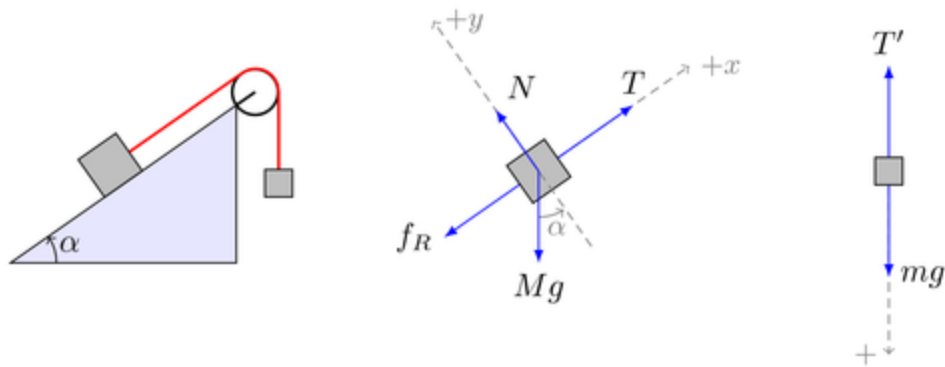


Unit 2: Dynamics



2.Dynamics Introduction

In Unit 1: Kinematics we learnt about the equations that govern the motion of objects. In unit 2: Dynamics we explore the reasons how and why they move. Dynamics is the branch of mechanics that deals with the motion and equilibrium of systems under the action of forces, usually from outside the system. In this unit we will be introduced to Newton's laws of motion and the implications. These laws of motion are the cornerstone of this AP course and their importance cannot be understated. The foundations of dynamics were laid at the end of the 16th century by Galileo Galilei who, by experimenting with a smooth ball rolling down an inclined plane, derived the law of motion for falling bodies. We now use derivations of these laws to send men to the moon.

Unit Priority Standards

- Newton's second law accurately predicts changes in the motion of macroscopic objects. (HS-PS2-1)

Unit Transfer Goals

- Using and developing scientific models to explain laws, theories, natural phenomena, and original ideas.
- The ability to create visual and verbal analysis of a scientific investigation or experiment.

| Unit Essential questions | |
|--|--|
| <ol style="list-style-type: none"> 1. From the point of view of a driving instructor, explain how the equations of motion can make us safer drivers? 2. Are Newton's Laws of Motion always applicable or are there times they shouldn't be used? | |
| Acquisition of Knowledge Skill | |
| <p><i>Students will know...</i></p> <ol style="list-style-type: none"> 1. Newton's second law can be applied to an object in accelerated motion or in a state of equilibrium. 2. how to draw and analyse force diagrams 3. how to calculate friction and apply it to situations 4. that the resistive force is often a function of the velocity 5. for an object to travel along a circular path there must be a radial force | <p><i>Students will be skilled at...I can...</i></p> <ol style="list-style-type: none"> 1. Analyse and/or use [non-narrative/non-mathematical] representations of physical situations 2. Determine scientific questions and methods. 3. Create visual representations or models of physical situations. 4. Determine the effects on a quantity when another quantity or the physical situation changes 5. Solve problems of physical situations using mathematical relationships 6. Develop an explanation or a scientific argument. |

Unit Plan

201. Forces and Newton's Laws of Motion

Goals: Develop conceptual understanding of Newton's Laws of Motion

Activity: Review experiment and lab journals

Activity: Introduce force, resultant forces and Newton's Laws of Motion

Group activity – Skateboard equal and opposite reaction

Homework #8: Newton's Laws of Motion Handout

202. Applications of Newton's Laws

Goals: Applications of friction and normal forces

Activity: Review questions for Newton's Laws (Chapter 4)

Activity: Introduce static and dynamic friction; reaction forces.

Group stations activity – Rocket fuel mass percentage

Homework #9: Friction Handout

203. Connected Objects

Goals: To understand the motion and forces related to connected objects and practice force diagrams and Newton's Laws for systems.

Group Activity: Atwood's Machines

Homework #10: Connected Objects Handout

204. Springs

Goals: To understand Hooke's Law and how springs can be used in combinations.

Group Activity: Hooke's Law PhET simulation

Homework #11: Springs Handout

205. Accelerating Frames

Goals: To understand how to calculate forces and accelerations in accelerating frames.

Introduce apparent weight and weightlessness.

Group activity – Weight in an elevator

Homework #12: Accelerating Frames Handout

206/7. Forces Lab (Experiment)

Goals: To show the vector nature of force and force diagrams

Experiment 2 – Forces lab

Homework: Write up Experiment

208/9. Circular Motion I and II

Goals: Understand circular motion and tangential forces

Introduce centripetal acceleration and force.

Group activity – Calculate geostationary orbit

Homework #13/14: Circular Motion Handout

210. Dynamics Problems Workshop Class

Goals: Give students the chance to answer a selection of questions and go through past problems to aid understanding

Homework: Finish class handouts

211. Unit 2 AP Classroom Personal Progress Check

Goals: To check current understanding of Dynamics

Activity: Personal Progress Check 2

Activity: Review questions / answers to check for misunderstandings

Homework: review concepts of difficulty

212. Dynamics Quiz

Goals: To check understanding of covered topics

Activity: Group review and question time

Quiz #2: Covers classes Unit 2: Dynamics

Homework: No Homework

213. Quiz Review

Goals: To check understanding of covered topics

Activity: Group review and question time

Assessment Details

| Evidence | |
|---|--|
| I will check students' understanding throughout the unit by... | |
| <p>Summative</p> <p>Homework Questions</p> <ul style="list-style-type: none"> After each regular class (non lab / quiz day) the students will be given a homework sheet that checks for understanding. Questions will be both conceptual and mathematical. <p>Quizzes</p> <ul style="list-style-type: none"> The quizzes will be in the AP test format with a mixture of MCQ and FRQ questions. All tests will be weighted on the AP scale to reflect your performance better. <p>Lab Reports</p> <ul style="list-style-type: none"> Students are required to conduct lab experiments and communicate their findings in a report. Lab Report Rubric | <p>Formative</p> <p>Group Activities</p> <ul style="list-style-type: none"> The class engages in small group activities to help each other and get help and feedback from myself. These group activities usually involve simulations / demonstrations or practice problems. <p>Workshop Classes</p> <ul style="list-style-type: none"> Each unit will have a dedicated workshop day where students can practice questions of varying difficulty. <p>AP Classroom Progress Checks</p> <ul style="list-style-type: none"> Collegeboard offers a wonderful tool for checking progress on their website. |