NGSS Standards in Earth & Space Science

Revisit a number of PS Standards to gain deeper understanding as "prep" for the State Test.

HS-ESS3-1 Earth and Human Activity - Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. *Population migrations*

HS-ESS3-2 Earth and Human Activity - Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios. *Compare fossil extraction & fracturing costs vs efficiency, etc*

HS-ESS3-3 Earth and Human Activity - Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. *Group discussions & research*

HS-ESS3-4 Earth and Human Activity - Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. *Ocean fishing, fracturing….*

HS-ESS3-5 Earth and Human Activity - Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. *Objective, Valid, empirical, multiple investigations, Peer Reviewed → use of models to predict…*

HS-ESS3-6 Earth and Human Activity - Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity. *Yes*

NGSS Standards in Physical Science

HS-PS1-1 Matter and its Interactions - Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms. ***Ch 12*** *- Models*

HS-PS1-2 Matter and its Interactions - Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. **Ch 12** - *(ionic – covalent…) Labs, Models*

HS-PS1-3 Matter and its Interactions - Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. **CH 12 -** *Ions, IF, Spec Heat, melting/boiling*

HS-PS1-5 Matter and its Interactions - Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs. **Ch 13 -** *Demo, Lab*

HS-PS1-7 Matter and its Interactions - Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. **CH 14 -** *Practice work, Models*

HS-PS1-8 Matter and its Interactions - Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay. **CH 14 -** *Model drawings*

HS-PS2-1 Motion and Stability: Forces and Interactions - Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. **CH 6 –** *Lab*

HS-PS2-2 Motion and Stability: Forces and Interactions - Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system. **CH 7 -** *Practice work*

HS-PS2-3 Motion and Stability: Forces and Interactions - Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision. **CH 5 -** *Lab*

HS-PS2-4 Motion and Stability: Forces and Interactions - Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law (not in this text) to describe and predict the gravitational and electrostatic forces between objects. ***CH 16*** *attractive & repulsion* ***& CH 26*** *attractive . Both are inverse square:*

Ch 12 Coulombs Law: $F = K_e \frac{(q_1 * q_2)}{r^2}$ **verses CH 26 Universal Law of Gravity:** $F = G \frac{(m_1 - m_2)}{r^2}$

HS-PS2-5 Motion and Stability: Forces and Interactions - Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current. **CH 16 –** *Lab*

HS-PS2-6 Motion and Stability: Forces and Interactions - Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials. **CH 10 & 22** Water's incredibly unique properties…

HS-PS3-1 Energy - Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known. **Ch 7 -** $E_K + E_P$

HS-PS3-2 Energy - Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).**CH 9-***Convection cycle models at micro/macro scale*

HS-PS3-3 Energy - Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. **Ch 7 & 9** $E_K + E_P$ *Model & Thermal* → E_K *molecules*

HS-PS3-4 Energy - Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). **CH 9 –** *Lab*

HS-PS3-5 Energy - Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction. **CH 12 –** Lab

HS-PS4-1 Waves and their Applications in Technologies for Information Transfer - Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. **CH – 24, 25,** *Practice*

HS-PS4-2 Waves and their Applications in Technologies for Information Transfer - Evaluate questions about the advantages of using digital transmission and storage of information. **CH 24 & 25** *Device storage vs 'cloud': speed, convenience, privacy, safety*

HS-PS4-3 Waves and their Applications in Technologies for Information Transfer - Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other. **CH 12, 24 & 25 -** *Waves with speed & dimensions vs photon particles*

HS-PS4-4 Waves and their Applications in Technologies for Information Transfer - Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter. **CH 25 -** *In or through Atmosphere, absorb (→thermal) vs reflect, into skin → DNA mutations…*

HS-PS4-5 Waves and their Applications in Technologies for Information Transfer - Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy. **CH 25, 26** *Solar PV cells, microwave mobile phone→ tower→ satellites …*

HS-ESS1-1 Earth's Place in the Universe - Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation. **CH 27 –** *Models*

HS-ESS1-2 Earth's Place in the Universe - Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe. **CH – 28** *Poster (background noise)*

HS-ESS1-5 Earth's Place in the Universe - Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks. **CH – 19 & 20** *(Mid-ocean ridge etc)*

HS-ESS1-6 Earth's Place in the Universe - Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.**CH – 18 & 26,** *(Plus Compare Earth & Moon)*

HS-ESS2-1 Earth's Systems - Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. **CH - 19 & 20** *Models*

HS-ESS2-2 Earth's Systems - Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems. **CH – 9, 15, 19 & 20** *Models ↑atm→ ↑temp→ ↓snow/ice → ↓reflection & ↑absorption→ ↑temp*

HS-ESS2-3 Earth's Systems - Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection. **CH - 19 & 20** *Model*

HS-ESS2-4 Earth's Systems - Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate. **CH 11 & 5 -** *Model ↑atm→ ↑temp→ ↓snow/ice→ ↓reflection & ↑absorption→ ↑temp air & ocean & ↑storm energy*

HS-ESS2-5 Earth's Systems - Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.**CH 22 -** *Water's Spec Heat & IF→ expanding solid insulates Earth's life*