**Marietta City Schools**

**2024–2025 District Unit 2 Planner**

| **Teacher(s)** | Thomas Shyamala | **Subject Group and Course** | Group 4 - Physics | | |
|---|---|---|---|---|---|
| **Course Part and Topic** | Unit 2 Theme B: The particulate nature of matter | **SL or HL / Year 1 or 2** | SL Year 1 | **Dates** | January- April (10 weeks) |
| **Unit Description and Texts** | | **DP Assessment(s) for Unit** | | | |
| Students analyze the transfer of thermal energy quantitatively, explain the cause and effect of the greenhouse effect,explain the behavior of gasses, use ohm's law for circuit analysis and describe the dynamics of electric and magnetic fields.<br>● Bowen-Jones, Michael, and David Homer. IB Physics. Oxford: Oxford UP, 2014. Print. | | ● B.1 Thermal Energy Transfer, B.2 Greenhouse Effect, B.3 Gas Laws, B.5 Current and Circuits<br>● 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: Energy always "evens out" causing moving things to eventually stop and temperature to equalize.

Statement of Inquiry: Energy cannot be created or destroyed, but studying the transfer of differing types of energy helps to describe the nature of matter

1. Students will quantitatively analyze thermal energy transferred by conduction, convection and radiation.
2. Students will calculate variables from an object's motion using conservation of energy and conservation of momentum.
3. Students will derive and apply the ideal gas law equation from the empirical gas laws for constant pressure, constant volume and constant temperature to study the behavior of gasses and solve real world problems.

4. Students will analyze the change in momentum of particles due to collisions with a given surface that gives rise to pressure in gasses and the average translational speed of molecules.
5. Students will explain the cause and effect of the “Greenhouse Effect”.
6. Students will apply ohm’s law to analyze circuits and study the dynamics of electric and magnetic fields.

## *ACTION: teaching and learning through inquiry*

| **Content / Skills / Concepts - Essential Understandings** | **Learning Process**<br>*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><br>• ***Molecular Theory in solids liquids and gasses***<br>• ***Density***<br>• ***Kelvin and Celsius scales***<br>• ***Average kinetic energy of particles***<br>• ***Thermal energy transfer***<br>• ***Conduction, Convection, and Thermal Radiation***<br>• ***Internal Energy***<br>• ***Rate of Thermal energy transfer***<br>• ***Luminosity***<br>• ***Emission Spectrum***<br>• ***Conservation of Energy***<br>• ***Emissivity***<br>• ***Greenhouse effect***<br>• ***Absorption***<br>• ***Pressure***<br>• ***Avogadro's Constant***<br>• ***The Ideal Gas Law Equations***<br>• ***Momentum of Particles***<br>• ***Cells and EMF*** | Learning experiences and strategies/planning for self-supporting learning:<br>☒ Lecture<br>□ Socratic seminar<br>☒ Small group/pair work<br>☒ PowerPoint lecture/notes<br>☒ Individual presentations<br>□ Group presentations<br>□ Student lecture/leading<br>□ Interdisciplinary learning<br>Details:<br>*Students will learn through a combination of presentations,* |

