KIRWAN STATE HIGH SCHOOL	SUBJECT: PHYSICS	UNIT:1 1ST TOPIC

Unit Description [copy from syllabus]	**Unit Objectives** [copy from syllabus]
5 weeks In Unit 1, students explore the ways Physics is used to describe, explain and predict the energy transfers and transformations that are pivotal to modern industrial societies. An understanding of heating processes, nuclear reactions and electricity is essential to appreciate how global energy needs are met. Students investigate heating processes, apply the nuclear model of the atom to investigate radioactivity, and learn how nuclear reactions convert mass into energy. They examine the movement of electrical charge in circuits and use this to analyse and design electrical circuits. Contexts that could be investigated in this unit include technologies related to nuclear and thermal energy, electrical energy production, radiopharmaceuticals and electricity in the home; and related areas of science such as nuclear fusion in stars. Through the investigation of these contexts, students may explore the challenge of meeting world energy needs and the ways in which science knowledge interacts with social, economic, cultural and ethical factors. Participation in a range of experiments and investigations will allow students to progressively develop their suite of science inquiry skills while gaining an enhanced appreciation of heating processes, ionising radiation, nuclear reactions and electric circuits. Collaborative experimental work also helps students to develop communication, interaction, character and management skills. Throughout the unit, students develop skills in interpreting, constructing and using a range of algebraic, graphical and symbolic representations to describe, explain and predict energy transfers and transformations.	Students will: 1. Describe and explain heating processes, ionising radiation and nuclear reactions, and electrical circuits 2. Apply understanding of heating processes, ionising radiation and nuclear reactions, and electrical circuits 3. Analyse evidence about heating processes, ionising radiation and nuclear reactions, and electrical circuits 4. Interpret evidence about heating processes, ionising radiation and nuclear reactions, and electrical circuits 5. Investigate phenomena associated with heating processes, ionising radiation and nuclear reactions, and electrical circuits 6. Evaluate processes, claims and conclusions about heating processes, ionising radiation and nuclear reactions, and electrical circuits 7. Communicate understandings, findings, arguments and conclusions about heating processes, ionising radiation and nuclear reactions, and electrical circuits.

Assessment Plan:				
Task	**%**	**Objectives to be assessed**	**Conditions**	**Date**
Data test after 2nd topic	10	This assessment technique is used to determine student achievement in the following objectives: 2. Apply understanding of heat to given algebraic, visual or graphical representations of scientific relationships and data to determine unknown scientific quantities 3. Analyse evidence about heat to identify trends, patterns, relationships, limitations or measures of uncertainty in datasets 4. Interpret evidence about heat to draw conclusions based on analysis of datasets. **Note:** Objectives 1, 5, 6 and 7 are not assessed in this instrument.	Exam conditions	Week 9 term 1 ???
Task	**%**	**Objectives to be assessed**	**Conditions**	**Date**
Cumulative test at end of year	50	This assessment technique is used to determine student achievement in the following objectives: 1. Describe and explain heat, electrical circuits, radiation, motion and waves. 2. Apply understanding of heat, electrical circuits, radiation, motion and waves. 3. Analyse evidence about heat, electrical circuits, radiation, motion and waves to identify trends, patterns, relationships, limitations or measures of uncertainty in datasets 4. Interpret evidence about heat, electrical circuits, radiation, motion and waves to draw conclusions based on analysis of datasets. **Note:** Objectives 5, 6 and 7 are not assessed in this instrument.	Exam conditions	Term 4 week 4 ???

Monitoring and Reviewing:

Strategies for Monitoring Student Progress	Date	Planned Reviews at Key Intervals	Date
Homework will be to revise – students will sit a 10 minute test at the start of the following week and receive feedback before the end of that lesson	End of week 1; week3 & week 5 / start of the following weeks		

Underpinning Factors:

