Curriculum Map: Academic Physics

Crawford Central School District

MASH

Science/Physics

Course Description: The topics can include making measurements; recording and interpreting data; description of forces; kinematics and dynamics; work and energy; and problem-solving using basic algebra-based calculations and supporting qualitative concepts. Other possible topics covered are thermodynamics; vibration, waves and energy; and electricity and magnetism.

Unit Title: **Kinematics and Dynamics (Forces and the Laws of Motion)**

Suggested time frame: 9 weeks

Standards: 3.2.P.B1-7, CC.3.6.11-12.B, CC.3.5.11-12.C, CC.3.5.11-12.D, CC.3.5.11-12.H

Essential Questions:

1) From where do units come?
2) How can a measurement be precise, but lack accuracy?
3) How can the motion of an object be described in a measurable and quantitative way?
4) What is a force?
5) What causes the motion of an object?

Competency	**Vocabulary**	**Strategy**	**Resource**
Perform laboratory procedures applying their understanding of forces and motion to predict the outcomes of moving objects.	Hypothesis, Accuracy, Precision, Significant Figures, Measurement, Conversion Factors, Uniform Motion, Displacement, Velocity, time, Acceleration, Gravity, Vector and Scalar Force, Newton	Notes, example problems, labs, readings, homework, online simulations, formative assessment, summative assessment, differentiated instructions, cooperative learning. **Labs** can include: Motion and Graphing, forces and force tables, momentum and Impulse, Pendulums **Projects** can include:	Merrill Physics: Principles and Problems. 1995. Glenco. Simulation Websites (e.g. PhET, physics classroom, hyperphysics, hippo campus, etc.) Updated web-based software (e.g. java, shockwave, flash, etc.) Lab equipment: data acquisition interface devices

		Vehicle safety, projectile launcher/catapult, egg drop, etc.	with sensors (e.g. force, motion, photogates, low-friction carts and tracks, etc.) Mass scale, string, meter sticks, stopwatches, ball bearings, tape measure,

Unit Title: **Work and Energy**

Suggested time frame: 9 weeks

Standards: 3.2.P.B1-7, CC.3.6.11-12.B, CC.3.5.11-12.C, CC.3.5.11-12.D, CC.3.5.11-12.H

Essential Questions:

1) How does an object's mass distribution and interactions with other and forces at a distance influence the object's motion?
2) Can kinematic equations be derived from kinetic and potential energy? If so, how?
3) Is the amount of work done on an object always conserved?
4) How can energy from a moving object such as a car, be used to power up an electric device, for example a light bulb?

Competency	Vocabulary	Strategy	Resource
Perform laboratory procedures applying their understanding of work and types of energy to determine the relationship between the work done on an object and the conversion of energy.	Work, energy, potential, kinetic, elastic potential, momentum, elastic/inelastic collisions, conservation of energy/momentum. Work-energy theorem.	Notes, example problems, labs, readings, homework, online simulations, formative assessment, summative assessment, differentiated instructions, cooperative learning. **Labs** can include: Human horsepower, tension at angle, pendulums, potential/kinetic energy, etc. **Projects** can include: Rollercoaster energy, "junk ramp rambler", build a car (mousetrap), Rube Goldberg, egg drop, etc.	Merrill Physics: Principles and Problems. 1995. Simulation Websites (e.g. PhET, physics classroom, hyperphysics, hippo campus, etc.) Updated web-based software (e.g. java, shockwave, flash, etc.) Lab equipment: data acquisition interface devices with sensors (e.g. force, motion, photogates, low-friction carts and tracks, etc.) Mass scale, string, meter sticks, stopwatches, ball bearings, tape measure

Unit Title: **Electricity and Magnetism**

Suggested time frame: 9 weeks

Standards: 3.2.P.B1-7, CC.3.6.11-12.B, CC.3.5.11-12.C, CC.3.5.11-12.D, CC.3.5.11-12.H

Essential Questions:

1) How is electricity used to create heat, sound, light, and motion?
2) What types of materials are conductors of electricity and what materials are not conductors (insulators)?
3) How do magnets interact with each other and other objects?
4) How does the size and strength of a magnet affect its ability to push and pull?

