

Teaching Unit: **P2: Energy**

Essential Understandings

Understand the basics such as heat, temperature, internal energy, specific heat, heat transfer (conduction, convection, radiation), change of phase, and thermodynamics  
Understand basic wave properties (frequency, amplitude, phase) and basic wave behavior (interference/superposition) to describe sound and light

Sub Topic: **Sound, Heat, Light**

Knowledge and Skills

what is temperature and what is heat  
what happens to a solid when heated  
what happens to water when heated and cooled  
what are conductors  
what are insulators  
what causes hypothermia  
what causes global warming  
what are the phase changes  
what is the first & second law of thermodynamics  
waves and their behavior  
em waves  
transverse waves  
longitudinal waves  
what is a beat  
what is a photon  
what are electromagnetic waves  
what are transparent materials  
what are opaque materials  
what is polarization  
what is the color spectrum  
what are complementary colors  
what is reflection/refraction  
what is total internal reflection  
what are converging & diverging lens  
what are various image formations

Teaching Unit: **P2: Universal Gravitation**

Essential Understandings

Understand the universal nature of gravity, gravitational constant, and the inverse square law

Sub Topic: **Newton's Law**

Knowledge and Skills

Newton's law of universal gravitation  
What allows the planets of our solar system to move in their respective orbits  
what makes the earth round

Teaching Unit: ***P2: Gravitational Interactions***

Essential Understandings

Understand gravitational fields, tidal forces, and black holes

Sub Topic: ***Fields, Tides, Black Holes***

Knowledge and Skills

what is a strong g field  
what is weight and weightlessness  
what causes earth's tides  
what are the different tides  
what is a black hole

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Teaching Unit: ***P2: Satellite Motion***

Essential Understandings

understand escape speed  
understand orbital speed  
understand circular orbit  
understand an elliptical orbit

Sub Topic: ***Circular Orbits, Elliptical Orbits***

Knowledge and Skills

what is the speed of a circular orbit  
what is the relationship of the  $p_e$  and  $k_e$  of a satellite in a constant orbit  
what is the apogee and perigee of a satellite

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Teaching Unit: ***P2: Nuclear Physics***

Essential Understandings

understand the atom and Quanta  
understand radioactivity  
understand nuclear reactions

Sub Topic: ***Decay, Fission, Fusion***

Knowledge and Skills

what is light quanta  
what is Planck's constant  
what is radioactive decay  
what are radioactive isotopes  
what is radioactive half life  
what is carbon dating  
what is nuclear fission  
what is nuclear fusion  
what is a breeder reactor  
what is a nuclear fission reactor

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Teaching Unit: ***P2: Elect. & Magnetism***

Essential Understandings

understand electrostatics  
understand electric fields & potential  
understand electric current  
understand electric circuits  
understand magnetism & electromagnetic induction

Sub Topic: ***Poles,Fields,Charges,Circuits,Curren***

Knowledge and Skills

what are electrical forces and charges  
what are conductors and insulators  
what is charging ( induction,polarization,friction)  
what are electric fields & field lines  
what is electric potential energy  
what is voltage  
what is electric current  
what is electric resistance  
what is Ohm's Law  
what is DC & AC current  
what is electric power  
what is a series circuit  
what is a parallel circuit  
what are magnetic poles & fields  
what are magnetic domains  
what is the basis of meters and motors  
what is the structure of the Earth's magnetic field  
what is Faraday's law  
what are transformers  
what is a generator

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