/s^2.

Repeat steps 2 through 8 for the 200 g hanging mass and the Styrofoam with the lead weight on it.

Results:

Make a table with eight columns titled object, weight in air, apparent weight, buoyant force, mass of beaker and water, mass of beaker, mass of displaced water and weight of displaced water. Then make 6 rows for each type of object tested: rock, 200 gram mass, and Styrofoam .

Analysis of Results

1. Which object appeared to weigh the least when submerged in water?
2. Which object displaced the most water?
3. Rank the objects in order of least dense to most dense.

Draw Conclusions

1. What is the general relationship between the volume of displaced water and the weight of the displaced water?

Unit 8 : Earth's Water

In this unit student will explore water's characteristics, the water cycle, freshwater bodies, oceans, and how water changes and nourishes Earth and its inhabitants. They will discover why water exists on Earth, how the water cycle works, and what makes water, water. They will also research different freshwater environments and learn how they are connected. Then they will learn what groundwater is and how it influences systems above ground. They will then learn about the composition layers and processes of the ocean and learn how waves, tides, and currents influence the environment. Finally the will research Wild World Weather and assess the effects of El Niño and La Niña on global weather patterns.

Unit Assignment(s):

Make a Big Splash

You've seen how man-made pollutants can find their way into the water supply. Share your thoughts on the importance of clean water by discussing the following issues:

- Why is clean water important to your family and to the economy of your city?
- Would you cut the number of baths or showers you take in half, if you knew it could improve the quality of water in your area? What are the pros and cons of your choice?
- If you could decide whether your community should build a new swimming pool or a new reservoir, which would you pick, and why?

Write one paragraph on each of the issues and write a conclusion on the importance of clean water.

Unit Lab Activities:

How Does Temperature Affect Water Density?

Ocean water temperatures vary from the equator to the poles, and at different depths. Temperature, like salinity, affects the density of seawater. The density of seawater, however, is more sensitive to temperature fluctuations than to salinity fluctuations. Cool surface water, which has a greater density than warm surface water, forms in the polar regions, sinks, and moves toward the tropics.

This lab stimulates these conditions and students will explores what happens when warm surface water mixes with cold water and how cold surface water mixes with warm water. They plot the surface temperature and notice what happens given the conditions discussed above. They write about:

What differences they observed in the behavior of the hot and cold water samples?

- Which water sample was the most dense in each experiment?
- How does temperature affect the density of water?
- If two water samples of equal mass had equal salinities, which sample would be more dense: Water Sample A, which has a temperature of 25o C, or Water Sample B, which has a temperature of 14o C? Why?
- If the two water samples below had equal temperatures, which one would be more dense: - Sample A - with a salinity of 20% or - Sample B – with a salinity of 35% Explain why?

Unit 9: Earth's Resources

In this unit students learn how humans use and sometimes abuse Earth's resources. As future environmentalists their goal is to preserve Earth's precious resources for future generations. They examine different methods of energy production, from oil and gas to wind and water and discover the pros and cons of each. They then explore Earth's limits with regard to population size and resource consumption. They then examine why Earth matters by exploring case studies of environmental successes and failures.

Unit Assignment(s):

Energy Conservation

You use energy many times every single day, but have you ever stopped to think about how muchenergy you're using? It may be hard to believe that one single person — out of the billions who live on this planet — can make a difference, but what if everyone turned out the light every time he or she left a room, took shorter or fewer showers, or turned the heat down just a few degrees. Estimate how much energy would be served in a day, month and year?

Unit Lab Activities:

Human Impact on Climate and Weather

Scientists now are closely monitoring how daily human activity is changing microclimates. There is concern that changing microclimates can have an effect on global climates. In this investigation, students will explore some of the ways that human activities are changing the atmosphere. Recall that a microclimate is the climate of a small environment, such as a garden, town, or forest.

The contour of the land, the presence or absence of plants, moisture and time of day may result in many climates (microclimates) within one ecosystem, or in this case – your school garden! In this lab students will compare the land cover and temperatures in different microclimates to determine why certain organisms live where they do. They examine whether the temperature has an impact on the kinds of plants and animals that live in a particular place. Students compare data gathered by others with different land cover, different times of the day, and other variables that interest students. From their observations, they may begin to see patterns that link temperature with land cover and determine what this means for the plants and animals within their ecosystem, or school garden.

Unit 10: Humans & The Environment

In this unit students will learn about historical trends in human population growth and distribution. They will identify characteristics of human populations. They will describe the purposes of human communities and identify different kinds of human communities. They will explain how individuals work together in groups and how groups work together in communities.

They will then identify the types of Earth's land and water used to support the lifestyles of humans. Identify types and sources of mineral resources used to produce goods and energy that support human lifestyles. Recognize the interdependence of natural resources and identify types and sources of biological resources used to produce food and goods that support human lifestyles.

