Logo, company name

Description automatically generated **2021 Science EXT Programme**

**PHYSICS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Year:** | 10 | **Course:** | Physics EXT  Rotation 3 | **Teachers:** | Mr Steve Dennis  Mrs Brenda Richter |

|  |  |  |  |
| --- | --- | --- | --- |
| **Week** | **Coursework outline** | **Activities/Resources** | **Evaluation/Review** |
| **Term 3**  **6** | **Distance and Displacement**  Distance as a scalar quantity; displacement as a vector; units of measurement  Finding displacement from maps  **Vector addition and bearings** | Demo: Trundle wheel shortcut | Distance and Displacement |
| **7** | **Previous rotation final assessment review** |  |  |
|  | Constructing and interpreting displacement-time graphs | Lab: Bringing graphs to life (O10.p271) |  |
|  | **Speed**  Speed as a scalar quantity; units; comparing speeds | Activity: Comparing speeds | Speed |
|  | Calculating average speed:  Calculating distance and journey time from speed | Lab: The ticker timer (O10.p222) |  |
|  | Measuring instantaneous and average speed | Lab: Sprinters |  |
| **8** | **Velocity**  Velocity as a vector quantity with statement of direction, including simple compass bearings; units and conversions (km/h to m/s); SI prefixes  Velocity calculations: |  | Velocity |
|  | Velocity as the slope of displacement-time graphs | Activity: Dice Walk (optional) |  |
|  | Displacement-time graph exercises  Consolidation | Lab: Using a motion sensor (O10.p223 – interpreting plot of displacement-time) |  |
|  | **Acceleration**  Acceleration as a vector quantity; deceleration; units  Calculating acceleration: | Demo: Fan cart acceleration (with video analysis of motion)  Activity: How fast is your car? |  |
|  | Acceleration of falling objects due to gravity; “g-force” | Lab: Measuring g-ball acceleration (cf. O10.p223) |  |
| **9** | Interpreting velocity-time graphs  Calculating final velocity:  Displacement and acceleration | Demo: Acceleration down the slope (motion sensor) | Acceleration |
|  | **Revision** |  | Physics Mid-Topic Test Revision |
|  | **Revision** |  |  |
|  |  |  | **Task: Physics Mid-Topic Test (10%)** |
|  | **Reaction Time**  Reaction time, braking distance and stopping distance for vehicles  Safe driving distance – the 2-second rule  Calculating stopping distances | Activity: Reaction Time  Activity: Hit and miss |  |
| **10** | **Force**  Force as a vector; units  Using free body diagrams to calculate net (resultant) force; “tug of war”; examples involving friction as a force that opposes motion | Demo: May the force be with you (P10.2nd.p384) | Set IV: Forces 1 |
|  | **Newton’s First Law**  Statement of first law (inertia)  Effect of unbalanced forces; effect of friction (static, sliding, rolling); transfer of force; applications to stationary and moving objects | Demo: Air track – inertia and effect of friction  Demo: Loose change (P10.p269)  Lab: Coin drop |  |
|  | Car crashes; seatbelts, child safety seats, head restraints | Lab: Make an accelerometer (O10.p224); cf. P10.p267 |  |
|  | **Newton’s Second Law**  Statement of second law  Using net force to calculate accelerations  CO2 dragsters  Using known accelerations/decelerations to calculate force | Video: Dragster acceleration  Demo: Air track – accelerating masses  Interactive: PhET Forces and Motion Basics |  |
|  | **Staff PL** |  |  |
| **Term 4**  **1** | **Newton’s Second Law Investigation** | Lab: Newton’s second law (P10.p277) |  |
|  | **Car Crash Safety Investigation – Planning** | Videos: Car crashes; air bags and crumple zones | **Task: Car Crash Safety Investigation (15%) Issued** |
|  | **Weight**  Weight as gravitational force acting on masses; units  Weight calculations  W=mg    Experience of weight, “weightlessness” and “g-force”; rollercoasters | Activity: Weights in the Solar System | Set V: Forces 2 |
|  | **Newton’s Third Law**  Statement of third law | Demo: Water bottle rocket launches (mass dependent) |  |
|  | Application to ball sports, vehicle collisions, rockets |  |  |
| **2** | **Newton’s law inv– Conducting** | | |
|  | **Newton’s law inv– Evaluation and reporting** | | |
|  | **Work and Energy**  Work is done when unbalanced forces change the energy of objects; units and conversions | Demo: Work done by a falling object | **Task: Car Crash Safety Investigation (15%) DUE** |
|  | Work done on a crumple zone during a collision using  W=Fs |  |  |
|  | **Kinetic Energy**  Defined as energy of motion; units  Car engines do work to increase kinetic energy; interpreting the effect of mass and velocity  Calculations using | Demo: Energy transfer (P10.p280) | Set VI: Energy |
| **3** | **Potential Energy**  Defined as stored energy; elastic and gravitational  Lifting objects against gravity increases PE; weightlifting  Calculations using PE=mgh | Activity: How much can you lift? |  |
|  | **Revision** |  | Set: Physics Topic Test Revision |
|  | **Revision** |  |  |
|  |  |  | **Task: Physics Topic Test (25%)** |
|  | **Conservation of Energy**  Statement of law of conservation of energy  Energy transformations in: trampolines, pendulums, skate parks, rollercoasters | Demo: Big pendulum  Interactive: Energy Skate Park Basics (PhET) |  |
| **4** | **Rollercoaster Investigation** | Lab: Energy changes in a rollercoaster (P10.p286) |  |
|  | **Energy loss and efficiency**  Useful energy is lost to the surroundings during energy conversions  Efficiency of bouncing balls; applications of  0 | Activity: Efficiency of bouncing balls | Set VII: Energy Conservation and Efficiency |
|  | **Revision** |  |  |
|  |  |  | **Task: Energy Efficiency Practical Test (10%)** |
|  | **Physics Topic Test – Review** |  |  |

O10 – Oxford Science 10

P10 – Pearson Science 10 (1st edition)

Year 10 Science assessments in 2021 are conducted on Wednesdays.