Competency	Vocabulary	Strategy	Resource
Perform laboratory procedures applying knowledge of simple circuits and the relationships between voltage, current, and power, magnetic domains and fields.	Electricity, charge, current, voltage, resistance, electric field, capacitance, inductance, ohm's law, coulomb's law, circuit, source, load, power, magnetic poles and domains.	Notes, example problems, labs, readings, homework, online simulations, formative assessment, summative assessment, differentiated instructions, cooperative learning. **Labs** can include: Ohm's law, series/parallel, magnetic field mapping, etc. **Projects** can include: Circuit design, household electronics, power use reduction, simple electric motors, etc.	Merrill Physics: Principles and Problems. 1995. Glenco. Simulation Websites (e.g. PhET, physics classroom, hyperphysics, hippo campus, etc.) Updated web-based software (e.g. java, shockwave, flash, etc.) Lab equipment: data acquisition interface devices with sensors (e.g. Voltmeter, ammeter, ohmmeter, etc.) Circuit boards, breadboards, voltage supply, Van der

			Graff generator, magnets, compasses

Unit Title: **Waves, Sound, and Light**

Suggested time frame: 9 weeks

Standards: 3.2.P.B1-7, CC.3.6.11-12.B, CC.3.5.11-12.C, CC.3.5.11-12.D, CC.3.5.11-12.H

Essential Questions:

1) How do electromagnetic waves compare to mechanical waves?
2) How are the characteristics of waves affected by the type of medium in which they travel?
3) How are wavelengths detected by the human eye?
4) How do you determine the velocity of a wave?

Competency	Vocabulary	Strategy	Resource
Perform laboratory procedures to show an understanding of wave characteristics, both light and sound.	Standing waves, nodes, antinodes, reflection, refraction, wavelength, amplitude, crest, trough, rarefaction, longitudinal wave, transverse, interference	Notes, example problems, labs, readings, homework, online simulations, formative assessment, summative assessment, differentiated instructions, cooperative learning. **Labs** can include: Reflection, refraction, slinky waves, resonance, etc. **Projects** can include: Hit the target (mirrors and lasers), solar cooker, homemade telescope, musical instruments etc.	Merrill Physics: Principles and Problems. 1995. Glenco. Simulation Websites (e.g. PhET, physics classroom, hyperphysics, hippo campus, etc.) Updated web-based software (e.g. java, shockwave, flash, etc.) Lab equipment: data acquisition interface devices with sensors (e.g. Light intensity, sound, , etc.) Tuning fork, Doppler effect demonstrator, Slinkies, laser pointers, mirrors & lenses, resonance tubes

Unit Title: **Heat and Thermodynamics**

Suggested time frame: 9 weeks

Standards: 3.2.P.B1-7, CC.3.6.11-12.B, CC.3.5.11-12.C, CC.3.5.11-12.D, CC.3.5.11-12.H

Essential Questions:

1) What is thermodynamics?
2) What impact do the Laws of Thermodynamics have on machines?
3) How is the temperature of a substance related to the thermal energy of its atoms?
4) What is the underlining principle behind the movement of heat by conduction, convection, and radiation?

Competency	Vocabulary	Strategy	Resource
Perform laboratory procedures applying their understanding of temperature and heat to explain and investigate the characteristics of heat transfer.	Heat, temperature, specific heat, Celsius, conductivity, expansion, R-value, conduction, convection, radiation, latent heat	Notes, example problems, labs, readings, homework, online simulations, formative assessment, summative assessment, differentiated instructions, cooperative learning. **Labs** can include: Candy-making, water mixture calorimetry, body temperature/energy, etc. **Projects** can include: Heat transfer conductivity, cooking/baking physics, etc.	Merrill Physics: Principles and Problems. 1995. Glenco. Simulation Websites (e.g. PhET, physics classroom, hyperphysics, hippo campus, etc.) Updated web-based software (e.g. java, shockwave, flash, etc.) Lab equipment: data acquisition interface devices with sensors (e.g. Temperature, pressure, volume, etc.) Insulated containers, mass scale