Nanyang Model Highschool

(BC OFFSHORE PROGRAM)

PHYSICS 11 Annual Plan

2025–2026

Link to Curriculum: https://curriculum.gov.bc.ca/sites/curriculum.gov.bc.ca/files/curriculum/science/en_science_11_physics_elab.pdf

Course Synopsis

Physics 11 is a hands-on course that looks to explain the workings of the physical world. The aim is to investigate the rules by which nature works. This course takes many of the concepts discussed in mathematics courses and applies them to the world around us.

Big Ideas

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An object's motion can be predicted, analyzed, and described.	Forces influence the motion of an object.	Energy is found in different forms, is conserved, and has the ability to do work.	Mechanical waves transfer energy but not matter.

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Competencies & Content

Core Competencies	Curricular Competencies	Content
Communication ▸ Connect and engage with others ▸ Acquire, interpret, and present information ▸ Collaborate to plan, carry out, and review activities ▸ Explain/recount and reflect on experiences **Creative Thinking** ▸ Novelty and value ▸ Generating ideas ▸ Developing ideas **Critical Thinking** ▸ Analyze and critique ▸ Question and investigate ▸ Develop and design **Personal & Cultural Identity** ▸ Relationship and cultural contexts ▸ Personal values and choice ▸ Personal strengths and abilities **Personal Awareness & Responsibility** ▸ Self-determination ▸ Self-regulation ▸ Well-being **Social Responsibility** ▸ Contributing to community ▸ Solving problems peacefully ▸ Valuing diversity ▸ Building relationships	**Questioning and predicting** ▸ Demonstrate sustained intellectual curiosity ▸ Make observations to identify questions ▸ Formulate multiple hypotheses **Planning and conducting** ▸ Plan and use appropriate investigation methods ▸ Assess risks and address ethical issues ▸ Use appropriate SI units and equipment ▸ Apply accuracy and precision concepts **Processing and analyzing** ▸ Experience and interpret local environment ▸ Apply First Peoples perspectives ▸ Seek patterns, trends, and connections ▸ Construct, analyze, and interpret graphs ▸ Draw evidence-based conclusions ▸ Analyze cause-and-effect relationships **Evaluating** ▸ Evaluate methods and identify sources of error ▸ Describe ways to improve investigations ▸ Evaluate validity and limitations of models ▸ Demonstrate awareness of assumptions and bias ▸ Connect scientific explorations to careers **Applying and innovating** ▸ Contribute to care for self, others, community ▸ Transfer and apply learning to new situations ▸ Generate new ideas when problem solving **Communicating** ▸ Formulate theoretical models ▸ Communicate scientific ideas with evidence ▸ Reflect on experiences and worldviews	**Students are expected to know:** ▸ Vector and scalar quantities ▸ Horizontal uniform and accelerated motion ▸ Vertical projectile motion ▸ Contact forces and factors affecting magnitude/direction ▸ Mass, force of gravity, apparent weight ▸ Newton's laws and free-body diagrams ▸ Balanced/unbalanced forces in systems ▸ Law of conservation of energy ▸ Potential energy (PE = mgh) ▸ Kinetic energy (KE = $\frac{1}{2}mv^2$) ▸ Transformation of energy ▸ Transfer of energy in closed/open systems ▸ Heat (Q = mcΔT) ▸ Local/global impacts of energy transformations ▸ Power and efficiency ▸ Simple machines and mechanical advantage ▸ Applications of simple machines by First Peoples ▸ Electric circuits (DC), Ohm's Law, Kirchhoff's Laws ▸ Thermal equilibrium and specific heat capacity ▸ Generation and propagation of waves ▸ Characteristics of waves ▸ Resonance and frequency of sound

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English Language Strategies, Indigenous Learning, Timeline

English Language Strategies	▸ Vocabulary words highlighted and practiced ▸ Assessments include vocabulary and language components ▸ Large projects scaffolded with checkpoints ▸ Oral speaking through discussions, think-pair-share, group work ▸ Materials supported by high quality visuals ▸ Lecture notes (animated PowerPoints) available online ▸ Foster open and safe environment for speaking
Indigenous Learning	▸ First People's principles embedded throughout course ▸ Learning process: holistic, reflexive, reflective, experiential, relational ▸ Focused on connectedness, reciprocal relationships, sense of place ▸ Learning involves patience and time; learning is different for everyone

Timeline

Unit	Title	Month
1	Introduction to Physics and Kinematics	September
2	Projectile Motion and Two-Dimensional Kinematics	October
3	Dynamics and Newton's Laws of Motion	November
4	Momentum, Work, Energy and Power	December
5	Simple Machines and Mechanical Advantage	February
6	Thermal Physics	March
7	Waves and Sound	April
8	Electricity and Circuits	May
9	Review/Buffer Class	June

Summary of Assessment

Formative Assessments	Self Evaluations	Summative Assessments
▸ Circulating during conceptual questions ▸ Gauging needs based on common homework questions ▸ Verbal checks for understanding ▸ Vocabulary: classroom challenge questions ▸ Homework checks as needed ▸ Demos/conversations	▸ During lectures: students try questions before teacher ▸ Answer keys for pre-tests and tests for self-corrections ▸ Core competency self reflections	▸ Unit tests ▸ Midterm and Final Exams ▸ Student submissions for activities and projects ▸ Labs

Assessment Weighting

Category	Weight
Quizzes	15%
Unit Tests	30%
Labs and Activities	15%
Homework	10%
Midterm	10%
Final Exam	20%