<table>
<tr><th colspan="2">Guaranteed Vocabulary:</th><th>Literacy Skills</th><th>21st Century Skill/s</th></tr>
<tr><td rowspan="3">Heat
Temperature
Conduction
Convection
Radiation
Standard
Precision
Accuracy
Specific Heat Capacity
Proportional
Uncertainty
Mean
Latent heat
Specific Latent Heat
Equilibrium
Thermal equilibrium
Efficiency
Work</td><td rowspan="3"></td><td>Interpreting the meaning of words
Using vocabulary appropriate to a context</td><td>Critical thinking</td></tr>
<tr><th>Numeracy Skills</th><th>Cognitive Verbs</th></tr>
<tr><td>• calculate percentages
• use power of 10 notation
• Calculate uncertainty, mean, significant figures, c, L, θ, & η.
• Use appropriate metric prefixes
• work with index (power) notation
• perform simple algebraic procedures and work with variables in a formula
• substitute one or more values into a formula
• use scale to determine distances or relative sizes
• perform calculations involving time
• read information from various types of graphs or diagrams
• estimate or approximate distances or quantities
• give a number to the nearest place value.</td><td>Define
Describe
Distinguish
Explain
Interpret
Solve</td></tr>
</table>

TEACHING AND LEARNING PLAN:

Hours/Weeks	Unit Objectives	Subject Matter	Learning Experiences [reflecting DQ 3, 4, 5 and 6]	Possible Resources

YEAR-TO-YEAR INFORMATION:

Differentiation [for small groups or individuals]:

LESSON SEQUENCE

WEEK	LESSON 1	LESSON 2	LESSON 3
1	Learning goal: Describe the kinetic particle model of matter Activity: Discuss: "What is heat?" & "What is the difference between heat and temperature?" Homework: log on and use textbook Resources: Oxford ~~still waiting on~~ p60-63. Otherwise use current book chapter 10; sections 10.1 and 10.2 Videos/animations of kinetic theory	Learning goal: Define and distinguish between thermal energy, temperature, kinetic energy, heat and internal energy. Explain heat transfers in terms of conduction, convection and radiation Activity: Modelling kinetic theory, Demo of heating $KMnO_4$ crystals in water Resources: Graphic organisers Oxford ~~still waiting on~~ p64-67. Otherwise use current book chapter 12; All sections but only superficially	Learning goal: is it important to have the same unit of measurement internationally? use $T_K = T_C + 273$ $T_K = T_C + 273$ to convert temperature measurements between Celsius and Kelvin Activity: Talk a mile a minute on the terms from previous lessons Then play a kind of charades on the terms "it's hot, its boiling, its cold, its freezing, its perfect temperature, the sun, " - to get them used to the idea that a common language makes scientific communication easier Homework: revise all ideas from this week for a quiz, in the SECOND lesson next week Resources: Oxford ~~still waiting on~~ p72-75(poss 76-77). Otherwise use current book chapter 10; sections 10.3 and 10.4.
2	Learning goal: Explain that a change in temperature is due to the addition or removal of energy from a system (without phase change) Activities HEAT WATER WITH A BUNSEN WHILST MEASURING ITS TEMPERATURE WITH TWO OR THREE THERMOMETER Use digital and other measuring devices to collect data, ensuring measurements are recorded using the correct symbol, SI unit, number of significant figures and associated measurement uncertainty (absolute and percentage); all experimental measurements should be recorded in this way Conduct an experiment to investigate the precision and accuracy of different temperature measuring devices, such as analogue and digital thermometers by determining measurement uncertainty.	Learning goal: Explain specific heat capacity and the concept of proportionality. Activities: QUIZ to follow on from last week's H/W Discuss: "Which has more energy — a cup of coffee or a swimming pool?" Conduct an experiment to investigate the proportional relationship between heat and temperature change.	Learning goals: Recall $Q = mc\Delta T$ Interpret tabulated and graphical data of heat added to a substance and its subsequent temperature change (without phase change). Solve problems involving specific heat capacity Activities: Worked examples Guided examples

