

CURRICULUM GUIDE

NAME OF COURSE: COLLEGE PREP FOUNDATIONS OF SCIENCE B
COURSE NUMBER: 403 **WRITTEN/REVISED:** AUGUST, 2008
LEVEL OF COURSE: COLLEGE PREP B **NUMBER OF CREDITS:** SIX (6)
PREREQUISITES: NONE **GRADE LEVEL OFFERED TO:** 9th

PREFACE/BACKGROUND STATEMENTS (INCLUDES STATEMENT OF PHILOSOPHY):

This course is designed to fulfill the needs of a college preparatory student. The course emphasis is on laboratory exercises and the techniques for solving problems and conducting investigations. Science is a number of processes, a way of thinking, and a way of learning how to solve a problem. This course should therefore encourage students to regard the scientific method as a way of being open minded about possible answers, not as a set of rules for solving problems.

GENERAL OBJECTIVES:

When the course has been completed successfully, students should be able to:

1. explain how all sciences are related rather than being separate and independent areas.
2. formulate hypotheses (including, at times, the idea of *Multiple Working Hypotheses*), devise procedures to test them, and carry out the investigations.
3. design, interpret, and perform experiments in the laboratory or in the natural environment.
4. collect real data, process it in meaningful ways, and make appropriate interpretations and conclusions from it.
5. select and use apparatus and materials appropriate to the investigation being conducted, with minimal error.
6. deduce information from appropriate data instead of relying on hearsay, superstition, or "tradition" for the answer.
7. work independently and/or in a group situation in order to gather data, carry out investigations, solve problems, etc.

8. write coherent, organized labs following the logic of the scientific method.
9. distinguish between scientific laws and scientific theories.
10. measure and compute using the metric system.
11. use scientific notation.
12. work safely in the science classroom.
13. research effectively using computers, reference texts, and library materials.
14. effectively take multiple-choice tests.
15. use examples from Sussex County and New Jersey whenever possible.

CORE CURRICULUM CONTENT STANDARDS ADDRESSED:

- 5.1 - Scientific Process** – Habits of Mind, Inquiry and Problem Solving, Safety
- 5.2 - Science and Society** – Cultural Contributions, Historical Perspectives
- 5.3 - Mathematics Application** – Numerical Operations, Geometry and Measurement Patterns and Algebra, Data Analysis and Probability
- 5.4 - Nature and Process of Technology** – Science and Technology, Nature of Technology, Technological Design
- 5.6 - Physical Science – Chemistry** – Structure and Property of Matter, Chemical Reactions
- 5.7 - Physical Science – Physics** – Motion and Forces, Energy Transformations
- 5.8 - Earth Science** – Properties, Atmosphere and Weather, Processes and How we study the Earth
- 5.9 - Astronomy and Space Science** – Earth, Moon and Sun Systems, Solar System, Stars and Galaxies and Universe
- 5.10 – Environmental Studies** – Natural Systems and Interactions, Human Interactions and Impact

Marking Period 1

Unit 1: Nature of Science

Days = 24

Goal: The students will demonstrate all the basic skills of a scientist.

Objectives: The students will be able to:

1. recognize the basic themes and topics of the course and of science.
2. demonstrate lab safety skills.
3. use proper laboratory equipment and techniques.
4. understand the need for the integration of technology with science.
5. perform the scientific method and use it to design an experiment.
6. distinguish between *Facts, Laws and Theories* and the importance of observation.
7. collect and organize information into graphs and data tables.
8. review and use SI units for, length, mass, volume and time through lab situations.
9. convert English to metric as well as metric to metric measures.
10. write numbers using scientific notation.
11. use measuring tools.

Audio-visuals:

Greatest Discoveries with Bill Nye

Assignments:

1. Reading of sections 1.1, 1.2, and 1.3
2. Section 1.1 vocabulary and review
3. Section 1.2 vocabulary and review
4. Metric system practice sheets
5. Scientific notation practice sheets
6. Measuring with accuracy and precision practice sheets
7. Study Guide Chapter Review

Recommended Lab Activities:

1. Data Collection and Organization Lab
2. Mystery Density Lab

Evaluation:

1. Graded homework
2. Graded lab reports
3. Vocabulary quizzes
4. Content quiz
5. Chapter 1 test

Unit 2: Contour Mapping Project

Days = 23

Goal: Students will plan a housing development (site plan).

Objectives: The students will be able to:

1. interpret contour maps.
2. relate map distances to actual distances.
3. explore various techniques of graphing.
4. build graphs from construction data.
5. use map measuring devices properly.
6. propose how to use land in an esthetic and environmentally sound manner.
7. present a complete and accurate hypothetical site plan.

Assignments:

1. Converting profiles to topographic images practice sheets

Recommended Labs and Projects:

1. New Jersey State Map interpretation
2. Hurricane Horrible Project
3. Housing Development Project

Evaluation:

1. Graded homework
2. Rubric graded projects
3. Housing project quiz

Marking Period 2

Unit 1: Matter and Energy

Days = 18

Goal: Students will gain a basic understanding of matter and energy.

