SCIENCE MS COLLEGE and CAREER READINESS STANDARDS
MADISON COUNTY SCHOOL DISTRICT
7TH GRADE PACING GUIDE

Note to educators: This document does not replace the standards. The pacing guide is not a stand-alone document and must be used in conjunction with the standards. The pacing guide provides clarification and helps teachers to better plan their time by showing what topics are to be taught during a nine-week period. The pacing guide does not provide the conceptual "big picture" required to fully comprehend the goal of the standard.

SCIENCE MS COLLEGE and CAREER READINESS STANDARDS
MADISON COUNTY SCHOOL DISTRICT
7TH GRADE: 1ST NINE WEEKS

INQUIRY

Clarification: Inquiry skills must be taught first nine weeks but reinforced each nine weeks through activities, labs, and experiments.

Additional Information:
- lab safety
- lab equipment
- graphing
- scientific method

CHEMICAL/PHYSICAL CHANGES

P.7.5D.3 Collect, organize, and interpret data using various tools (e.g., litmus paper, pH paper, cabbage juice) regarding neutralization of acids and bases using common substances.

P.7.5A.1 Collect and evaluate qualitative data to describe substances using physical properties (state, boiling/melting point, density, heat/electrical conductivity, color, and magnetic properties).

Clarification: Keep this basic – refer to particles instead of atoms and bonds (these will be used later).

Additional information:
- Also discuss volume (in with density), soluble, mixtures, malleable, ductile, pH, and freezing point.

P.7.5A.2 Analyze and interpret qualitative data to describe substances using chemical properties (the ability to burn or rust).

Clarification: Keep this basic – refer to particles instead of atoms and bonds (these will be used later).

Additional information:
- Also discuss combustion, oxidation, tarnish, decomposition, and cooking.

P.7.5A.3 Compare and contrast chemical and physical properties (e.g., combustion, oxidation, pH, solubility, reaction with water).

Additional information:
- Discuss endothermic and exothermic.
- Discuss energy transfer with physical properties. Ex: Water (liquid) absorbs energy and turns to water vapor (gas). It can then "transfer back" in the form of releasing thermal energy and turn the gas back into a liquid. An energy change will not reverse a chemical change.

P.7.5D.1 Analyze evidence from scientific investigations to predict likely outcomes of chemical reactions.

Clarification: According to the State Department, this standard is asking students to identify how they know that a chemical reaction has taken place. (for example: presence of gas, color change, presence of smell, new substance created)

Additional information:

- Use information from labs, graphs from prior investigations, and scientific articles.

P.7.5D.2 Design and conduct scientific investigations to support evidence that chemical reactions (e.g., cooking, combustion, rusting, decomposition, photosynthesis, and cellular respiration) have occurred.

Additional information:

- Only cover cooking, combustion, rusting, and decomposition at this point.

P.7.5B.1 Make predictions about the effect of temperature and pressure on the relative motion of atoms and molecules (speed, expansion, and condensation) relative to recent breakthroughs in polymer and materials science (e.g. self-healing protective films, silicone computer processors, pervious/porous concrete).

Clarification: A polymer is a large chemical compound made up of smaller, repeating units. It is used to modify technology to improve the functions and abilities of substances. (You do not have to go in depth with polymers.)

Additional information:

- *Examples include: small computer units that don't over-heat (large desktop to small computer in a phone or apple watch), protective layers for cell phones to reduce breaking, materials that allow precipitation to flow directly through concrete – thus reducing run-off and erosion, etc.*

P.7.5B.2 Use evidence from multiple scientific investigations to communicate the relationships between pressure, volume, density, and temperature of a gas.

Additional information:

- Use graphs, labs, scientific articles, etc. to create a power point, demonstration, lab report, and/or a graph to represent the research.

P.7.5B.3 Ask questions to explain how density of matter (observable in various objects) is affected by a change in heat and/or pressure.

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7TH GRADE: 2ND NINE WEEKS

ATOMS, ELEMENTS, & CHEMICAL EQUATIONS

P.7.5C.2 Use informational text to sequence the major discoveries leading to the current atomic model.

