Archdiocese of Philadelphia
Secondary School System
Physical Science Standards

The Catholic school community strives to make its faith commitment a complement to academic excellence by developing a curriculum that leads all students to Christ as it prepares them for a successful life in the twenty-first century. It is a curriculum that recognizes the sanctity of each human life while affirming the dignity of each person as a unique creation of God. It is a curriculum that is intended to offer all students the opportunity to study the world at many levels of complexity, through a variety of courses.

Schools of the Archdiocese of Philadelphia shall teach, challenge, and support every student to realize his/her maximum potential and to acquire the knowledge and skill to achieve the general standards in physical science.

General Standards

- Physical Science Methods and Measurements
- Motion and Forces
- Energy
- Waves
- Matter
- The Atom
- Periodic Table
- Chemical interactions
- Radioactivity and nuclear reactions
- Energy Sources and society

Standards Terminology Glossary

- General - Goals
- Content - What a student should know
- Competency - What a student should be able to do
- Assessment - How well a student should be able to perform
- Rubric - Scoring tool to evaluate the level of student performance

1. Physical Science Methods and Measurements

Content Standard

1.1. Scientific Method

Competency Standard

1.1.1. Demonstrate understanding of the scientific method.

1.1.2. Distinguish between controls and variables.

Content Standard

1.2. SI Units

Competency Standard

1.2.1. Use SI units to measure length, volume and mass.

1.2.2. Convert SI Units to other SI units.

Content Standard

1.3. Laboratory Skills.

Competency Standard

1.3.1. Understand and demonstrate the rules of laboratory safety.

1.3.2. Construct a written laboratory report.

Content Standard

1.4. Making and using graphs.

Competency Standard

1.4.1. Recognize when data display requires a line graph or a bar graph.

1.4.2. Construct line and bar graphs according to accepted graphing criteria.

2. Motion and Forces

Content Standard

2.1. Motion, speed and acceleration.

Competency Standard

2.1.1. Define speed as a rate.
2.1.2. Perform calculations involving velocity and acceleration.
2.1.3. Interpret distance-time graphs.
2.1.4. Interpret speed-time graphs.
2.1.5. Recognize that an object in circular motion is accelerating.

Content Standard

2.2. Types of forces and friction.

Competency Standard

2.2.1. Identify the different types of forces.
2.2.2. Contrast balanced and unbalanced forces.
2.2.3. Compare mass and weight.
2.2.4. Relate gravitational force to mass and distance.
2.2.5. Understand the role of friction in forces.

Content Standard

2.3. Newton's Laws of motion.

Competency Standard

2.3.1. Discuss Newton's Laws of motion.
2.3.2. Describe momentum.

3. Energy

Content Standard

3.1. Nature of potential and kinetic energy.

Competency Standard

3.1.1. Understand that energy causes change.
3.1.2. Distinguish between potential and kinetic energy.
3.1.3. Describe different types of energy conversions.
3.1.4. Explain the relationship between matter and energy.
3.1.5. Understand that energy is used to do work.
3.1.6. Perform calculations using the formula for work.
3.1.7. Contrast the everyday definition of work with its scientific meaning.

Content Standard

3.2. Heat

Competency Standard

3.2.1. Understand that heat is a form of energy.
3.2.2. Distinguish between temperature and heat.
3.2.3. Use temperature measurements to calculate heat energy.
3.2.4. Describe how conduction, convection and radiation transfer heat.
3.2.5. Explain how heat energy causes a phase change.
3.2.6. Discuss thermal expansion.

4. Waves

Content Standard

4.1. Characteristics of waves and their interactions.

Competency Standard

4.1.1. Sketch a transverse wave and identify its characteristics.
4.1.2. Contrast transverse waves and compression waves.
4.1.3. Calculate the speed of waves.
4.1.4. Classify wave interactions of sound.

Content Standard

4.2. Sound as compression waves.

Competency Standard

4.2.1. Describe sound and its transmission.
4.2.2. Understand that the speed of sound varies.
4.2.3. Distinguish between frequency and pitch.
4.2.4. Define loudness.
4.2.5. Illustrate the Doppler Effect with an example.
4.2.6. Understand the way the human ear detects sound.

