

DOWNEY UNIFIED SCHOOL DISTRICT  
Middle School Course Outline

**Course Title:** Physical Science (One Year)

**Grade Level:** 8

**Prerequisites:** None

**Course Description:**

This course presents the basic aspects of physical science with emphasis on the scientific processes in the content areas. The content areas covered are: physics, chemistry, and astronomy. The scientific method will be integrated throughout the content areas.

Applications of technology will be discussed. Safety in the lab and metric measurement will also be emphasized.

**Student Performance**

**Objectives for this**

**Course:**

***MOTION***

1. The velocity of an object is the rate of change of its position. As a basis for understanding this concept, students will:
  - a. Define a position as relative to some choice of standard reference point and a set of reference directions.
  - b. Calculate the average speed as the total distance traveled divided by the total time elapsed. The speed of an object along the path traveled can vary.
  - \*c. Solve problems involving distance, time, and average speed.
  - d. Describe the velocity of an object by specifying both direction and speed.
  - e. Identify changes in velocity as changes in speed, direction, or both.
  - \*f. Interpret graphs of position versus time and speed versus time for motion in a single direction.

***FORCES***

2. Unbalanced forces cause changes in velocity. As a basis for understanding this concept, students will:
  - a. Demonstrate that a force has both direction and magnitude.
  - b. Explain that when an object is subject to two or more forces at once, the effect is the cumulative effect of all the forces.

\*Indicates KEY STANDARDS for emphasis.

## Physical Science - continued

- \*c. Demonstrate when the forces on an object are balanced, the motion of the object does not change.
- \*d. Identify separately two or more forces acting on a single static object (including gravity), elastic forces due to tension or compression in matter, and friction.
- \*e. Demonstrate that when the forces on an object are unbalanced, the object will change its motion (that is, it will speed up, slow down, or change direction).
- f. Demonstrate that the greater the mass of an object, the more force is needed to achieve the same change in motion.
- g. Explain the role of gravity in forming and maintaining planets, stars and the solar system.

### ***STRUCTURE OF MATTER***

3. Elements have distinct properties and atomic structure. All matter is comprised of one or more of over 100 elements. As a basis for understanding this concept, students will:
- \*a. Illustrate the structure of the atom and how it is composed of protons, neutrons and electrons.
  - \*b. Give examples that compounds are formed by combining two or more different elements. Compounds have properties that are different from the constituent elements.
  - c. Give examples of atoms and molecules forming solids by building up repeating patterns such as the crystal structure of NaCl or long chain polymers.
  - d. Demonstrate that the states (solid, liquid, gas) of matter depend on molecular motion.
  - \*e. Illustrate and explain that the atoms in solids are closely locked in position and can only vibrate; the atoms and molecules in liquids are more loosely connected and can collide with and move past one another; and the atoms or molecules in gases are free to move independently, colliding frequently.
  - f. Use the Periodic Table to identify elements in simple compounds.

\*Indicates KEY STANDARDS for emphasis.

## Physical Science - continued

### ***EARTH IN THE SOLAR SYSTEM (EARTH SCIENCE)***

4. The structure and composition of the universe can be learned from the study of stars and galaxies, and their evolution. As a basis for understanding this concept, students will:
  - a. Identify galaxies as clusters of billion of stars, and give examples of different shapes.
  - \*b. Identify the sun as one of many stars in our own Milky Way galaxy, and classify stars by their size, temperature, and color.
  - \*c. Use astronomical units and light years as measures of distance between the sun, stars, and Earth.
  - d. Explain that stars are the source of light for all bright objects in outer space and illustrate that the moon and planets shine by reflected sunlight, not by their own light.
  - \*e. Describe the appearance, general composition, and illustrate relative position and size, and motion of objects in the solar system, including planets, planetary satellites, comets, and asteroids.

### ***REACTIONS***

5. Chemical reactions are processes in which atoms are rearranged into different combinations of molecules. As a basis for understanding this concept, students will:
  - a. Demonstrate that reactant atoms and molecules interact to form products with different chemical properties.
  - \*b. Diagram the law of conservation of matter, which states that in a chemical reaction, the number of atoms stays the same no matter how they are arranged, so their total mass stays the same.
  - c. Demonstrate that chemical reactions usually liberate heat or absorb heat.
  - \*d. Demonstrate that physical processes include freezing and boiling, in which a material changes form with no chemical reaction.
  - e. Determine whether a solution is acidic, basic or neutral.

\*Indicates KEY STANDARDS for emphasis.

***CHEMISTRY OF LIVING SYSTEMS (LIFE SCIENCE)***

6. Principles of chemistry underlie the functioning of biological systems. As a basis for understanding this concept, students will:
  - a. Give examples of how carbon, because of its ability to combine in many ways with itself and other elements, has a central role in the chemistry of living organisms.
  - b. Describe how living organisms are made of molecules largely consisting of carbon, hydrogen, nitrogen, oxygen, phosphorus and sulfur.
  - c. Give examples of the many different kinds of molecules of living organisms including small ones such as water and salt and very large ones such as carbohydrates, fats, proteins and DNA.