Additional information:

- Allow students to research different discoveries – make sure that they research the Bohr model and the Schrodinger model. They also need to look at how the periodic table was formed and then adjusted – Dmitri Mendeleev and Henry Moseley.

P.7.5C.1 Develop and use models that explain the structure of an atom.

Additional information:

- Review the basics: nucleus, protons, neutrons, and electrons
- Discuss the periodic table and the transformation of the order (atomic mass to atomic number).
- Explain valence electrons and how they can be found using the periodic table (octet rule).

P.7.5C.4 Predict the properties and interactions of elements using the periodic table (metals, non-metals, reactivity, and conductors).

Additional information:

- Use the chemical and physical properties and the shared characteristics of groups in the periodic table.

P.7.5C.3 Collect, organize, and interpret data from investigations to identify and analyze the relationships between the physical and chemical properties of elements, atoms, molecules, compounds, solutions, and mixtures.

Additional information:

- Discuss how valence electrons and bonding can change the properties of the compounds, solutions, and mixtures (this can include table salt, water, fluoride, etc…)

P.7.5C.5 Describe concepts used to construct chemical formulas (e.g. CH4, H2O) to determine the number of atoms in a chemical formula.

Additional information:

- Also include the formulas for table salt, ozone, oxygen gas, sugar, carbon dioxide, etc…

P.7.5C.6 Using the periodic table, make predictions to explain how bonds (ionic and covalent) form between groups of elements (e.g., oxygen gas, ozone, water, table salt, and methane).

P.7.5E.3 Compare and contrast balanced and unbalanced chemical equations to demonstrate the number of atoms does not change in the reaction.

Additional information:

- Describe what a chemical equation is and use the terms reactants, products, yields, and produces.
- Use manipulatives to show the number of atoms (possibly by color) on each side of the equation. Have students compare the numbers of atoms on each side of the yield sign to determine if the equation is balanced or unbalanced.

P.7.5D.2 Design and conduct scientific investigations to support evidence that chemical reactions (e.g., cooking, combustion, rusting, decomposition, photosynthesis, and cellular respiration) have occurred.

Additional information:

- Only cover decomposition, photosynthesis, and cellular respiration – using their chemical equation to explain the reactants and products. You can also discuss synthesis and replacement here (will also be used in the cycles during 3rd nine weeks).

P.7.5D.4 Build a model to explain that chemical reactions can store (formation of bonds) or release energy (breaking of bonds).

Clarification: When bonds are formed or broken, energy can be stored or released for both! Include endothermic, exothermic, photosynthesis, and respiration.

P.7.5E.1 Conduct simple scientific investigations to show that total mass is not altered during a chemical reaction in a closed system. Compare results of investigations to Antoine-Laurent Lavoisier's discovery of the law of conservation of mass.

Additional information:

- You can show the students the mathematical procedure for calculating total mass on each side of the equation. You can demo a small lab (Ex: Use baking soda and vinegar (measure the mass) – have them "react" with each other and then measure the mass again. YOU MUST use a container with a balloon or some sort of closure to keep in the gases. Compare the measurements.

P.7.5E.2 Analyze data from investigations to explain why the total mass of the product in an open system appears to be less than the mass of reactants.

Additional information:

- Repeat the lab from above (baking soda and vinegar), but do not close it in. Allow the gas to escape. Then compare the measurements and discuss how the gases can't be measured once they "escape" into the air.

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7TH GRADE: 3ND NINE WEEKS

THE CYCLES OF MATTER & EARTH'S TILT

L.7.3.1 Analyze diagrams to provide evidence of the importance of the cycling of water, oxygen, carbon, and nitrogen through ecosystems to organisms.

Additional information:

- Review ecosystems – terrestrial, freshwater, marine, and food webs.
- When discussing cycles, use the chemical formulas and equations as much as possible (O_2, CO_2, CH_4, etc.).

L.7.3.2 Analyze and interpret data to explain how the processes of photosynthesis, and cellular respiration (aerobic and anaerobic) work together to meet the needs of plants and animals.

Additional information:

- Look at the products and reactants of photosynthesis and cellular respiration and how they are used by plants and animals.

