8th | Grade 8 SCIENCE: Content Map

Quarter 1 2 3 4 Teacher:______________________

Content
(*Specific* text, chapter, lesson, etc.)

	PHYSICS	Weeks 1-3	Weeks 4-6	Weeks 7-9
1A. Motion	Velocity and speed o The velocity of an object is the rate of change of its position in a particular direction. Speed is the magnitude of velocity expressed in distance covered per unit of time. o Changes in velocity can involve changes in speed or direction or both.			
	Average speed = total distance traveled divided by the total time elapsed o Formula: Speed = Distance/Time (S = D/T) o Familiar units for measuring speed: miles or kilometers per hour			
1B. Forces	The concept of force: force as a push or pull that produces a change in the state of motion of an object o Examples of familiar forces (such as gravity, magnetic force) o A force has both direction and magnitude. o Measuring force: expressed in units of mass, pounds in English system, newtons in metric system			
	Unbalanced forces cause changes in velocity. o If an object is subject to two or more forces at once, the effect is the net effect of all forces. o The motion of an object does not change if all the forces on it are in balance, having net effect zero. o The motion of an object changes in speed or direction if the forces on it are unbalanced, having net effect other than zero. To achieve a given change in the motion of an object, the greater the mass of the object, the greater the force required.			
1C. Density & Buoyancy	When immersed in a fluid (i.e. liquid or gas), all objects experience a buoyant force. o The buoyant force on an object is an upward (counter-gravity) force equal to the weight of the fluid displaced by the object. o Density = mass per unit volume o Relation between mass and weight (equal masses at same location have equal weights)			
	How to calculate density of regular and irregular solids from measurements of mass and volume o The experiment of Archimedes			
	How to predict whether an object will float or sink			
1D. Work	In Physics, work is a relation between force and distance: work is done when force is exerted over a distance. o Equation: Work equals Force × Distance (W = F × D) o Common units for measuring work: foot-pounds (in English system), joules (in metric system; 1 joule = 1 newton of force × 1 meter of distance)			

1E. Energy	In physics, energy is defined as the ability to do work.			
	Energy as distinguished from work o To have energy, a thing does not have to move. o Work is the transfer of energy.			
	Two main types of energy: kinetic and potential o Some types of potential energy: gravitational, chemical, elastic, electromagnetic o Some types of kinetic energy: moving objects, heat, sound and other waves			
	Energy is conserved in a system			
1F. Power	In physics, power is a relation between work and time: a measure of work done (or energy expended) and the time it takes to do it. o Equation: Power equals Work divided by Time (P = W/T), or Power = Energy/Time o Common units of measuring power: foot-pounds per second, horsepower (in English system); watts, kilowatts (in metric system)			
ELECTRICITY & MAGNETISM		Weeks 1-3	Weeks 4-6	Weeks 7-9
2A. Electricity	Basic terms and concepts (review from grade 4): o Electricity is the flow of electrons in a conductor. o Opposite charges attract, like charges repel. o Conductors and insulators o Open and closed circuits o Short circuit: sudden surge of amperage due to the reduction of resistance in a circuit; protection from short circuits is achieved by fuses and circuit breakers o Electrical safety			
	Electricity as the flow of electrons o Electrons carry negative charge; protons carry positive charge o Conductors: materials like metals that easily give up electrons o Insulators: materials like glass that do not easily give up electrons			
	Static electricity o A static charge (excess or deficiency) creates an electric field. o Electric energy can be stored in capacitors (typically two metal plates, one charged positive and one charged negative, separated by an insulating barrier). Capacitor discharges can release fatal levels of energy. o Grounding drains an excess or makes up a deficiency of electron, because the earth is a huge reservoir of electrons. Your body is a ground when you get a shock of static electricity o Lightning is a grounding of static electricity from clouds			
	Flowing electricity o Electric potential is measured in volts o Electric flow or current is measured in amperes: 1 ampere = flow of 1 coulomb of charge per second (1 coulomb = the charge of 6.25 billion electrons). o The total power of an electric flow over time is measured in watts. o The unit of electrical resistance is the ohm. Ohm’s Law: watts = amps × volts. And the corollaries: amps = watts/volts; volts = watts/amps.			

