IB Physics YEAR 1 - Unit 2

Teacher(s)	Cole Phillips	**Subject Group and Course**	Group 4 - Physics		
Course Part and Topic	Topic 2 - Mechanics	**SL or HL / Year 1 or 2**	SL Year 1	**Dates**	September - October (9 weeks)
Unit Description and Texts		**DP Assessment(s) for Unit**			
Students examine the basics of motion through kinematic equations, Newton's 2nd law problems, conservation of energy, and conservation of momentum. ● Bowen-Jones, Michael, and David Homer. IB Physics. Oxford: Oxford UP, 2014. Print.		● 2.1 paper 1 quiz, 2.2 paper 1 quiz, 2.3 paper 1 quiz, 2.4 paper 1 quiz ● Test (paper 1 + paper 2)			

INQUIRY: establishing the purpose of the unit

Transfer Goals

List here one to three big, overarching, long-term goals for this unit. Transfer goals are the major goals that ask students to "transfer" or apply their knowledge, skills, and concepts at the end of the unit under new/different circumstances, and on their own without scaffolding from the teacher.

Phenomenon: Technically, a perfectly designed roller coaster does not need harnesses.

Statement of Inquiry: An object is said to undergo projectile motion when it follows a curved path due to the influence of gravity.

1. Students will solve problems using kinematic equations.
2. Students will solve for an object's acceleration using Newton's 2nd law in various scenarios.

3. Students will calculate variables from an object's motion using conservation of energy and conservation of momentum.

ACTION: teaching and learning through inquiry

Content / Skills / Concepts - Essential Understandings	**Learning Process** *Check the boxes for any pedagogical approaches used during the unit. Aim for a variety of approaches to help facilitate learning.*
<u>Students will know the following content:</u> • ***Distance and displacement*** • ***Speed and velocity*** • ***Acceleration*** • ***Graphs describing motion*** • ***Equations of motion for uniform acceleration*** • ***Projectile motion*** • ***Fluid resistance and terminal speed*** • ***Objects as point particles*** • ***Free-body diagrams*** • ***Translational equilibrium*** • ***Newton's laws of motion*** • ***Solid friction*** • ***Kinetic energy*** • ***Gravitational potential energy*** • ***Elastic potential energy*** • ***Work done as energy transfer*** • ***Power as rate of energy transfer*** • ***Principle of conservation of energy*** • ***Efficiency*** • ***Newton's second law expressed in terms of rate of change of momentum*** • ***Impulse and force–time graphs***	Learning experiences and strategies/planning for self-supporting learning: ☒ Lecture ☐ Socratic seminar ☒ Small group/pair work ☒ PowerPoint lecture/notes ☒ Individual presentations ☐ Group presentations ☐ Student lecture/leading ☐ Interdisciplinary learning Details: *Students will learn through a combination of presentations, small group work, practice problems, and lab work.* ☒ Other(s): *practice problems, lab work*

- *Conservation of linear momentum*
- *Elastic collisions, inelastic collisions and explosions*

Students will develop the following skills:

- **Determining instantaneous and average values for velocity, speed and acceleration**
- **Solving problems using equations of motion for uniform acceleration**
- **Sketching and interpreting motion graphs**
- **Determining the acceleration of free-fall experimentally**
- **Analyzing projectile motion, including the resolution of vertical and horizontal components of acceleration, velocity and displacement**
- **Qualitatively describing the effect of fluid resistance on falling objects or projectiles, including reaching terminal speed**
- **Representing forces as vectors**
- **Sketching and interpreting free-body diagrams**
- **Describing the consequences of Newton's first law for translational equilibrium**
- **Using Newton's second law quantitatively and qualitatively**
- **Identifying force pairs in the context of Newton's third law**
- **Solving problems involving forces and determining resultant force**
- **Describing solid friction (static and dynamic) by coefficients of friction**
- **Discussing the conservation of total energy within energy transformations**
- **Sketching and interpreting force–distance graphs**
- **Determining work done including cases where a resistive force acts**
- **Solving problems involving power**
- **Quantitatively describing efficiency in energy transfers**
- **Applying conservation of momentum in simple isolated systems including (but not limited to) collisions, explosions, or water jets**
- **Using Newton's second law quantitatively and qualitatively in cases where mass is not constant**
- **Sketching and interpreting force–time graphs**
- **Determining impulse in various contexts including (but not limited to) car safety and sports**
- **Qualitatively and quantitatively comparing situations involving elastic collisions, inelastic collisions and explosions**

Formative assessment(s):

Paper 1 quizzes at the end of each subtopic.

	Summative assessments: *Topic test consisting of questions from P1 and P2*
	Differentiation: ❑ Affirm identity - build self-esteem ✓ Value prior knowledge ✓ Scaffold learning ✓ Extend learning Details: ● *SWD/504 – Accommodations Provided* ● *ELL – Reading & Vocabulary Support* ● *Intervention Support* ● *Extensions – Enrichment Tasks and Project*

Approaches to Learning (ATL)

Check the boxes for any explicit approaches to learning connections made during the unit. For more information on ATL, please see the guide.

✓ Thinking
❑ Social
✓ Communication
❑ Self-management
❑ Research

Details:

Students will be continuously challenged to develop higher-order thinking skills as they take prior knowledge, combine it with new content, and analyze the data they collected to reach a conclusion

Students will communicate their findings to their peers in the form of small-group presentations.

Language and Learning *Check the boxes for any explicit language and learning connections made during the unit. For more information on the IB's approach to language and learning, please see the guide.*	**TOK Connections** *Check the boxes for any explicit TOK connections made during the unit*	**CAS Connections** *Check the boxes for any explicit CAS connections. If you check any of the boxes, provide a brief note in the "details" section explaining how students engaged in CAS for this unit.*
✓ Activating background knowledge ❑ Scaffolding for new learning ✓ Acquisition of new learning through practice ✓ Demonstrating proficiency Details: *Students will build on knowledge gained in Honors Physics.* *Students will analyze data from a cart being accelerated by a hanging mass.* *Students will complete practice problems* *Students will produce a full scatter plot with high and low gradients as demonstration of learning.*	❑ Personal and shared knowledge ❑ Ways of knowing ❑ Areas of knowledge ✓ The knowledge framework Details: *To what extent is scientific knowledge based on fundamental concepts such as energy? What happens to scientific knowledge when our understanding of such fundamental concepts changes or evolves?*	❑ Creativity ✓ Activity ❑ Service Details: *Students will actively be carrying out experiments involving accelerating carts.*

Resources *List and attach (if applicable) any resources used in this unit*
• Textbooks (see page 1) • Laboratory resources • Online notes and videos (Schoology)

REFLECTION: considering the planning, process, and impact of the inquiry

What worked well *List the portions of the unit (content, assessment, planning) that were successful*	**What didn't work well** *List the portions of the unit (content, assessment, planning) that were not as successful as hoped*	**Notes / Changes / Suggestions** *List any notes, suggestions, or considerations for the future teaching of this unit*