L.7.3.3 Use models to describe how food molecules (carbohydrates, lipids, proteins) are processed through chemical reactions using oxygen (aerobic) to form new molecules.

Additional information:

- Food molecules are broken down and rearranged through chemical reactions forming new molecules that support cell growth and/or release of energy.
- Specific details of the biochemical steps of breaking down food, or the resulting molecules (e.g., carbohydrates are broken down into monosaccharides) are bit expected to be covered.

L.7.3.4 Explain how disruptions in cycles (e.g., water, oxygen, carbon, and nitrogen) affect biodiversity and ecosystem services (e.g., water, food, and medications) which are needed to sustain human life on Earth.

Additional information:

- Some examples to include: deforesttion, pollution, invasive species, flooding, drought, global warming, permafrost, fossil fuel and carbon emissions, destruction of wetlands, etc..

L.7.3.5 Using an engineering design process, create a solution for sustaining the health of ecosystems to maintain biodiversity and the resources needed by humans for survival (e.g. water purification, nutrient recycling, prevention of soil erosion, and prevention or management of invasive species).

E.7.9C.1 Construct models and diagrams to illustrate how the tilt of Earth's axis results in differences in intensity of sunlight on the Earth's hemispheres throughout the course of one full revolution around the Sun.

Additional information:

- Review heat transfer.

E.7.9C.2 Investigate how variations of sunlight intensity experienced by each hemisphere (to include the equator and poles) create the four seasons.

E.7.9A.4 Construct an explanation for how climate is determined in an area using global and surface features (e.g. latitude, elevation, shape of the land, distance from water, global winds and ocean currents).

Additional information:

- Only cover: latitude, elevation, shape of land, and distance from water.
- Also include altitude, marine climate, and continental climate.

SCIENCE MS COLLEGE and CAREER READINESS STANDARDS
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7TH GRADE: 4TH NINE WEEKS

WEATHER

E.7.9A.2 Analyze evidence to explain the weather conditions that result from the relationship between the movement of water and air masses.

Additional information:

- Review air pressure, water in the atmosphere (water cycle), how clouds form, precipitation, humidity, fog, layers of air masses give off different temperatures (thus different precipitation), etc..

E.7.9A.4 Construct an explanation for how climate is determined in an area using global and surface features (e.g. latitude, elevation, shape of the land, distance from water, global winds and ocean currents).

Additional information:

- Only cover global winds and ocean currents.
- Include the California Current and the Gulf Stream. Tell how they contribute to the weather patterns in the United States.
- Tell how the Coriolis Effect impacts winds and ocean currents.

E.7.9A.5 Analyze models to explain the cause and effect relationship between solar energy and convection and the resulting weather patterns and climate conditions.

Additional information:

- Local Winds, Sea Breeze, Land Breeze, Monsoons, Lake-Effect Snows, etc…

E.7.9A.1 Analyze and interpret weather patterns from various regions to differentiate between weather and climate.

Additional information:

- Look globally – the parts of countries that share climate zones, but have different weather because of the impacts of ocean currents and global winds.

E.7.9A.3 Interpret atmospheric data from satellites, radar, and weather maps to predict weather patterns and conditions.

Additional information:
- Look at the United States only here!

E.7.9A.6 Research and use models to explain what type of weather (thunderstorms, hurricanes, and tornadoes) results from the movement and interactions of air masses, high and low pressure systems, and frontal boundaries.

E.7.9A.7 Interpret topographic maps to predict how local and regional geography affect weather patterns and make them difficult to predict.

E.7.9B.1 Read and evaluate scientific or technical information assessing the evidence and bias of each source to explain the causes and effects of climate change.

Additional information:
- Research different viewpoints and determine validity.

E.7.9B.2 Interpret data about the relationship between the release of carbon dioxide from burning fossil fuels into the atmosphere and the presence of greenhouse gases.

E.7.9B.3 Engage in scientific argument based on current evidence to determine whether climate change happens naturally or is being accelerated through the influence of man.

Additional information:
- Debate, create a persuasive essay, Socratic seminar, etc…