Finally they evaluate the economic significance of natural resources. Summarize the effects and cost-benefit trade-offs of practices used in commercial agriculture, forestry, and fishing. Evaluate the hazards and risks involved in obtaining natural resources. Evaluate the hazards and risks to human health and well-being involved in obtaining and managing natural resources. Summarize the advantages and disadvantages of using different energy resources. Summarize the effects on natural ecosystems of human activities such as recreation, urbanization, conservation, preservation, restoration, and resource gathering and management. Discuss the validity and impact of scientific research on environmental issues related to human activities.

Unit Assignment(s):

In recent years, much of California has had drought conditions. Much of our food comes from California, and there are many growing cities in that state. What do you think has happened to the groundwater supply as droughts have occurred there? Explain how a diversion system could be useful in California, including the parts of such a system.

Unit Lab Activities:

Resource Consumption

In this lab, students will be modeling resource consumption using cereal and spoons. They will then design their own simulation and make some inferences about resource consumption in the real world. As they go through the lab, they will imagine that the cereal they are using is a real resource such as water, food, energy, land, minerals, coal, lumber, or wildlife. They will then perform three tests. These tests are part of an experiment designed to test the independent variable of placement of natural resources and its effect on the rate that resources can be obtained.

Test A. Even Distribution of Nearby Resources.

Test B. Uneven Distribution of Nearby Resources

Test C. Resources at a Distance from Consumers

They will try to collect the resource in one minute and provide a detailed description of the experience of collecting resources, including how the experience changed as the placement of the resources changed.

Unit 11: Environmental Challenges

In this unit students will learn about resource availability, water, air, and land pollution, environmental change

Describe effects of air pollution on the natural systems that regulate Earth's climate. Analyze the historical trends observed in global climate data. Relate human activities to observed changes in global climate. Evaluate differing views on global warming and climate change. Summarize scientists' predictions about the effects of global climate change on the biosphere. Discuss the validity and impact of scientific research on environmental issues related to human activities.

Resource Availability

Identify renewable resources on which humans depend. Identify nonrenewable resources on which humans depend. Differentiate between renewable and nonrenewable resources. Evaluate the cost-benefit trade-offs of using renewable resources instead of nonrenewable resources. Describe how the use of natural resources will affect future generations of humans. Describe alternative forms of energy production.

Water, Air, and Land Pollution

Identify point sources and nonpoint sources of air, land, and water pollution. Describe the effects of pollution on oceans, freshwater supplies, air, and land. Recognize the consequences of air, land, and water pollution on human health and societies. Evaluate the hazards pollutants pose to wildlife and other types of natural resources. Describe methods of waste management, including burial in a landfill, dumping, incineration, composting, recycling, and reuse. Evaluate the impact of waste management and reduction strategies on resource availability.

Environmental Change

Describe effects of air pollution on the natural systems that regulate Earth's climate. Analyze the historical trends observed in global climate data. Relate human activities to observed changes in global climate. Evaluate differing views on global warming and climate change. Summarize scientists' predictions about the effects of global climate change on the biosphere. Discuss the validity and impact of scientific research on environmental issues related to human activities.

Unit Assignment(s):

Use the information in the article "Habitat Fragmentation Prevents Migration During Climate Change". Habitat fragmentation is a problem for many species, and the combined issues of fragmentation and climate change are discussed in this article.

Why does "only 2% of the eastern United States contains the connected green space needed for animals to find new homes"?

Why do animals need to migrate farther if they live on flat terrain (which is more common in the eastern U.S.) rather than in a mountainous region (which is more common in the western U.S.)?

Unit Lab Activities:

How Pollutants Affect Plants

In this lab, student will test concentrations of the salt (NaCl) on germinating radish seedlings. They will then make a hypothesis about the effects of other pollutants on plant germination and design an experiment to test their hypothesis.

Part A: Effect of Salinization on Seedlings

They will model the effect of irrigating otherwise arid areas by observing how various salt concentrations affect plant growth. At the end of seven days, they will count the number of seeds that germinated in each cup and record it.

Part B: Effect of a Chemical Pollutant on Seedlings

They will model the effect of irrigating otherwise arid areas by observing how various pollutants affect plant growth. At the end of seven days, they will count the number of seeds germinated in each cup and record it.

They will then make a conclusion by summarizing their results for Part A and determine if there was the relationship between salt concentration and seed germination? What data drove this statement)? They will then similarly summarize their results for Part B. They will then determine if their hypothesis was supported and what data drove this decision.

ourse Materials

Other

itle	Authors	Date	Course material type	Website

Title	Authors	Date	Course material type	Website
APEX Learning Libraries of Physical Science, Chemistry, Biology, Physics, Earth Science and Environmental Studies	[empty]	[empty]	Hybrid- Online course and in class labs	Apexlearning.cor

Additional Information

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