KIRWAN STATE HIGH SCHOOL: **YEAR 10 UNIT OVERVIEW**

Term 3: Physical Sciences
See Unit 5 & 6 (C2Cs) for extra details and resources

Year 10 Australian Curriculum Achievement Standard:

By the end of Year 10, students analyse how the periodic table organises elements and use it to make predictions about the properties of elements. They explain how chemical reactions are used to produce particular products and how different factors influence the rate of reactions. **They explain the concept of energy conservation and represent energy transfer and transformation within systems. They apply relationships between force, mass and acceleration to predict changes in the motion of objects.** Students describe and analyse interactions and cycles within and between Earth's spheres. They evaluate the evidence for scientific theories that explain the origin of the universe and the diversity of life on Earth. They explain the processes that underpin heredity and evolution. Students analyse how the models and theories they use have developed over time and discuss the factors that prompted their review.

Students develop questions and hypotheses and independently design and improve appropriate methods of investigation, including field work and laboratory experimentation. They explain how they have considered reliability, safety, fairness and ethical actions in their methods and identify where digital technologies can be used to enhance the quality of data. When analysing data, selecting evidence and developing and justifying conclusions, they identify alternative explanations for findings and explain any sources of uncertainty. Students evaluate the validity and reliability of claims made in secondary sources with reference to currently held scientific views, the quality of the methodology and the evidence cited. They construct evidence-based arguments and select appropriate representations and text types to communicate science ideas for specific purposes.

Unit Overview:

Students will develop an understanding of motion, based on energy and forces. Students will explain how energy is conserved through transfers and transformations. In addition, students will apply relationships between force, mass and acceleration, and Newton's Laws of Physics to predict changes in the motion of object.

Students will develop hypotheses and independently design a safe and fair test to investigate motion. Students will analyse data and construct evidence based arguments by selecting appropriate representations to communicate findings about motion in a scientific report. Students will evaluate secondary sources and the quality of the methodology and propose refinements.

Assessment Overview:

Task: Formative Exam **Key Skill/s:** Analysing **Conditions:** 60 minutes	**Task:** Summative Experimental Investigation (Scientific Report) **Key Skill/s:** Analysing **Conditions:** 800 words max (Introduction & Discussion)

Guaranteed Vocabulary:	**Design Question Four Strategy**	**Design Question Five Strategy**	**21st Century Skill:**
Content Vocabulary: Kinetic energy, Potential energy, Conservation, Motion, Velocity, Speed, Distance, Displacement, Acceleration, Mass, Weight, Gravity, Inertia, Force, Newton's Laws Thinking Vocabulary: Modify, Analyse, Draw Conclusions, Justify	Students will practice and deepen their understanding of procedural knowledge and declarative knowledge through: • modelling, guided and independent practice and monitoring (E9) • examining similarities and differences through summaries (E10) • examining support for claims and judging reasoning and evidence in work (E11)	Students will engage in cognitively complex tasks by completing experimental-inquiry tasks (E12). Students will be provided with guidance (E13) through: • providing resources • using proficiency scales • teaching research skills • feedback Students will generate and defend claims (E14).	• Collaboration • Use of ICT for learning • Skilled communication • Self-regulation • Knowledge-construction
Guaranteed Skills/Language Features:	**Reading Comprehension Skill and Strategy**	**Cognitive Verbs**	**ICT to Enhance Learning:**
Consequential Explanation (multiple effects from one cause) Stages: Phenomenon, Explanation	***Synthesising*** *Graphical Organisers ie; flow charts* ***Determining Importance*** *Suggested Strategies:* Different Perspectives for Reading (Buehl, p 91-93) Power Notes (Buehl, p155-157) Text Coding (Buehl, p210 -213) Magnet Words	Core: • Analyse Others • Describe • Explain • Evaluate • Identify • Summarise • Justify	• Real World Problem Solving • Using ICT to analyse data and construct scientific argument. • Using ICT to access scientific research

Learning Goals:

