FERNY GROVE
State High School

Science Department
2020 Year 10 Science Unit Plan

Unit: Physics	**Duration:** Term 2/ 10 weeks

Students (and parents) below is the Unit outline and lesson sequence for term 2. The first column shows you the objectives (what you need to know about) and the second has the textbook reading. **Please complete the reading and do the text questions as you read, including the chapter summary questions.**

We will be using STILE for this unit (online STEM resource). Teachers can check on your progress through STILE.

Students please check your emails regularly for more information from your teacher as updates and extras for specific classes will be **emailed out** as the weeks progress, and if you have any questions or concerns email your science teacher directly.

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Year 10 Science Team:				
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TERM OVERVIEW

During this term, students will learn the mathematical and experimental foundations of our understanding of forces, motion and energy.
They will conduct an extended experimental investigation.
This unit has two overarching aims — that students understand:

- The collection, processing and analysing of data, including interpretation of graphs
- The importance of mathematics and precise measurement in physics.

Students will:

- gather data (such as measurements of distance and time, speed, force, mass and acceleration) to analyse motion, using appropriate technology
- represent motion graphically
- interpret graphs of motion
- use Newton's laws to describe and explain the motion of objects
- use mathematical equations to solve problems related to the motion of objects
- use models to describe how energy is transferred and transformed within systems.

UNIT OVERVIEW

By the end of this unit, students will be able to demonstrate:

KNOWLEDGE & UNDERSTANDING of:

- Characteristics of motion
- Vector and scalar quantities, SI Units and unit conversion
- Accuracy vs. precision, systematic vs. random error
- Methods for measuring motion
- Formula used to calculate and predict motion
- Representing and interpreting motion using graphs
- Newton's three laws of motion
  - Law of inertia, effect that mass has on inertia, effect of inertia on motion
  - Effect of an unbalanced force vs. balanced forces on an object
  - effect of mass and force on the acceleration of an object
  - Action-reaction force pairs
- Law of conservation of energy
- Different forms of energy
- energy efficiency and loss of useful energy
- Energy transfer vs energy transformation, and energy diagrams
- Kinetic energy and potential energy, and link between forms of energy and law of conservation of energy
- Closed energy systems

SKILLS:

- Use of formulae to predict/calculate motion, resultant forces, kinetic and gravitational potential energy, and energy efficiency
- Construct and interpret motion graphs
- Plan experiments and predict outcomes
- Measure and record, and analyse primary data using different techniques and technology
- Compare primary and secondary data to evaluate outcomes
- Construct a scientific report

Weeks 1-3 What is motion? - Describing Motion

Topics:

- Classroom expectations
- Unit overview and assessment outline
- Describing motion – terminology, concepts, units and unit conversion
- Measuring motion
- Applying algorithms to solve problems involving different types of motion
- Graphing motion – identifying and interpreting graphs, constructing graphs

Learning Intentions:

KNOWLEDGE

- Explain terminology and key concepts
- Describe and evaluate motion using
  - Various units and symbols (including SI units)
  - Diagrammatic representations
  - formula
  - motion graphs
- identify and explain different error types and % uncertainty
- compare accuracy and precision

SKILLS

- manipulating equations
- constructing and interpreting graphs
- planning and conducting investigations
- measuring and recording data and observations
- interpreting data and justifying conclusions

Text References:

PearsonScience10 (PS10), ch9.1, 9.2 pg.363-383

Stile: Kinematics

1.1 Simulation: Time, distance & speed
1.2 Lesson: Time, distance & speed
1.3 Average Speed
1.4 Transposing equations
1.5 Graphing speed
2.1 Simulation: Displacement & velocity
2.2 Lesson: Vectors & velocity
3.1 Lesson: Acceleration
3.2 Lesson: Acceleration & graphing

Practical Activities:

(M) Wk 2: PS10 - 9.1(1) measuring reaction times, pg 373 + follow up
(M) Wk 3: PS10 – 9.2(1) measuring acceleration, pg 382 + follow up