Objectives: The students will be able to:

1. define elements, molecules, compounds, and mixtures.
2. categorize materials as pure substances or mixtures.
3. use the Kinetic Theory to describe the properties and structures of matter.
4. describe energy transfers in changes of state.
5. describe the laws of conservation of mass and conservation of energy, and explain how they apply to changes of state.
6. apply the laws of conservation of mass and conservation of energy to chemical and physical changes.
7. distinguish between the chemical and physical properties of matter.
8. explain the difference between chemical changes and physical changes.
9. determine the difference between endothermic and exothermic reactions.
10. identify the factors that effect the rate of chemical reactions.
11. identify reactants and products.

Assignments:

1. Reading of sections 2.1, 2.2, and 2.3
2. Section 2.2 vocabulary and review
3. Section 2.3 vocabulary and review
4. States of matter concept map
5. Chapter 2 concept map

Recommended Labs:

1. Chemical and Physical Changes Lab
2. Conservation of Matter Lab

Evaluation:

1. Graded homework
2. Graded lab
3. Vocabulary quizzes
4. Content quiz
5. Chapter 2 test

Unit 2: Structure of the atom**Days = 17****Goal: Students will be able to explain modern atomic theory****Objectives:** The students will be able to:

1. define the term atom.
2. explain the relationship between matter, atoms, and elements.
3. explain how the idea of the atom originated.
4. name and describe the 3 subatomic particles of the atom.
5. determine the number of protons, neutrons, and electrons in an atom.
6. explain how an ion differs from an atom.
7. explain how isotopes of the same element differ.
8. define atomic number and atomic mass.

Assignments:

1. Atomic Configuration Drawings
2. Reading of sections 3.1 and 3.2
3. Section 3.1 vocabulary and review
4. Section 3.2 vocabulary and review

Evaluation:

1. Graded Homework
2. Vocabulary quizzes
3. Content quiz
4. Graded lab reports

Unit 3: Periodic Table

Days = 5

Goal: Master the basics of the Periodic Table.

Objectives: The students will be able to:

1. explain the logic of the structure of the periodic table.
2. explain the Periodic Law.
3. explain the properties of metals and nonmetals.
4. define periods and series as they relate to the basic structure of the Periodic Table.
5. identify the charge of common ions using the periodic table.
6. explain the electron structure of each period.
7. draw Lewis dot structures for the first 18 elements.

Assignments:

1. Reading of section 3.3
2. Section 3.3 vocabulary and review
3. Subatomic Particles Chart
4. Chapter 3 concept map

Recommended labs and projects:

1. Structure of the Atom Project
2. Mystery Molecule Project

Evaluation:

1. Graded Homework
2. Vocabulary quiz
3. Content quiz
4. Rubric graded projects
5. Chapter 3 test

Marking Period 3

Unit 1: Plate Tectonics

Days = 20

Goal: Students will be able to describe the forces that have shaped the face of the planet.

Objectives:

1. identify the structure of the Earth.
2. describe how heat creates convection currents within the mantle.
3. explain the current theory of plate tectonics.
4. model the different types of plate boundaries.
5. explain how plate motion has created Earth's topography.
6. relate plate tectonics to the causation of earthquakes.
7. relate plate tectonics to the formation of volcanoes.

Audio-visuals:

1. *Raging Planet: Volcanoes*
2. *Raging Planet: Earthquakes*
3. Excerpts from the movie *Dante's Peak*
4. Excerpts from the movie *The Core*
5. *Discovery Channel: The Earth Inside and Out*

Assignments:

1. Reading of sections 17.1 and 17.2
2. Section 17.1 vocabulary and review
3. Section 17.2 vocabulary and review
4. Forces, faults, and boundaries practice sheets
5. Plate Tectonics Concept Map

Recommended labs and projects:

1. Mercalli Scale Lab
2. Modeling Faults and Forces Lab
3. Virtual Earthquake Seismology Project

Evaluation:

1. Graded Homework
2. Vocabulary quizzes
3. Content quiz
4. Graded labs and project
5. Chapter 17 test

Unit 2: Weather and the Atmosphere**Days = 10****Goal: To conduct activities in Weather using science skills.****Objectives:**

1. define common weather terms.
2. determine how different weather trends form and why.
3. read weather maps.
4. generate weather maps from raw data.
5. read national weather radar.
6. locate websites with real time weather data and interpret its significance.

Audio-visuals:

1. Excerpts from the movie *The Day After Tomorrow*
2. Excerpts from the movie *Twister*
3. *Weather Extremes*
4. *Discovery Channel Tornadoes*

5. *PBS Special: Global Warming the Signs and the Science*
6. *PBS Special: Lightning*
7. *Raging Planet: Tornadoes, Hurricanes, and Lightning*

Assignments:

1. Reading of sections 18.1, 18.2, and 18.3
2. Section 18.1 vocabulary and review
3. Section 18.2 vocabulary and review
4. Section 18.3 vocabulary and review

Recommended labs and projects:

1. Mountain Rainfall Lab
2. Hurricane Tracking Lab
3. Weather Prediction Project

Evaluation:

1. Graded homework
2. Content quiz
3. Vocabulary quiz
4. Graded labs and projects
5. Chapter 18 test

Unit 3: Astronomy

Days = 5

Goal: The students will be able to investigate topics in earth science.

