Moon Area School District Curriculum Map

Course: Integrated Science 1
Grade Level: 9th Grade
Content Area: Science
Frequency: Full-Year Course

Course Description

This comprehensive lab-based course is designed to expose 9th grade students to the different science classes offered at the high school. Students will spend time learning about the process of science and how scientists use various tools and equipment to successfully carry out studies. Students will also be introduced to the basic building blocks of Chemistry, the intricacies of the Earth and Solar System, and the fundamentals of our biological world. Students will be expected to analyze, interpret, and make predictions based on given data. Scientific calculators will be used in this course.

Prerequisite: Recommendation from 8th grade Science Teacher.

Big Ideas

1. Decisions we make affect our level of safety in a lab situation.
2. Scientific inquiry involves asking scientifically-oriented questions, performing experiments, drawing, and revising conclusions, connecting explanations to scientific knowledge and theory, and communicating explanations.
3. Mathematics is a tool used by scientists to model objects, events, and relationships in the natural world.
4. The branches of chemistry extend to many aspects of our daily lives.
5. Matter is neither created nor destroyed in a chemical reaction, the atoms simply rearrange.
6. Chemical reactions change the identity of a substance and can be recognized by various signs.
7. All matter is composed of atoms.
8. Atoms are divisible into 3 subatomic particles.
9. The periodic table is a working arrangement of elements; known and unknown.
10. The position of an element determines its properties.
11. Chemical bonding occurs because of attractive forces between particles.
12. Changes in matter involve the rearrangement and/or reorganization of atoms and/or the transfer of electrons
13. Changes in matter are accompanied by changes in energy.
14. pH is the measure of H+ ions in the solution and varies depending on the substance.
15. The difference in acidity and basicity can affect the molecular structure of a compound.
16. Spectroscopy is the study of how light interacts with matter.
17. Spectroscopy can be used to determine what wavelengths compounds absorb.

18. The universe is composed of a variety of different objects that are organized into systems each of which develops according to accepted physical processes and laws.
19. The Earth is a complex and dynamic set of interconnected systems (e.g., geosphere, hydrosphere, atmosphere, biosphere) that interact over a wide range of temporal and spatial scales.
20. The Earth's processes affect and are affected by human activities.
21. The world is comprised of different levels of ecological organization
22. Two species can occupy the same habitat but two species cannot occupy the same niche
23. Biomes are classified by both their biotic and abiotic factors including climate, temperature and plant/animal life
24. Limiting factors affect the rate of population growth
25. Food webs and energy pyramids explain the energy loss throughout an ecosystem
26. Invasive species have negative impacts on the energy flow and population growth in an ecosystem
27. Density dependent and density independent limiting factors play distinct roles in population growth based on population size

Essential Questions

1. Why is it important to study science?
2. How do scientists solve problems?
3. How does a degree of uncertainty affect conclusions?
4. How would you gather data in order to calculate the density of a regular objected? Irregular object?
5. How do you calculate density when you have the appropriate data?
6. How do you convert from one unit to another unit?
7. What is the scientific method?
8. How do scientists use the scientific method to design experiments?
9. How is matter characterized?
10. How do changes affect the properties, identities, and interactions of matter?
11. Which physical properties and changes can be used to identify an unknown substance?
12. How are chemical properties and changes used to identify a substance?
13. What is the molecular motion of solids, liquids, and gases?
14. How does the energy change during a phase change?
15. How is it possible that all matter is composed of atoms?
16. What are the position, charge, and relative size of the subatomic particles?
17. How is an element's identity determined?
18. How do various atomic models compare with current scientific evidence?
19. How does the abundance of various isotopes affect an element's atomic mass?
20. What happens when electrons in atoms absorb or release energy?
21. How can an element be identified by light emission and the movement of electrons?
22. Would the periodic table be as meaningful if it was organized differently?
23. How can periodic trends be explained?

24. What characteristic of the atom is used to organize the periodic table?
25. What characteristics of the atom determines the row placement of an element?
26. How does the element's position on the periodic table affect the number of valence electrons?
27. How are metals, metalloids, and nonmetals positioned on the periodic table?
28. Why do elements bond in nature?
29. How is an ionic compound formed and named?
30. What is the different between the formation of an anion and a cation?
31. What is the difference between physical and chemical change?
32. How does the Kinetic Molecular Theory explain properties of solids, liquids, and gases?
33. What is the difference between acids and bases?
34. What is an indicator?
35. Why do acids and bases change colors when an indicator is added?
36. What is spectroscopy?
37. How can UV-Visible Spectroscopy be used in a scientific experiment?
38. What is the universe and what is Earth's place in it?
39. How and why is Earth constantly changing?
40. How do Earth's processes and human activities affect each other?
41. How do a species habitat and niche differ?
42. What is the correct level of ecological organization?
43. How do mutualism, commensalism and competition differ?
44. What are major similarities and differences between predation and parasitism?
45. How do limiting factors impact the growth of a population?
46. How can you differentiate between density dependent and density independent limiting factors?
47. How can infectious disease impact the population growth of a population?
48. How do invasive species impact the population growth of native species in the habitat?
49. How do invasive species impact of a food web in a particular ecosystem?
50. How does the energy available change as you change levels in a trophic pyramid?
51. Why do food webs show more detailed feeding patterns within an ecosystem when compared to food pyramids?
52. How can we differentiate between autotrophs and heterotrophs?
53. How do autotrophs convert energy from the sun into usable energy for the ecosystem?
54. What criteria is used to classify biomes?