***PERIODIC TABLE***

7. The organization of the Periodic Table is based on the properties of the elements and reflects the structure of atoms. As a basis for understanding this concept, students will:
  - a. Identify regions corresponding to metals, nonmetals and inert gases.
  - \*b. Identify elements by the number of protons in the nucleus, which is called the atomic number. Different isotopes of an element have a different number of neutrons in the nucleus.
  - \*c. Classify substances by their properties, including melting temperature, density, hardness, heat, and electrical conductivity.

***DENSITY AND BUOYANCY***

8. All objects experience a buoyant force when immersed in a fluid. As a basis for understanding this concept, students will:
  - a. Identify density as mass per unit volume.
  - \*b. Calculate the density of substances (regular and irregular solids, and liquids) from measurements of mass and volume.

\*Indicates KEY STANDARDS for emphasis.

## Physical Science – continued

- c. Demonstrate that the buoyant force of an object in a fluid is an upward force equal to the weight of the fluid it has displaced.
- \*d. Predict whether an object will float or sink.

### ***INVESTIGATION AND EXPERIMENTATION***

- 9. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content of the other three strands, students should develop their own questions and perform investigations. Students will:
  - a. Plan and conduct a scientific investigation to test a hypothesis.
  - b. Evaluate the accuracy and reproducibility of data.
  - \*c. Distinguish between variable and controlled parameters in a test.
  - d. Recognize the slope of the linear graph as the constant in the relationship  $y=kx$  and apply this to interpret graphs constructed from data.
  - \*e. Construct appropriate graphs from data and develop quantitative statements about the relationships between variables.
  - \*f. Apply simple mathematical relationships to determine one quantity given the other two (including  $\text{speed} = \text{distance}/\text{time}$ ,  $\text{density} = \text{mass}/\text{volume}$ ,  $\text{force} = \text{pressure} \times \text{area}$ ,  $\text{volume} = \text{area} \times \text{height}$ ).
  - g. Distinguish between linear and non-linear relationships on a graph of data.

\*Indicates KEY STANDARDS for emphasis.

## Physical Science - continued

### Instructional Strategies

1. Lecture/note taking
2. Observation/demonstration
3. Laboratory hands-on experimentation
4. Written assignments
5. Group projects
6. Audio-visual aids
7. Tests
8. Games
9. Reading - text, graphs, charts, magazines

### Instructional Units

*Investigation and Experimentation instruction will be integrated throughout the course.*

| <u>Weeks</u> | <u>Unit – Organized by Standards Unit</u> |
|--------------|---|
| 3.5          | Motion                                    |
| 3.5          | Forces                                    |
| 4            | Structure of Matter                       |
| 4            | Earth in the Solar System                 |
| 4            | Reactions                                 |
| 4.5          | Chemistry of Living Systems               |
| 4            | Periodic Table                            |
| 3            | Density and Buoyancy                      |
| 4            | Investigation and Experimentation         |
| 1-2          | State Assessment/Review                   |

### Weeks Unit – Organized by Text/Chapter

(1 day = .2 week)

|     |  |
|-----|--|
| 1   | Chapter 1: Motion                          |
| 1.6 | Chapter 2: Forces                          |
| 1.4 | Chapter 3: Forces in Fluids                |
| 1.6 | Chapter 4: Work and Machines               |
| 1.4 | Chapter 5: Energy and Power                |
| 1.4 | Chapter 6: Thermal Energy and Heat         |
| 1.2 | Chapter 7: Characteristics of Waves        |
| 2   | Chapter 8: Sound                           |
| 1.6 | Chapter 9: Electromagnetic Spectrum        |
| 1.6 | Chapter 10: Light                          |
| 1.6 | Chapter 11: Magnetism and Electromagnetism |

## Physical Science – continued

|            |   |
|------------|---|
| 1.4        | Chapter 12: Electric Charges and Current      |
| 1.4        | Chapter 13: Electricity and Magnetism at Work |
| 1          | Chapter 14: An Introduction to Matter         |
| 1.4        | Chapter 15: Changes in Matter                 |
| 1.4        | Chapter 16: Elements and the Periodic Table   |
| 1.4        | Chapter 17: Chemical Reactions                |
| 1.6        | Chapter 18: Atoms and Bonding                 |
| 1.2        | Chapter 19: Acids, Bases, and Solutions       |
| 1.2        | Chapter 20: Exploring Materials               |
| 1.6        | Chapter 21: Chemistry of Living Systems       |
| 1.8        | Chapter 22: Earth, Moon, and Sun              |
| 1.6        | Chapter 23: The Solar System                  |
| 1.6        | Chapter 24: Stars, Galaxies, and the Universe |
| <u>1-2</u> | State Assessment/Review                       |

Total: 36 Weeks

## Evaluation

Performance-based projects and testing  
Teacher observation  
Homework  
Test & quizzes  
Completion and quality of assignments

## Materials and Resources

Student Textbook:

Focus on Physical Science  
Science Explorer – California Edition  
Prentice Hall