Content Standard

4.3. Light as electromagnetic waves.

Competency Standard

4.3.1. Contrast electromagnetic waves with other types of waves.
4.3.2. Summarize the different parts of the electromagnetic spectrum.
4.3.3. Identify the colors in visible light.
4.3.4. Explain how you can see color.
4.3.5. Describe the process of reflection.
4.3.6. Describe the process of refraction.
4.3.7. Analyze diffraction and interference patterns and relate them to the wave behavior of light.

5. Matter

Content Standard

5.1. Volume and density.

Competency Standard

5.1.1. Explain what is meant by the term, matter.

5.1.2. Calculate the density of an object when you know its mass and volume.

Content Standard

5.2. Physical and chemical properties and changes.

Competency Standard

5.2.1. Distinguish between physical and chemical properties.

5.2.2. Distinguish between properties and changes.

Content Standard

5.3. Phases of Matter

Competency Standard

5.3.1. Model the solid, liquid and gaseous forms of matter.

Content Standard

5.4. Elements, Compounds and Mixtures

Competency Standard

5.4.1. Describe how matter is classified according to its make-up.

5.4.2. Recognize the difference among elements, compounds and mixtures.

6. The Atom

Content Standard

6.1. Development of the atomic model.

Competency Standard

6.1.1. Describe how the atomic model has changed over time.

Content Standard

6.2. Structure of the atom.

Competency Standard

6.2.1. Summarize the parts of the atom.

6.2.2. Describe the present model of the atom.

Content Standard

6.3. Common elements and isotopes.

Competency Standard

6.3.1. List the names and symbols of the common elements.

6.3.2. Explain the meaning of the term isotope.

7. Periodic Table

Content Standard

7.1. Origin and arrangement of the Periodic Table.

Competency Standard

7.1.1. Summarize Mendeleev's role in the formation of the periodic table.

7.1.2. Recognize how the modern periodic table is designed.

Content Standard

7.2. Chemical families and periodic properties.

Competency Standard

7.2.1. Describe differences among metals, nonmetals and metalloids.

7.2.2. Describe some properties of eight families of the periodic table. (the representative elements)

7.2.3. Explain how periodic properties of the elements are functions of Atomic number.

8. Chemical Interactions

Content Standard

8.1. Bonding

Competency Standard

8.1.1. Explain why atoms combine.

8.1.2. Describe the difference among ionic, covalent, metallic and network bonds.

8.1.3. Explain how to determine oxidation numbers.

8.1.4. Write formulas for the compounds from their names.

8.1.5. Write names for the compounds from their formulas.

Content Standard

8.2. Reactions

Competency Standard

8.2.1. Classify the four types of chemical reactions.

8.2.2. Balance simple chemical equations.

8.2.3. Explain the reasons for a change in the rate of a chemical reaction.

Content Standard

8.3. Acids, bases and salts.

Competency Standard

8.3.1. Describe the properties and uses of acids and bases.

8.3.2. Relate the strength of acids and bases to pH.

8.3.3. Describe the formation of a salt through a neutralization reaction.

8.3.4. Understand the importance of acids, bases and salts in the environment.

9. Radioactivity and nuclear reactions

Content Standard

9.1. Discovery.

Competency Standard

9.1.1. Discuss the discovery of radioactivity.

Content Standard

9.2. Nuclides.

Competency Standard

9.2.1. Contrast the properties of radioactive versus stable nuclides.

Content Standard

9.3. Forms of radiation.

Competency Standard

9.3.1. Discuss the different forms of radioactivity.

9.3.2. Determine the half-life of an isotope.

9.3.3. Describe current methods for the detection of radioactivity

Content Standard

9.4. Nuclear Reactions.

Competency Standard

9.4.1. Distinguish between nuclear fission and nuclear fusion.

Content Standard

9.5. Uses of radioactivity.

Competency Standard

9.5.1. Discuss current uses for radioactivity in daily life.

10. Energy Sources and society

Content Standard

10.1. Fossil Fuels.

Competency Standard

10.1.1. Discuss the types of fossil fuels.

Content Standard

10.2. Nuclear Energy.

Competency Standard

10.2.1. Outline the operation of a nuclear reactor.

10.2.2. Describe the problems associated with nuclear waste disposal.

10.2.3. Discuss nuclear fusion as a possible energy source.

Content Standard

10.3. Alternative Energy Sources.

Competency Standard

10.3.1. Describe the advantages and disadvantages of several alternative energy sources.

Content Standard

10.4. Energy Conservation

Competency Standard

10.4.1. Discuss the need and methods for energy conservation.