Strands and Sub-Strands	Australian Curriculum Content Descriptors	Kirwan High Learning Goals
Science Understanding	*Physical Sciences* • Energy conservation in a system can be explained by describing energy transfers and transformations (ACSSU190)	• Calculate Kinetic Energy & Gravitational Potential Energy • Understand that the Law of Conservation of Energy explains that total energy is maintained during transfers and transformations • Understand that energy transfers and transformations are not 100% efficient and therefore reduce the useable energy of a system
	Physical Sciences • The motion of objects can be described and predicted using the laws of physics (ACSSU229)	• Understand that a stationary object, or an object moving at constant motion, has balanced forces acting on it • Calculate work & force • Calculate speed, velocity and acceleration to describe motion • Use Newton's Three Laws of Motion to explain the effects of forces on objects • Gather data to analyse motion produced by forces (distance, time, speed, force, mass, acceleration)
Science Inquiry Skills	*Questioning & Predicting* • Formulate questions or hypotheses that can be investigated scientifically (ACSIS198)	• Develop hypotheses based on scientific theories • Formulate questions that can be investigated
	Planning & Conducting • Plan, select and use appropriate investigation types, including field work and laboratory experimentation, to collect reliable data; assess risk and address ethical issues associated with these methods (ACSIS199) • Select and use appropriate equipment, including digital technologies, to collect and record data systematically and accurately (ACSIS200)	• Identify independent, dependent & controlled variables to ensure a fair test • Identify potential hazards and risks, and ensure these are managed in the investigation • Select data to be collected and analysed • Select appropriate equipment to accurately record data
	Processing & Analysing Data and Information • Analyse patterns and trends in data, including describing relationships between variables and identifying inconsistencies (ACSIS203) • Use knowledge of scientific concepts to draw conclusions that are consistent with evidence (ACSIS204)	• Describe and interpret trends shown in experimental data and results (graphs, tables, patterns) • Analyse experimental data to identify and describe relationships between variables and draw conclusions • Draw conclusions that are supported by scientific theory
	Evaluating • Evaluate conclusions, including identifying sources of uncertainty and possible alternative explanations, and describe specific ways to improve the quality of the data (ACSIS205)	• Evaluate the strength of conclusions drawn from data, identifying any uncertainties with data, propose possible alternative explanations and propose improvements to method
	Communicating • Communicate scientific ideas and information for a particular purpose including constructing evidence-based arguments and using appropriate scientific language, conventions and representations (ACSIS208)	• Construct concise, detailed, evidence-based arguments using formal scientific language, representations and conventions.

Possible Habit of Mind:				
Exploring Meaning of the HOM By the end of this unit students will be able to: Think Flexibly (Use critical & creative thinking to consider alternatives)	**Expanding Capacity for using the HOM** By the end of this unit students will be able to: Analyse data to draw conclusions.	**Increasing Alertness for the HOM** By the end of this unit students will be able to: Evaluate validity and bias.	**Extending Values of the HOM** By the end of this unit students will be able to: Recognise alternate viewpoints.	**Building Commitment towards the HOM** By the end of this unit students will be able to: Draw accurate and justified conclusions from data.

General Capabilities: This unit provides opportunities for students to engage in following capabilities:

Literacy
- ✓ Comprehending texts through listening, reading and viewing
- ✓ Composing texts through speaking, writing and creating
- ✓ Text knowledge
- ☐ Grammar knowledge
- ✓ Word knowledge
- ✓ Visual knowledge

Numeracy
- ✓ Estimating and calculating with whole numbers
- ✓ Recognising and using patterns and relationships
- ✓ Using fractions, decimals, percentages, ratios and rates
- ✓ Using spatial reasoning
- ✓ Interpreting statistical information
- ✓ Using measurement

ICT
- ☐ Applying social and ethical protocols and practices when using ICT
- ✓☐ Investigating with ICT
- ☐ Creating with ICT
- ☐ Communicating with ICT
- ✓ Managing and operating ICT

Critical and creative thinking
- ✓ Inquiring - identifying, exploring and organising information and ideas
- ✓ Generating ideas, possibilities and actions
- ✓ Reflecting on thinking and processes
  Analysing, synthesising and evaluating reasoning and procedures

Personal and social capability
- ✓ Self-awareness
- ✓ Self-management
- ✓ Social awareness
- ✓ Social management

Ethical understanding
- ☐ Understanding ethical concepts and issues
- ✓ Reasoning in decision making and actions
- ☐ Exploring values, rights and responsibilities

Intercultural understanding
- ☐ Recognising culture and developing respect
- ☐ Interacting and empathising with others
- ☐ Reflecting on intercultural experiences and taking responsibility

Cross Curriculum Priorities:

✓ Aboriginal and Torres Strait Islander histories and cultures	✓ Asia and Australia's engagement with Asia	✓ Sustainability

Differentiation [for small groups or individuals]:

- Individualise formative assessment tools
- Include increased scaffolding where needed
- Plan open-ended lesson tasks that require higher order thinking skills from more capable students
- Make use of heterogeneous collaborative groups to gain different perspectives
- Make use of homogeneous collaborative groups to tailor tiered questions
- Attend to any individual work plan requirements
- Collect and analyse student profiles for literacy and numeracy needs