C2C Resources: PowerPoint slides

Motion *(Sci_Y10_U5_SS_Motion.pptx)*
-Interpreting ticker tapers *(Sci_Y10_U5_SS_IntTicTap.pptx)*
Motion in a straight line *(Sci_Y10_U5_SS_MotStrLin.pptx)*

C2C Resources: Worksheets

Distance and distance *(Sci_Y10_U5_SH_ConDisDis.docx)*
Definitions and formulae *(Sci_Y10_U5_SH_DefinitionsAndFormulas.docx)*
Exploring Displacement, velocity and acceleration *(Sci_Y10_U5_SH_ExpDisVelAcc.docx)*
Representing and describing velocity and acceleration *(Sci_Y10_U5_SH_RepDisVelAcc.docx)*
Analysing motion of a ball dropped from lighthouse *(Sci_Y10_U5_SH_AnalysingBallDroppedLighthouse.docx)*

Suggested in-class problems, homework:

Wk 1 – PS10 ch9.1 pg 371 Q3,4,5,7,8
Wk 2 – PS10 ch9.1 pg 371 Q1,2,6,9,10,11,14,15,16
Wk 3 – PS10 ch9.2 pg 380-381 Q15,16,17,19 (**HW:** Q1-3, Q18)

Week 4-5 What makes something move? – Newton's 3 Laws of Motion

Topics:

- Inertia – what it is and how it affects an object's motion
- Acceleration depends on the mass of an object AND the size and direction of the force applied to it
- Equal and opposite forces – and how the force pushing back on an object affects its motion …
  (or … how pushing against a wall helps you to move away from it)

Learning Intentions:

KNOWLEDGE

- describe Newton' 3 laws of motion
- use examples to explain Inertia and how it affects an object's motion
- explain the effect of forces on an object's motion
  - Balanced forces result in no change to object's motion (N1)
  - Unbalanced forces result in a net force
  - Unbalanced forces result in the change of motion (acceleration) in an object in the direction that the force is applied (N2)
  - The size of the acceleration depends on the size of the force and the mass of the object (N2)
  - For every action force, there is an equal and opposite reaction force (N3)
    - If an object is in contact with another object, then they will exert a force on each other *(in other words, you can't touch something without it touching you back)*
- give examples of how society uses these laws in everyday life, and how they can benefit you

SKILLS

- manipulating equations
- constructing and interpreting free body diagrams (FBD)
- planning and conducting investigations
- measuring and recording data and observations
- interpreting data and justifying conclusions

Text References:

PearsonScience10 (PS10), ch9.3 pg.384-394

Stile: Newton's laws of motion

1.2 Lesson: The first law of motion
3.2 Lesson: The second law of motion
2.2 Lesson: The third law of motion

Practical Activities:

Wk 4: PS10 – 9.3(1) Newton's 2nd Law, pg 392 + follow up
Wk 5: PS10 – 9.2(3) Investigating Newton's 3rd Law, pg 394 + follow up

C2C Resources: Powerpoints

Force, mass and acceleration (Sci_Y10_U5_SS_ForMasAcc.pptx)
Newton's third law of motion (Sci_Y10_U5_SS_NewThiLawMt.pptx)

C2C Resources: Worksheets

Action and reaction examples (Sci_Y10_U5_SH_ActionReaction_Examples.docx)
Consolidating Newton's first law of motion (Sci_Y10_U5_SH_ConNewFirLaw.docx)
Exploring Newton's first law of motion
(Sci_Y10_U5_SH_ExpNewFirLaw.docx)
Exploring Newton's second law of motion
(Sci_Y10_U5_SH_ExpNewSecLawMot.docx)

Suggested in-class problems, homework:

Wk 4 – PS10 ch9.2 pg 380 Q 1-3, 7-14
– PS10 ch9.3 pg 390 Q 6,10 (N1 – Law of Inertia)
Wk 5 – PS10 ch9.3 pg 390 Q 7,8,11,12 (**HW:** Q1-3,4,9,13,14-16)

