

AP Physics

Classical High School

Instructor: Mr. Butler

End of Year Project

Purpose: To provide meaningful instruction after the AP exam that bridges, extends and assesses content.

- Students will work independently, or cooperatively in teams of two, to conduct research on topics of interest not covered by course material.
- Teams will discuss their research in class presentations.
- In some years, an in-class comprehensive multiple choice exam assessing physical principles covered during the academic year will be given as a component of the final exam grade.

Power Point Presentation

Students will work cooperatively in teams of two to conduct research on topics in astronomy and modern physics. A 15-20 minute Power Point presentation will be the culmination of the research project which will take place during the last two weeks of school. This research and presentation will be 60% of your final exam grade. Due to the timely nature of end-of-year events and scheduling, teams will have a firm presentation date. Teams who fail to present on their assigned day will incur a significant grade reduction.

Topics

Some possible topics of interest are given on the next page. Many student teams will choose one of these topics of interest to focus their research. Other teams may find an alternate topic of interest not included in the list. These alternate topics must meet the following criteria:

- 1) Topics must be modern physics or astronomy related.*
- 2) Topics must meet the approval of the instructor.*

Google Doc

In addition to the PowerPoint presentation, each student group will create a Google document that includes the significant elements and content of the team's research. The Google document is a required companion to the PowerPoint presentation. The Google document is worth 15% of the total presentation grade. Teams have flexibility in the form, style and structure of the document, but it must include the elements outlined in the checklist. The Google document is due at the time of the team presentation. Late submissions will incur a significant grade reduction.

Evaluation

Evaluation of the PowerPoint presentation and the accompanying companion Google document for final grading will use the PowerPoint Rubric and Google Doc Checklist given on the last page.

Astronomy Topics

Cosmology

Auroras

Dark Matter

Binary Star Systems

Survey of Unmanned Space Missions

Survey of Manned Space Missions

Neutron Stars and Black Holes

Quasars, Blazars, Pulsars and Magnetars

The Kuiper Belt and Oort Cloud

Stellar Evolution

Asteroids and Comets

The Moon: A Survey of its Important Features

Light and Telescopes

The Celestial Sphere:

- 1) Apparent-Diurnal Motions and Rotation
- 2) Horizon and Equatorial Coordinate Systems

Gravitational Lensing

Luna and Solar Eclipses

Galaxies: A Survey of Their Types and Structure

Solar System Planets: A Short Survey of Their Important Features

Exoplanets: The Hunt for Other Planets

Hubble's Law, Einstein and Dark Energy

GRB's (Gamma Ray Bursts)

Lunar Phases

The "Big Bang" and CBR (Cosmic Background Radiation)

Aerogel: Its origins, Properties and Applications

Modern Physics Topics

Special Relativity: Time Dilation and the Twin Paradox

$E=mc^2$ and Antimatter Pair Creation/Annihilation

Gravitational Redshift and Bending-of-Starlight

Riemannian Space-Time Curvature and Geodesic Orbits

Photons: Plank Blackbody Law, Einstein Photoelectric Effect and Compton Effect

Photons: Lasers and Holography

DeBroglie Matter-Wave Duality and Complementarity Principle

Heisenberg Uncertainty Principle [and the "Copenhagen Interpretation"]

The Quark-Gluon (or Chromodynamic) Nuclear Model

Superstrings or M-Theory

Quantum Entanglement

The Standard Model

Higgs and the God Particle

Survey of Worldwide Particle Colliders and Their Discoveries

Neutrinos: Explanation and Detection

Team Members _____



Topic _____

Google Doc Checklist

- Includes complete summary of topic and subtopics 1 2 3 4
- Essential questions have been adequately addressed and explained 1 2 3 4
- Summary provides detailed description of concepts/principles 1 2 3 4
- Diagrams are included as graphic aids that detail and model phenomena 1 2 3 4
- Applet/Simulation URL's have been incorporated, explained and listed 1 2 3 4

GD Score = _____ /20 = _____

**Power Point Rubric
 Topic Development Presentation**

	4	3	2	1
PP Flow and Transitions	PP flows seamlessly with coherent transitions	Some hiccups and/or incoherent transitions	Poor flow with many hiccups and incoherent transitions	Flow and transitions completely incoherent
Fundamental Concepts/Principles	Integrates all fundamental concepts/principles	Integrates most fundamental concepts/principles	Integrates very few fundamental concepts/principles	Integrates no fundamental concepts/principles
Graphic Effects	Incorporates graphics, images and effects that enhance PP	Incorporates some images, but amount not adequate or not engaging	Incorporates very few images, graphics or effects Graphics not engaging	No graphics, images or effects are incorporated
Explanations	Explanations are logical and coherent with principles	Some explanations are not logical or not consistent with principles	Many explanations are not logical or not consistent with principles	No explanations are provided
Time-Slide Constraints	Time-Slide constraints recognized			Time-Slide constraints not recognized
Concept Knowledge & Questions	Clearly knows concepts well and effectively answers questions	Knowledge of some concepts weak Some questions are not answered effectively	Mostly weak knowledge of concepts Many question answers ineffective	No knowledge of concepts Cannot answer questions

Checks indicate rubric score received in specific category.

PP Score = _____ /24 = _____