| | |
|---|---|
| • ***Chemical cells and Solar Cells***<br>• ***Direct Current***<br>• ***Electric Power***<br>• ***Combination of resistors in series and parallel***<br>• ***Charge***<br>• ***Electric field***<br>• ***Coulomb's law***<br>• ***Electric current***<br>• ***Circuit diagrams***<br>• ***Kirchhoff's circuit laws***<br>• ***Heating effect of current and its consequences***<br>• ***Resistance expressed as***<br>• ***Power dissipation***<br>• ***Internal resistance***<br>• ***Secondary cells***<br>• ***Terminal potential difference***<br>• ***Electromotive force (emf)***<br>• ***Magnetic fields***<br>• ***Magnetic force***<br><br><u>Students will develop the following skills:</u><br>• **Identifying two forms of charge and the direction of the forces between them**<br>• **Solving problems involving electric fields and Coulomb's law**<br>• **Calculating work done in an electric field in both joules and electronvolts**<br>• **Identifying sign and nature of charge carriers in a metal**<br>• **Identifying drift speed of charge carriers**<br>• **Solving problems using the drift speed equation**<br>• **Solving problems involving current, potential difference and charge**<br>• **Drawing and interpreting circuit diagrams**<br>• **Identifying ohmic and non-ohmic conductors through a consideration of the V/I characteristic graph**<br>• **Solving problems involving potential difference, current, charge, Kirchhoff's circuit laws, power, resistance and resistivity** | *small group work, practice problems, and lab work.*<br><br>☒ Other(s): *practice problems, lab work*<br><br>**Formative assessment(s):**<br><br>*Paper 1 quizzes at the end of each subtopic.* |

<table>
<tr>
<td>

- **Investigating combinations of resistors in parallel and series circuits**
- **Describing ideal and non-ideal ammeters and voltmeters**
- **Describing practical uses of potential divider circuits, including the advantages of a potential divider over a series resistor in controlling a simple circuit**
- **Investigating one or more of the factors that affect resistance experimentally**
- **Investigating practical electric cells (both primary and secondary)**
- **Describing the discharge characteristic of a simple cell (variation of terminal potential difference with time)**
- **Identifying the direction of current flow required to recharge a cell**
- **Determining internal resistance experimentally**
- **Solving problems involving emf, internal resistance and other electrical quantities**
- **Determining the direction of force on a charge moving in a magnetic field**
- **Determining the direction of force on a current-carrying conductor in a magnetic field**
- **Sketching and interpreting magnetic field patterns**
- **Determining the direction of the magnetic field based on current direction**
- **Solving problems involving magnetic forces, fields, current and charges**

</td>
<td></td>
</tr>
<tr>
<td rowspan="2"></td>
<td>Summative assessments:<br><br>Topic test consisting of questions from P1 and P2</td>
</tr>
<tr>
<td>Differentiation:<br><br>❏ Affirm identity - build self-esteem<br>✓ Value prior knowledge<br>✓ Scaffold learning</td>
</tr>
</table>

| | |
|---|---|
| | ✓ Extend learning<br><br>Details:<br><br>● *SWD/504 – Accommodations Provided*<br>● *ELL – Reading & Vocabulary Support*<br>● *Intervention Support*<br>● *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**<br>*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**<br>*Check the boxes for any explicit TOK connections made during the unit* | **CAS Connections**<br>*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 | ❏ Personal and shared knowledge | ❏ Creativity |

| | | |
|---|---|---|
| ❑ Scaffolding for new learning<br>✓ Acquisition of new learning through practice<br>✓ Demonstrating proficiency<br><br>Details:<br><br>*Students will build on knowledge gained in Honors Physics.*<br><br>*Students will analyze data from a cart being accelerated by a hanging mass.*<br><br>*Students will complete practice problems*<br><br>*Students will produce a full scatter plot with high and low gradients as demonstration of learning.* | ❑ Ways of knowing<br>❑ Areas of knowledge<br>✓ The knowledge framework<br><br>Details:<br><br>*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?* | ✓ Activity<br>❑ Service<br><br>Details:<br><br>*Students will actively be carrying out experiments involving accelerating carts.* |
| **Resources**<br><br>*List and attach (if applicable) any resources used in this unit* | | |
| • Textbooks (see page 1)<br>• Laboratory resources<br>• Online notes and videos (Schoology) | | |

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

| **What worked well** | **What didn't work well** | **Notes / Changes / Suggestions** |
|---|---|---|
| *List the portions of the unit (content, assessment,* | *List the portions of the unit (content, assessment,* | *List any notes, suggestions, or considerations for* |

| *planning) that were successful* | *planning) that were not as successful as hoped* | *the future teaching of this unit* |
|---|---|---|
| | | |