Objectives: The students will be able to:

1. detail the current theory of the origin of the universe.
2. describe the components of the universe and their relative sizes.
3. explain the current theories for the formation of solar system.
4. cite the changes that have occurred throughout Earth's evolution.
5. detail the technologies that are used to explore and observe the universe.

Audio-visuais:

1. *Discovery Channel: The Solar System*

Assignments:

1. Reading of section 16.1
2. Section 16.1 vocabulary and review

Recommended projects and labs:

1. Size of the Solar System Lab
2. Universe Concept Map

Evaluation:

1. Graded Homework
2. Content and vocabulary quiz
3. Graded lab and project

Marking Period 4**Unit 1: Motion and Forces****Days = 20****Goal: The students will demonstrate an understanding of motion and force.****Objectives:** The students will be able to:

1. define speed and give examples of units for speed.
2. distinguish between speed and velocity.
3. define acceleration and give examples of units for acceleration.
4. state Newton's Laws of Motion.
5. determine the implications of momentum on a system.
6. distinguish between mass and weight and their proper units of measurement.
7. state Newton's Law of Universal Gravitation.
8. interpret velocity/time graphs.
9. interpret acceleration graphs.
10. create motion graphs from provided data.
11. read velocity time graphs.

Audio-visuals:

1. Excerpts from the movie *The Hire*
2. *Discovery Channel: Roller Coasters*
3. *The Way Things Go*

Assignments:

1. Reading of sections 8.1, 8.2 and 8.3
2. Section 8.1 vocabulary and review
3. Section 8.2 vocabulary and review
4. Section 8.3 vocabulary and review
5. Calculating velocity practice sheets
6. Calculating acceleration practice sheets
7. Calculating momentum practice sheets
8. Calculating force practice sheets

Recommended Labs:

1. Specific Gravity Lab
2. Paper Tower Lab
3. Foil Boat Lab

Evaluation:

1. Graded homework
2. Graded lab reports
3. Vocabulary quizzes
4. Content quiz
5. Chapter 8 test

Unit 2: Work and Energy**Days = 20****Goal: The students will be able to demonstrate an understanding of work, power, and energy.****Objectives:** The students will be able to:

1. state the Law of Conservation of Energy.
2. define work in terms of energy.
3. distinguish between kinetic energy and potential energy.
4. determine the work being done by a simple machine.
5. construct a compound machine.

Assignments:

1. Reading of sections 9.1, 9.2, 9.3, and 9.4
2. Section 9.1 vocabulary and review
3. Section 9.2 vocabulary and review
4. Section 9.3 vocabulary and review
5. Section 9.4 vocabulary and review
6. Calculating kinetic and potential energy practice sheets
7. Calculating work practice sheets
8. Calculating power practice sheets

Recommended Labs:

1. Human Horse Power Lab

Projects:

1. Roller Coaster Project
2. Simple Machine Project

Evaluation:

1. Graded homework
2. Graded lab reports
3. Vocabulary quizzes
4. Content quiz
5. Rubric graded projects
6. Chapter 9 test

Materials / Resources:

Text: Science Spectrum – A Physical Approach - 2001

Labs: Teacher generated and selected

Audio-visual: As selected by instructor

A. STUDENT PROGRESS:

The following are the items included in the evaluation of student achievement and in the computation of the grade received by the student.

1. Labs, Unit Tests and Quizzes 75-80%
2. Class Participation/Homework 20-25%

B. PERIODIC EVALUATION OF OBJECTIVES AND GUIDE:

This program is due for reevaluation in 2009.

SPECIAL COURSE POLICIES:

The major portion of instruction involves student discovery of data guided by the laboratory exercises. There is opportunity to develop skills in analyzing results and forming conclusions. In addition to lecture-demonstrations and discussion there is a requirement for outside preparation by the student. The knowledge learned is evaluated by completion of long term projects. Unit tests and mid-term and final examinations are used to evaluate achievement of course goals.

DATE MID-TERM / FINAL REVISED

1. Mid-term – January 2008
2. Final – June 2008

SUPPLEMENTARY READINGS AND INSTRUCTORS BIBLIOGRAPHY:

1. *Environmental Science* by Karen Arms, Saunders College Publishing, 1990.
2. *General Science* by Richard Moyer and Jeanne Bishop, Merrill Publishing, 1986.
3. *Modern Chemistry* by Metcalfe, Williams and Castka, Holt Rinehart and Winston Publishing, 1996.
4. *Conceptual Physics* by Paul Hewitt, Addison-Wesley Publishing, 1997.

High Point Regional High School's curriculum and instruction are aligned to the State's Core Curriculum Content Standards and address the elimination of discrimination by narrowing the achievement gap, by providing equity in educational programs and by providing opportunities for students to interact positively with others regardless of race, creed, color, national origin, ancestry, age, marital status, affectionate or sexual orientation, gender, religion, disability or socioeconomic status.