Primary Resource(s) & Technology:

Primary Textbook Reference: Hewitt, P.G.; Lyons, S.; Suchocki, J.; Yah, J. *Conceptual Integrated Science*, 3rd Ed. Pearson; 2020.

Technology: Microsoft Teams, Promethean Boards, Student Laptops

Pennsylvania and/or focus standards referenced at:
www.pdesas.org
www.education.pa.gov

Big Ideas/ EQs	Focus Standard(s)	Assessed Competencies (Key content and skills)	Timeline
1-3 1-8	3.1.10 3.2.10 3.4.10.E4 3.4.10.C1 HS-ETS1-3	Unit 1: The Process of Science • Describe the two measurement scales used in the world • Identify the seven base SI units • Explain the difference between mass and weight • Recognize the prefixes used in the metric system • Write large or small numbers in proper scientific notation • Convert between units using dimensional analysis • Define temperature • Explain the difference between heat and temperature • Identify the three different temperature scales • Convert from one temperature scale to another • Define accuracy and precision • Determine if a scenario is accurate and/or precise • Calculate percent error of an experiment • Define density • Calculate density using the density equation and water displacement • Identify the steps of the scientific method • Correlate the steps of the scientific method to the steps of the experimental design process • Develop an experiment using the experimental design process	7 Weeks
4-17 9-37	3.2.C.A1 3.2.10.A1 3.2.10.A2 3.2.C.A2 3.2.10.A3	Unit 2: Chemistry – The Central Science • Define chemistry • Identify the different branches of chemistry • Define matter. • Identify if something is matter or not.	11 Weeks

	3.2.C.A3 3.2.C.A4 3.2.12.A4 3.2.C.A6 HS-PS1-1 HS-PS1-2 HS-PS1-7	• Define qualitative and quantitative data. • Determine if a property is a physical or chemical property. • Differentiate between the four types of models used in science • Distinguish between macroscopic and particulate level views of chemistry • Identify the main components of the kinetic molecular theory. • Define all states of matter. • Depict all states of matter in particulate representations. • Define thermal energy. • Differentiate the different phases changes of matter. • Explain the relationship between thermal energy and temperature during phase changes. • Determine the various physical and chemical properties to identify different plastic samples. • Define physical change and list several common physical changes. • Define chemical change and list several indications that a chemical change has taken place. • Apply the law of conservation of mass of chemical reactions. • Define matter, pure substance, element, compound, mixture • Distinguish between a pure substance and a mixture • Determine the difference between a homogeneous or heterogeneous mixture • Define mass percent • Calculate the mass percent of various substances • Define matter, pure substance, element, compound, mixture • Distinguish between a pure substance and a mixture • Determine the difference between a homogeneous or heterogeneous mixture • Identify how the periodic table is structured	

		• Determine how the position of an element on the periodic table will determine its properties • Define atom, proton, neutron, electron • Identify the location of the three subatomic particles • Define isotope • Explain how each element contains different isotopes • Define ionic, covalent and metallic bonds • Identify the type of bond formed when two elements combine • Define acids and bases • Identify household materials that are acidic and basic • Explain how different compound structure can change due to different pH situations • Define spectroscopy • Explain how different atoms give off different wavelengths when subjected to energy • Determine the maximum wavelength absorbance of various solutions using UV-Visible Spectroscopy	
18-20 38-40	3.4.10.D 3.1.12.E 3.5.10.A 3.5.12.C HS-ESS1-1 HS-ESS1-2 HS-ESS1-3 HS-ESS2-2 HS-ESS2-3 HS-ESS2-4 HS-ESS2-5	Unit 3: Earth and Space Our Place in the Universe • Compare and contrast the life cycles of stars of different masses and compositions • Understand the electromagnetic spectrum and how it is used by astronomers • Use spectral data to describe color, temperature, and other characteristics of stars. • Discuss everything scientists have learned about space from light observations and spectroscopy • Explain how a star's lifespan is dependent on its mass • Differentiate nuclear fusion and fission and explain how stars make their energy • Explain different scales for measuring space and create a scale model of the galaxy	10 weeks

		• Use math to create a model of the earth's place in space in relation to the solar system • Modeling a mission to Mars • Navigate the sky using a planisphere (star map) • Identify constellations visible in our area • Create a moon calendar by making nightly observations of the moon Earth's Systems • Use and share observations of local weather conditions to describe patterns over time. • Explain how changes in temperature, air pressure, and humidity affect the weather • Forecast the weather using weather maps • Discuss the greenhouse effect and how humans are contributing to climate change • Explain Earth's cycles in terms of the atmosphere, ocean, and geosphere	
22-27 41-54	4.1.10.A 4.1.10.D 4.1.10.C 4.1.10.E 4.2.10.C BIO.B.4.1.1 BIO.B.4.1.2 BIO.B.4.2.1 BIO.B.4.2.2 BIO.B.4.2.4 BIO.B.4.2.5 HS-LS2-1 HS-LS2-3 HS-LS2-4 HS-LS2-7 HS-LS2-8	Unit 4: Biology – The Science of Life • Differentiate between biotic and abiotic factors • Analyze food webs to determine energy transfer in an ecosystem • Describe the different levels of ecological organization • Differentiate between an organisms habitat and it's niche • Describe the five types of species interactions and how they benefit or harm each species • Investigate how density dependent limiting factors can affect the population growth of a species? • Investigate how density independent limiting factors can affect the population growth of a species? • Analyze graphs to determine the carrying capacity of populations • Analyze the impacts of invasive species on native species and ecosystems • Analyze the impacts of invasive species on population growth in ecosystems • Locate invasive species within Western PA	8 weeks

		• Compare the climate and flora of biomes around the world	