

QUEENS ACADEMY HIGH SCHOOL

DEPARTMENT OF SCIENCE

Introduction to Physics Elective – Curriculum

Course Description

The introduction to physics science elective is a survey course which covers the same six areas as a Regents physics class covers, but in less depth. These areas are: measurement and mathematics; mechanics; energy; electricity and magnetism; waves; and modern physics. Because this class is completed in a semester rather than a full year, about one-half the time is spent on each of these areas as in Regents physics course. There are hands-on, inquiry-based activities that are performed during class, but there is not an independent lab for this course.

Textbook

The book for this class is:

Hladik Cook, B. (2007). *Brief review for New York Physics: The physical setting* (2007 ed.). Lebanon, Indiana: Prentice Hall.

Materials

Every student is expected to have their own annotated copy of the Physics Reference Tables available in each class. Students will also need a basic, 4-function calculator to complete homework assignments. Additional materials such as rulers, compasses, and protractors are supplied to the students as needed.

Assessment

Students will be assessed on their ability to answer multiple choice and constructed-response questions. In addition, students must demonstrate their ability to successfully solve a variety of physics problems using algebra, trigonometry, and geometry. Physics problems represent real-world problems and involve a great deal of critical thinking skills. Assessment is on going and is both formative and summative. Authentic assessments and GRASPS activities are being used as well.

Topics to be Covered and Pacing Schedule

Unit 1: Measurement and Mathematics (20 days)

- Units for measurement and the S.I. system
- Uncertainty in measurement
- Scientific notation
- Graphing data
- Scalar and vector quantities

- Solving equations using algebra
- Solving problems using geometry and trigonometry

Unit 2: Mechanics (30 days)

- Kinematics
- Statics
- Dynamics
- Two-dimensional motion and trajectories
- Uniform circular motion
- Newton's universal law of gravitation
- Friction
- Momentum

Unit 3: Energy (11 days)

- Work and energy
- Forms of energy
- Potential energy
- Kinetic energy
- Elastic potential energy
- Nuclear energy

Unit 4: Electricity and magnetism (12 days)

- Electric fields
- Electric current
- Electric circuits
- Magnetism

Unit 5: waves (4 days)

- Introduction to waves
- Light
- The electromagnetic spectrum

Unit 6: Modern Physics (3 days)

- Wave-particle duality
- The nucleus
- The standard model of particle physics

New York State Standards for Math, Science and Technology

Including Standard 3: Mathematics and Standard 4: Science. Key ideas and performance indicators for Standard 4 are included

Standard 3 - Mathematics-

Students will understand mathematics and become mathematically confident by communicating and reasoning mathematically, by applying mathematics in real-world settings, and by solving problems through the integrated study of number systems, geometry, algebra, data analysis, probability, and trigonometry.

Mathematical Reasoning

Key Idea 1-

Students use mathematical reasoning to analyze mathematical situations, make conjectures, gather evidence, and construct an argument.

Number and Numeration

Key Idea 2- Students use number sense and numeration to develop an understanding of the multiple uses of numbers in the real world, the use of numbers to communicate mathematically, and the use of numbers in the development of mathematical ideas.

Operations

Key Idea 3- Students use mathematical operations and relationships among them to understand mathematics.

Modeling, Multiple representation

Key Idea 4- Students use mathematical modeling/multiple representation to provide a means of presenting, interpreting, communicating, and connecting mathematical information and relationships.

Measurement

Key Idea 5- Students use measurement in both metric and English measure to provide a major link between the abstractions of mathematics and the real world in order to describe and compare objects and data.

Uncertainty

Key Idea 6- Students use ideas of uncertainty to illustrate that mathematics involves more than exactness when dealing with everyday situations.

Patterns and functions

Key Idea 7- Students use patterns and functions to develop mathematical power, appreciate the true beauty of mathematics, and construct generalizations that describe patterns simply and efficiently.

Standard 4 - Science-The Physical Setting

Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.

Key Idea 4-Energy exists in many forms, and when these forms change energy is conserved.

Performance Indicator 4.1

Students can observe and describe transmission of various forms of energy.

Performance Indicator 4.3

Students can explain variations in wavelength and frequency in terms of the source of the vibrations that produce them, e.g., molecules, electrons, and nuclear particles.

Key Idea 5-Energy and matter interact through forces that result in changes in motion.

Performance Indicator 5.1 Students can explain and predict different patterns of motion of objects (e.g., linear and uniform circular motion, velocity and acceleration, momentum and inertia).

Performance Indicator 5.3

Students can compare energy relationships within an atom's nucleus to those outside the nucleus.