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Unit Overviews

Unit 0: Skills for Physics

Big Idea(s)	Core Competencies	Content	Activities
Use the scientific method to make predictions	**Communication:** Lab report writing **Personal Awareness:** Set realistic goals, persevere with challenging tasks **Creativity:** Design experiment to plot distance vs height **Critical Thinking:** Limits of scientific models	**Graphical methods:** - Plotting linear relationships - Calculation of slope of line of best fit - Significant figures and units	**Assessments:** Quiz, unit tests **ESL:** Review vocabulary **Indigenous:** As outlined above **Lab:** Ball rolling lab

Unit 1: Kinematics

Big Idea(s)	Core Competencies	Content	Activities
How can uniform motion and uniform acceleration be modelled?	**Communication:** Lab report writing **Personal Awareness:** Set realistic goals **Creativity:** Design experiment to measure g **Critical Thinking:** Distinguish speed vs velocity, distance vs displacement	**Vector/scalar:** - Addition and subtraction - Right-angle triangle **Uniform/accelerated motion:** - Graphical and quantitative **Projectile motion:** - Vertical, horizontal, angled launch	**Assessments:** Quiz, unit tests **ESL:** Review vocabulary **Indigenous:** As outlined above **Lab:** Gravity acceleration lab

Unit 2: Newton's Laws

Big Idea(s)	Core Competencies	Content	Activities
How can forces change motion? How can Newton's laws explain changes in motion?	**Communication:** Lab report writing **Personal Awareness:** Set realistic goals, persevere **Creativity:** Build skills to make ideas work **Critical Thinking:** Consider alternative approaches	**Contact forces:** normal, spring, tension, friction **Newton's laws:** - First: mass as inertia - Second: net force - Third: action/reaction pairs **Forces in systems:** - Multi-body, inclined planes, elevators	**Assessments:** Quiz, unit tests **ESL:** Review vocabulary **Indigenous:** As outlined above **Lab:** Elevator acceleration experiment with scale

Unit 3: Momentum

Big Idea(s)	Core Competencies	Content	Activities
Why is an inelastic or elastic collision more dangerous? Why does energy appear not conserved in some collisions? Why do cars have crumple zones and airbags?	**Communication:** Lab report writing **Personal Awareness:** Set realistic goals, persevere **Creativity:** Build skills to make ideas work **Critical Thinking:** Consider alternative approaches	**Impulse:** relation to Newton's second law in closed/isolated system **Collisions:** elastic, inelastic, completely inelastic in 1D and 2D **Ballistic pendulums**	**Assessments:** Quiz, unit tests **ESL:** Review Grade 10 vocabulary **Indigenous:** As outlined above **Lab:** Air track egg protection

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Unit 4: Variable Forces

Big Idea(s)	Core Competencies	Content	Activities
How can forces change the motion of an object?	**Communication:** Lab report writing **Personal Awareness:** Set realistic goals, persevere **Creativity:** Build skills to make ideas work **Critical Thinking:** Consider alternatives	**Hooke's Law** **Universal Gravitation Law**	**Assessments:** Quiz, unit tests **ESL:** Review vocabulary **Indigenous:** As outlined above **Lab:** Spring lab

Unit 5: Work and Energy

Big Idea(s)	Core Competencies	Content	Activities
What is the relationship between work, energy, and power? How are conservation laws applied in circuits? Why can't a machine be 100% efficient?	**Communication:** Lab report writing **Personal Awareness:** Set realistic goals, persevere **Creativity:** Build skills to make ideas work **Critical Thinking:** Consider alternative approaches	**Power and efficiency:** mechanical and electrical **Simple machines:** lever, ramp, wedge, pulley, screw, wheel and axle **Thermal equilibrium:** as application of conservation of energy (calorimeter)	**Assessments:** Energy Sources Poster **ESL:** Review vocabulary **Indigenous:** As outlined above **Activity:** 7E Phases for Science Fair topics

Unit 6: Electricity

Big Idea(s)	Core Competencies	Content	Activities
Where do we use electricity in daily life and where does it come from?	**Communication:** Lab report writing **Personal Awareness:** Set realistic goals, persevere **Creativity:** Build skills to make ideas work **Critical Thinking:** Consider alternative approaches	**Electric circuits (DC), Ohm's law, Kirchhoff's laws:** - Terminal voltage vs EMF - Safety, power distribution - Fuses/breakers, switches - Overload, short circuits, alternators	**Assessments:** Quizzes, unit test, Electricity Lab **ESL:** Review vocabulary **Indigenous:** As outlined above **Activity:** 7E Phases for Science Fair

Unit 7: Waves

Big Idea(s)	Core Competencies	Content	Activities
What factors affect wave behaviours? How would you investigate relationships between wave and medium properties? How can you determine which harmonics are audible in different instruments?	**Communication:** Lab report writing **Personal Awareness:** Set realistic goals, persevere **Creativity:** Build skills to make ideas work **Critical Thinking:** Consider alternative approaches	**Propagation:** transverse vs longitudinal, linear vs circular **Properties:** wave vs medium, periodic vs pulse **Behaviours:** reflection, refraction, diffraction, interference, Doppler shift, standing waves **Characteristics:** pitch, volume, speed, sonic boom **Frequency:** harmonic, fundamental, beat	**Assessments:** Energy Sources Poster **ESL:** Review vocabulary **Indigenous:** As outlined above **Activity:** Science Fair Preparation

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