**Disclaimer**

*The information contained in this outline is subject to change if a need exists and is, therefore, provided as a guide. This outline indicates approximate times that assessments will be conducted and students should always confirm assessment timing with their classroom teacher.*

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**Weekly Review**

* Students are expected to complete and summarise coursework lesson by lesson.
* Understanding will be validated throughout the week to help students make progress in areas of weakness.
* Additional tasks may be assigned for completion at home.

The following tasks are designed for consolidation of classwork and regular revision:

|  |  |  |  |
| --- | --- | --- | --- |
| **Week** | **Tasks** | | **Due Date** |
| 3.6 | Set I: Distance and Displacement | Exercises in |  |
| 3.7 | Set II: Speed | booklet |  |
| 3.8 | Set III: Velocity |  |  |
| 3.9 | Set IV: Acceleration and Physics Mid-Topic Test Revision |  |  |
| 3.10 | Set V: Forces 1 |  |  |
| 4.1 | Set VI: Forces 2 |  |  |
| 4.2 | Set VII: Energy |  |  |
| 4.3 | Physics Topic Test Revision |  |  |
| 4.4 | Set VIII: Energy Conservation and Efficiency and  Practical Test Revision |  |  |
| 4.5 | Semester Two Examination Revision |  |  |

\*Education Perfect task set by teacher (optional)

**Assessment**

This topic will be assessed according to the assessment types and weightings set out in the following table.

|  |  |  |
| --- | --- | --- |
| **Assessment Type** | **Task** | **Weighting**  **(% of Topic)** |
| Science Inquiry (30%) | Energy Efficiency Practical Test | 10% |
| Car Crash Safety Investigation | 20% |
| Test (70%) | Physics Mid-Topic Test | 10% |
| Physics Topic Test | 20% |
| Semester 2 Examination - Physics | 40% |
|  | **Total** | **100%** |

**Key Curriculum Outcomes**

* Explain the difference between distance and displacement using appropriate examples
* Plot and interpret position/displacement–time graphs for linear motion
* Explain the difference between speed and velocity using appropriate examples
* Use

 to calculate average speed, travel distance and journey time

* Interpret speed/velocity–time graphs for linear motion
* Calculate velocities using

, giving answers with simple descriptions of direction

* Understand that acceleration is the rate of change of velocity
* Calculate accelerations using

  and final velocities using

* Recognise that acceleration due to gravity on earth is 9.80 m/s2
* Apply equations of motion to calculate and compare the stopping distance of vehicles
* Recognise, through observation and measurement, that forces cause changes to objects they act on
* Interpret free-body diagrams to describe how unbalanced forces cause a change in the velocity of an object
* State Newton’s first law of motion (inertia) and explain this law using appropriate examples
* Describe how unbalanced forces acting on an object can cause it to accelerate or decelerate using appropriate examples
* Understand that friction is a force that opposes motion, resisting the motion of one object relative to another, and can be explained in terms of static, sliding and rolling friction.
* State Newton’s second law of motion and explain this law using appropriate examples
* Calculate the net (unbalanced) force acting on an object or acceleration of an object using

* Use Newton’s second law in the form of

  to relate mass and weight.

* State Newton’s third law of motion and explain this law using appropriate examples of action-reaction pairs
* Understand that action and reaction pairs always act on different objects
* Apply Newton’s third law to explain the operation of rockets and the forces involved in ball sports and vehicle collisions
* Explain work, kinetic energy and gravitational potential energy using appropriate examples
* Calculate work using

* Calculate kinetic energy using

* Calculate gravitational potential energy using

* Explain the law of conservation of energy using examples such as trampolines, pendulums, skate parks and rollercoasters
* Determine energy efficiency using

0

* Apply Newton’s laws to the function of car safety features including seatbelts, child safety seats, rear facing child restraints, air bags and crumple zones

## **SCSA Curriculum Statements**

Energy conservation in a [system](https://k10outline.scsa.wa.edu.au/home/teaching/curriculum-browser/science-v8/overview/glossary/system) can be explained by describing energy transfers and transformations [(ACSSU190)](https://k10outline.scsa.wa.edu.au/home/teaching/codes/science/year-10/acssu190)

The motion of objects can be described and predicted using the laws of physics [(ACSSU229)](https://k10outline.scsa.wa.edu.au/home/teaching/codes/science/year-10/229)

## **SCSA Judging Standards**

|  |  |
| --- | --- |
| **A** – Excellent Achievement | Applies Newton’s laws and equations of motion to explain and quantitatively determine the motion of objects in unfamiliar situations, taking direction into account.  Describes in detail energy transfers and transformations and conservation of energy in a system. Explains how energy is lost from a system, reducing energy efficiency. |
| **B** – High Achievement | Applies Newton’s laws and equations of motion to explain and quantitatively determine the motion of objects.  Describes energy transfers and transformations and conservation of energy in a system. Explains how energy is lost from a system, reducing useful energy. |
| **C** – Satisfactory Achievement | Applies relationships between force, mass and acceleration to describe and predict the motion of objects.  Describes energy transfers and transformations and conservation of energy in a system. |