<table>
<tr><td rowspan="2">2B. Magnetism & Electricity</td><td>Earth’s magnetism
o Earth’s magnetism is believed to be caused by movements of charged atoms in the molten interior of the planet.
o Navigation by magnetic compass is made possible because the earth is a magnet with north and south magnetic poles.</td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td>Connection between electricity and magnetism
o Example: move a magnet back and forth in front of wire connected to a meter, and electricity flows in the wire. The reverse: electric current flowing through a wire exerts magnetic attraction.
o Spinning electrons in an atom create a magnetic field around the atom.
o Unlike magnetic poles attract, like magnetic poles repel.
o Practical applications of the connection between electricity and magnetism, for example:
• An electric generator creates alternating current by turning a magnet and a coil of wire in relation to each other; an electric motor works on the reverse principle.
• A step-up transformer sends alternating current through a smaller coil of wire with just a few turns next to a larger coil with many turns. This induces a higher voltage in the larger coil. A step-down transformer does the reverse, sending current through the larger coil and creating a lower voltage in the smaller one.</td></tr>
<tr><td colspan="2">ELECTROMAGNETIC RADIATION & LIGHT</td><td>Weeks 1-3</td><td>Weeks 4-6</td><td>Weeks 7-9</td></tr>
<tr><td rowspan="3">3. Electromagnetic Radiation & Light</td><td>Waves and electromagnetic radiation
o Most waves, such as sound and water waves, transfer energy through empty space.</td><td rowspan="3"></td><td rowspan="3"></td><td rowspan="3"></td></tr>
<tr><td>The electromagnetic spectrum
o From long waves, to radio waves, to light waves, to x-rays, to gamma rays
o Called “electromagnetic” because the radiation is created by an oscillating electric field which creates an oscillating magnetic field at right angles to it, which in turn creates an oscillating electric field at right angles, and so on, with both fields perpendicular to each other and the direction the wave is moving.
o The light spectrum: from infrared (longest) to red, orange, yellow, green, blue, violet (shortest)
o Speed in a vacuum of all electromagnetic waves including light: 300,00 km per second, or 186,000 miles per second; a universal constant, called c</td></tr>
<tr><td>Refraction and reflection
o Refraction: the slowing down of light in glass causes it to bend, which enables lenses to work for television, photography, and astronomy
o How Isaac Newton used the refraction of a prism to discover that white light was made up of rays of different energies (or colors)
o Reflection: concave and convex reflectors; focal point</td></tr>
</table>

SOUND WAVES		Weeks 1-3	Weeks 4-6	Weeks 7-9
4. Sound Waves	General properties of waves o Waves transfer energy by oscillation without transferring matter; matter disturbed by a wave returns to its original place. o Wave properties: wavelength, frequency, speed, crest, trough, amplitude o Two kinds of waves: transverse (for example, light) and longitudinal (for example, sound) o Common features of both kinds of waves: o Speed and frequency of wave determine wavelength. o Wave interference occurs in both light and sound. o Doppler effect occurs in both light and sound.			
	Sound waves: longitudinal, compression waves, made by vibrating matter (e.g., strings, wood, air) o While light and radio waves can travel through a vacuum, wound waves cannot. Sound waves need a medium through which to travel. o Speed • Sound goes faster through denser mediums, that is, faster through solids and liquids than through air (gases). • At room temperature, sound travels through air at about 340 meters per second (1,130 feet per second). • Speed of sound = March number • Supersonic booms; breaking the sound barrier o Frequency • Frequency of sound waves measured in "cycles per second" or Hertz (Hz) • Audible frequencies roughly between 20 and 20,000 Hz • The higher the frequency, the higher the subjective "pitch" o Amplitude • Amplitude or loudness is measured in decibels (dB). • Very loud sounds can impair hearing or cause deafness. • Resonance, for example, the sound board of a piano, or plates of a violin			
CHEMISTRY OF FOOD & RESPIRATION		Weeks 1-3	Weeks 4-6	Weeks 7-9
5. Food & Respiration	Energy for most life on earth comes from the sun, typically from the sun, to plants, to animals, back to plants.			
	Living cells get most of their energy through chemical reactions. o All living cells make and use carbohydrates (carbon and water), the simplest of these being sugars. o All living cells make and use proteins, often very complex compounds containing carbon, hydrogen, oxygen, and many other elements. o Making these compounds involves chemical reactions which need water, and take place in and between cells, across cell walls. The reactions also need catalysts called "enzymes". o Many cells also make fats, which store energy and food.			

5. Food & Respiration (continued)	Energy in plants: photosynthesis o Plants do not need to eat other living things for energy. o Main nutrients of plants; the chemical elements nitrogen, phosphorus, potassium, calcium, carbon, oxygen, hydrogen (some from soil or the sea, others from the air) o Photosynthesis, using chlorophyll, converts these elements into more plant cells and stored food using energy for sunlight. o Leafy plants mainly get their oxygen dissolved in water from their roots, and their carbon mainly from the gas CO_2. o Plant photosynthesis uses up CO_2 and releases oxygen.			
	Energy in animals: respiration o Animal chemical reactions do the opposite of plants—they use up oxygen and release CO_2. o In animals the chief process is not photosynthesis but respiration, that is, the creation of new compounds through oxidation. o Animals cannot make carbohydrates, proteins, and fats from elements. They must eat these organic compounds from plants or other animals, and create them through respiration. o Respiration uses oxygen and releases CO_2, creating an interdependence and balance between plant and animal life.			
	Human nutrition and respiration o Humans are omnivores and can eat both plant and animal food. o Human respiration, through breathing, gets oxygen to the cells through the lungs and the blood. o The importance of hemoglobin in the blood.			
	Human health o While many other animals can make their own vitamins, humans must get them from outside. o A balanced diet: the food pyramid for humans (review); identification of the food groups in terms of fats, carbohydrates, proteins, vitamins, and trace elements.			
SCIENCE BIOGRAPHIES		Weeks 1-3	Weeks 4-6	Weeks 7-9
6. Biographies	o Albert Einstein o Dorothy Hodgkin o James Maxwell o Charles Steinmetz			