***(week 5, lesson 3: ch9.4 Energy Changes)**

<table>
<tr><th colspan="3">Week 5-6 Energy changes – forms of energy, energy efficiency, energy transfers and transformations + Data test (Thursday of week 6)</th></tr>
<tr>
<td>Topics:

• the Law of Conservation of Energy (total energy is maintained)

• energy efficiency: energy systems are not 100% efficient

• comparing energy changes in interactions

• using models to describe how energy is transferred and transformed within systems</td>
<td>Learning Intentions:

KNOWLEDGE
- state the law of conservation of energy
- describe and compare kinetic and potential energy
- describe different forms of energy
- compare energy transfer and energy transformation
- use energy diagrams to show how energy is transformed in every-day situations
- recognise that useful energy is reduced during any energy transfer, and link this to the concept of energy efficiency
- calculate the efficiency of a simple energy transformation
- relate energy transfers and transformations to the Law of Conservation of Energy within a system
- use examples to explain the relationship between kinetic and potential energy within a closed system
- describe a simple model of energy transformation and transfer within a system

SKILLS
- manipulating equations: calculating KE, PE, and energy efficiency
- representing energy transformation as an energy diagram
- using models to explain the law of conservation of energy
- planning and conducting investigations
- measuring and recording data and observations
- interpreting data and justifying conclusions</td>
<td><u>Text References:</u>
PearsonScience10 (PS10), ch9.4 pg.395-410

<u>Stile: Energy Conservation</u>
Gather: Energy Conservation
Process: Energy Conservation

<u>Practical Activities:</u>
(M) Wk 6: PS10 - 9.4(2) Kinetic energy of a ball, pg 407 + follow up

<u>C2C Resources: Powerpoints</u>
The law of Conservation of Energy (Sci_Y10_U6_SS_ConEne.pptx)
<u>C2C Resources: Worksheets</u>
Energy and car crashes (Sci_Y10_U6_SH_EnCarCrashes.docx)

<u>Suggested in-class problems, homework:</u>
Wk 7 – PS10 ch9.4 pg 404 Q 1-10, (complete for HW)
Wk 8 – PS10 ch9.4 pg 404-405 Q 11,14,15,16</td>
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<td>Week 7:</td>
<td>Lesson 1: Monday 1st June

** Data Test **</td>
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Week 7-10 Student experiment		
Week 7	**W7 L1:** EXAM **W7 L2:** Base experiment - conduct (prac journal worksheet to be used) **W7 L3:** Base experiment - analyse, evaluate (prac journal, excel spreadsheet template)	***RESOURCES:*** Prac journal template ***CHECKPOINT: => digital submission*** Prac journal (progress to date) submitted *(scanned & uploaded or emailed & uploaded)*
Week 8	**W8 L1:** modified experiment – planning, predicting, familiarisation with equipment, etc **(research** **W8 L2:** modified experiment – conducting, collect and record data **W8 L3:** processing data: - checking for anomalies (calculating uncertainty, visual inspection) - using excel (setting up tables, organising data, calculating uncertainty, graphing)	***RESOURCES:*** SE planning template SE excel EXAMPLE spreadsheet ***CHECKPOINT: => digital submission*** SE planning worksheet Excel data processing spreadsheet
Week 9	**W9 L1:** processing data - deriving results, - calculating %uncertainties & % error, - creating graphs (excel) **W9 L2:** analysing results: - identifying relationships/trends and limitations - explaining relationships/trend and limitations **W9 L3:** interpreting results - drawing a conclusion about the - determining validity and reliability of results - identifying improvements and extensions	***RESOURCES:*** SE data processing worksheet SE excel EXAMPLE spreadsheet "Discussion of results" template: analysing and evaluating results ***CHECKPOINT: => digital submission*** SE planning worksheet Excel data processing spreadsheet
Week 10	**W10 L1: ***submission of completed worksheets, planning documents***** **W10 L2, L3:** competition: building a catapult	SUBMISSION: completed prac journal; planning worksheets and analysis; and "discussion of results" worksheet