	Homework: Read Oxford p7-19 Resources : equipment as above Oxford p78-80	FEEDBACK GIVEN ON QUIZ Resources: equipment as above Oxford p26-31, p 68-71	Resources: Oxford ~~still waiting on~~ p91-97 Otherwise use current book chapter 10; Sections 10.5 & 10.6.
3	Learning goal: Be able to draw a scatter graph and interpret it Activity: Investigate what property of water makes it ideal for use as a coolant in car engines. They will do this by conducting an experiment that obtains data to be plotted on a scatter graph (with correct title and symbols, units and labels on the axes), analysed by calculating the equation of a linear trend line, interpreted to draw a conclusion, and reported on using scientific conventions and language. Homework: Complete the activities above. Resources: equipment as previous week but heating a different substance Oxford p26-31, 94-97	Learning goals: Review specific heat capacity, uncertainty, and know the method of mixtures. Mandatory practical: Conduct an experiment that determines the specific heat capacity of a substance, ensuring that measurement uncertainties associated with mass and temperature are propagated. Where the mean is calculated (in this, and future experiments), determine the percentage and/or absolute uncertainty of the mean. Conduct an experiment to investigate the initial and final temperature of two liquids before and after they are mixed. Compare the final temperature data with a temperature value calculated theoretically by finding the percentage error. Resources: equipment as previous week but with sand too. Oxford p26-37	Learning goals: Recall Q=mL Define specific latent heat Explain why the temperature of the system remains the same during the process of state change; explain it in terms of the internal energy of a system and the kinetic particle model of matter Activity: Discuss why you feel colder when you are wearing wet clothes. Demo of salt melting ice whilst reducing temperature. Homework: revise all ideas to date for a short test next lesson Resources: demo, and Oxford ~~still waiting on~~ p98-101. Otherwise use current book chapter 10; Sections 10.7 & 10.8.
4	Learning goal: Students should be able to solve problems involving specific latent heat Activity: Short test on prior content Discuss: How is it possible to boil water in a paper cup on a camp fire? Conduct an experiment to observe the change in temperature while heating substances before, during and after a phase change. Homework: FEEDBACK on test Resources; Ideally, a Gallium sample to heat. Otherwise, some water to freeze in real time using a double container, and either ice and salt or dry ice. Oxford p102-105	Learning goal, Students should be able to: Define thermal equilibrium in terms of the temperature and average kinetic energy of the particles in each of the systems. Explain the process in which thermal energy is transferred between two systems until thermal equilibrium is achieved, and recognise this as the zeroth law of thermodynamics (Understand that predictions of global temperatures and human-induced climate change is greatly aided by new technologies and an understanding of heating processes.)(If time – this is an SHE outcome) Activities: Understanding random processes and comparisions to shuffling a pack of cards Exploring simulations from pHet Resources; A pack of cards, internet access. Examples of climate data Oxford p90, p113-117	Learning goal: Students should be able to: Solve problems involving specific heat capacity, specific latent heat and thermal equilibrium (Understand The need to increase the efficiency of early steam engines led to further technological advancements (e.g. the internal combustion engine) and scientific advancements (e.g. an understanding of, and mathematical articulation of, the relationship between heating processes and mechanical work))(if time – this is an SHE outcome) Activities: Discuss whether putting a coat on a snowman makes it melt faster. Think-Pair-Share Homework: Complete a plenary set of questions about heat Resources: Videos, Oxford ~~still waiting on~~ all of chapter 2. Otherwise use current book chapters 10 & 12, end of chapter questions.
5	Learning goal: Students should be able to: Explain that a system with thermal energy has the capacity to do mechanical work Recall $\Delta U=Q+W$ Recall that the change in the internal energy of a system is equal to the energy added or removed by heating plus the work done on or by the system, and recognise this as the first law of thermodynamics and that this is a consequence of the law of conservation of energy. (Understand that the science of heating processes is of key importance to the development of efficient and cost-effective technologies that use sustainable and renewable energy sources.)(If time – this is an SHE outcome)	Learning goal: Students should be able to: Explain that energy transfers and transformations in mechanical systems always result in some heat loss to the environment, so that the amount of useable energy is reduced. Define efficiency (Understand that if useable energy is reduced every time an energy transfer occurs, what implications will this have on the availability of useable energy in the future?)(If time – this is an SHE outcome)	Learning goal: Students should be able to: Recall η= energy output / energy input× 100% Solve problems involving finding the efficiency of heat transfers. (Use the concepts of energy transfers and efficiency to consider the economic and ethical implications of this science on the choice of solar panel, building design, flooring insulation, etc.)(If time – this is an SHE outcome)

	Activities: Demo of a steam engine Homework: Revise for a short test for the end of the week. Resources: Steam engine and video of Joule's experiment. Oxford ~~still waiting on~~ p112, 118-119	Activities: Reviewing Sankey diagrams. Finding the amounts of energy available from a variety of resources Resources: Oxford ~~still waiting on~~ p120-129 Otherwise use current book chapter 9, sections 9.1 & 9.2.	Activities: Short test on heat. Homework: Reflect on feedback from short test. Resources: Oxford ~~still waiting on~~ all of chapter 3. Otherwise use current book parts of chapters 9 and 12.