Lesson Sequence:

Week	Lesson 1	Lesson 2	Lesson 3	Homework
1	**Distance & Displacement** Students can: - Explain that motion is a change in position of an object with respect to time, which can be described in terms of displacement, distance, and time. - Distinguish between distance and displacement - Represent displacement and distance graphically Engagement & Extension Ideas: Analysis of rugby/footy video of a line break for try -	**Velocity, Speed and Acceleration** Students can: - Explain that motion is a change in position of an object with respect to time, which can be described in terms of displacement, distance, velocity, acceleration, time and speed. - Distinguish between acceleration and velocity - Understand the concept of acceleration and gravity. - Calculate acceleration (acceleration = Δ velocity / time) - Represent velocity and time graphically and calculate acceleration using the slope. Engagement & Extension Ideas: Analysis of rugby/footy video of a line break for try	**PRAC - ROCKETS** Rockets – Introduce Newton's 3 laws and find examples of this with the rockets 1.25L v 2L rockets Calculate velocity and measure distances What forces are in action? Angle of firing and distance reached - graph Create a claim Discuss error	
2	**Newton's Laws of Motion** Students can: - Understand the difference between balanced and unbalanced forces - Understand that changes in movements are caused by unbalanced forces, as described by **Newton's First Law of Motion** - Explain inertia - Identify and explain applications of **Newtons First & Second Law of Motion** - Explain the difference between mass and weight - Calculate force, mass and acceleration Engagement & Extension Ideas: - Spring balance prac - Ball drop prac Inertia towers : wooden blocks versus paper cups. https://ngss.nsta.org/Resource.aspx?ResourceID=1023	**Newton's Laws of Motion** Students can: - Calculate force (F=ma) - Identify and explain applications of **Newton's Third Law of Motion** Engagement & Extension Ideas: - Force pairs (Tug of war, kicking football, car moving on road, rocket moving forward)	**PRAC – CAR CRASHES** Build cardboard model cars to survive a crash, then test by pulling/pushing into a wall Record impact in slow motion video Students can: - Calculate force (F=ma), speed (speed = distance/time) and velocity (displacement/time) - Distinguish between average speed and instantaneous speed' - Calculate error Engagement & Extension Ideas: Scalars & vectors	

3	**Energy** Students can: - Understand that there are different types of energy - Explain that energy is conserved in a system - Represent energy transfers and transformations in energy flow diagrams Engagement & Extension Ideas: - Energy efficiency of appliances - apply energy changes in systems Chemical/nuclear reactions, Rockets/solar system, ecosystems & cities	**KE & GPE** Students can: - Calculate Kinetic Energy (KE= ½ m x v^2) and Gravitational Potential Energy (GPE= m x g x h) - Calculate elastic potential energy (F=kx) Engagement & Extension Ideas: - Pendulum Prac - Marshmallow seesaw flip (person jumps on lever to flip marshmallow into the air (will it fly higher if a heavier person jumps on the lever?)	**PRAC – ENERGY TRANSFERS** Create a cardboard pinball machine with levers, and spring. Make a short video narrating the energy transfers that happen from spring-loaded start, for 20 sec.	
4	**Interpreting/creating Graphs** Students can: - Read and interpret graphs representing various forms of motion –use graphs from pracs too - Create graphs in excel with error bars Engagement & Extension Ideas: - Analyse results from pracs	**Referencing** Students can: - Reference sources appropriately - Find referenced sources Engagement & Extension Ideas: - Treasure hunt style referencing activity	**PRAC – design an experiment, write a claim** Students can: - understand the process of scientific inquiry - Perform experiments to collect data to calculate & graph acceleration/velocity - Basketball pressure v bounce height - Parachute size and drop time - Water pressure and velocity Engagement & Extension Ideas:	
5	**Assessment Planning** Students can: - Plan (Variables, Claim, Methods, Risk Assessment, Focus Questions) - Conduct background research - Log book Engagement & Extension Ideas: - Group work	**Planning/Research**	**Construction of catapult**	Research & Start Introduction
6	**Construction of catapult**	**Construction of catapult**	**Data collection**	Results & Discussion
7	**Results writing** -graph and include error	**Discussion writing**	**Draft Due**	Edits
8	**Feedback**	**Edit Draft**	**Edit Draft**	Finish report
9	**Drafting**	**Report Due**	**Catapult battle between classes**	
10	Physics in gaming and films	The Martian – all students need to be 16+	The Martian – all students need to be 16+	