CHINO VALLEY UNIFIED SCHOOL DISTRICT
INSTRUCTIONAL GUIDE
SCIENCE 8
SCIENCE GATE/HONORS 8

Course number	3042-Science 8 3043-Science GATE/Honors 8
Department	Science
Length of course	One (1) year
Grade Level	8
Board Approved	June 19, 2008

Description of Course - This course presents an introductory general science curriculum with an emphasis on physical science.

Rationale of Course - This course fulfills the requirement for promotion to high school. This course also presents standards that will be tested in the 10th grade life science test as required by NCLB.

Standard 1 (Motion) - Students will demonstrate a working knowledge that the velocity of an object is the rate of change of its position.

1.1 Objective: Know that position is defined in relation to some choice of a standard reference point and a set of reference directions.

1.1.1 Performance Indicator: Students will be able to determine when an object is in motion.

1.1.2 Performance Indicator: Students will be able to distinguish between distance and displacement.

1.2 Objective: Understand that the average speed is the total distance traveled divided by the total time elapsed and that the speed of an object along the path traveled can vary.

1.2.1 Performance Indicator: Students will be able to calculate an object's speed.

1.3 Objective: Understand how to solve problems involving distance, time, and average speed.

1.3.1 Performance Indicator: Students will be able to solve word problems involving speed, distance, and time.

1.4 Objective: Understand that the velocity of an object must be described by specifying both the direction and the speed of the object.

1.4.1 Performance Indicator: Students will be able to describe velocity as speed and direction.

1.5 Objective: Understand that changes in velocity may be due to changes in speed, direction, or both.

1.5.1 Performance Indicator: Students will be able to describe the motion of an object as it accelerates or slows down.

1.5.2 Performance Indicator: Students will be able to calculate acceleration.

1.6 Objective: Understand how to interpret graphs of position versus time and graphs of speed versus time for motion in a single direction.

1.6.1 Performance Indicator: Students will be able to analyze a distance vs. time graph and a speed vs. time graph.

Standard 2 (Forces) - Students will demonstrate a working knowledge that unbalanced forces cause changes in velocity.

2.1 Objective: Understand that a force has both direction and magnitude.

2.1.1 Performance Indicator: Students will be able to describe what a force is.

2.2 Objective: Understand when an object is subject to two or more forces at once, the result is the cumulative effect of all the forces.

2.2.1 Performance Indicator: Students will be able to determine the net force on an object.

2.3 Objective: Understand that when the forces on an object are balanced, the motion of the object does not change.

2.3.1 Performance Indicator: Students will be able to explain how balanced and unbalanced forces affect an object's velocity.

2.4 Objective: Understand how to identify separately the two or more forces that are acting on a single static object, including gravity, elastic forces due to tension or compression in matter, and friction.

2.4.1 Performance Indicator: Students will be able to identify the factors that affect the gravitational force between two objects.

2.4.2 Performance Indicator: Students will be able to explain why objects accelerate during free fall.

2.4.3 Performance Indicator: Students will be able to describe the elastic forces of tension or compression.

2.4.4 Performance Indicator: Students will be able to describe the force of friction.

2.5 Objective: Understand that when the forces on an object are unbalanced, the object will change its velocity (that is, it will speed up, slow down, or change direction).

2.5.1 Performance Indicator: Students will be able to state Newton's first law of motion.

2.5.2 Performance Indicator: Students will be able to sate Newton's third law of motion.

2.5.3 Performance Indicator: Students will be able to explain how an object's momentum is calculated.

2.5.4 Performance Indicator: Students will be able to state the law of conservation of momentum.

2.5.5 Performance Indicator: Students will be able to explain how a rocket lifts off the ground.

2.6 Objective: Understand that the greater the mass of an object, the more force is needed to achieve the same rate of change in motion.

2.6.1 Performance Indicator: Students will be able to state Newton's second law of motion.

2.7 Objective: Understand the role of gravity in forming and maintaining the shapes of planets, stars, and the solar system.

2.7.1 Performance Indicator: Students will be able to identify what determines the strength of the force of gravity between two objects.

2.7.2 Performance Indicator: Students will be able to describe two factors that keep the moon and Earth in orbit.

Standard 3 (Structure of Matter) - Students will have a working knowledge that each of the more than 100 elements of matter has distinct properties and a distinct atomic structure.

3.1 Objective: Understand the structure of the atom and know it is composed of protons, neutrons, and electrons.

3.1.1 Performance Indicator: Students will be able to explain the Dalton's modern atomic model.

3.1.2 Performance Indicator: Students will be able to identify relative charges of protons, neutrons, and electrons.

3.1.3 Performance Indicator: Students will be able to define isotopes.

3.2 Objective: Understand that compounds are formed by combining two or more different elements and that compounds have properties that are different from their constituent elements.

3.2.1 Performance Indicator: Students will be able to define elements and explain how they relate to compounds.

3.2.2 Performance Indicator: Students will be able to explain the difference between physical and chemical properties of matter.

3.2.3 Performance Indicator: Students will be able to explain the differences between physical and chemical changes in matter.

3.2.4 Performance Indicator: Students will be able to explain the difference between ionic and covalent compounds.

3.3 Objective: Understand that atoms and molecules form solids by building up repeating patterns, such as the crystal structure of NaCl or long-chain polymers.

3.3.1 Performance Indicator: Students will be able to explain how ions form bonds.

3.3.2 Performance Indicator: Students will be able to explain how the formulas and names of ionic compounds are written.

3.3.3 Performance Indicator: Students will be able to identify the properties of ionic compounds.

3.4 Objective: Understand that the states of matter (solid, liquid, and gas) depend on molecular motion.

3.4.1 Performance Indicator: Students will be able to describe the molecular motion of particles in a solid, liquid, or gas.

3.5 Objective: Understand that in solids the atoms are closely locked in position and can only vibrate; in liquids the atoms and molecules are more loosely connected and can collide with and move past one another; and in gases the atoms and molecules are free to move independently, colliding frequently.

3.5.1 Performance Indicator: Students will be able to explain that in solids the atoms are closely locked in position and can only vibrate; in liquids the atoms and molecules are more loosely connected and can collide with and move past one another; and in gases the atoms and molecules are free to move independently, colliding frequently.

3.6 Objective: Understand how to use the periodic table to identify elements in simple compounds.

3.6.1 Performance Indicator: Students will be able to identify the symbols and names of the first 20 elements on the periodic table.

3.6.2 Performance Indicator: Students will be able to explain how the reactivity of elements is related to valence electrons in atoms.

3.6.3 Performance Indicator: Students will be able to state what the periodic table tells you about atoms and the properties of elements.

Standard 4 (Earth in the Solar System) - Students will have a working knowledge of the structure and composition of the universe that can be learned from studying stars and galaxies and their evolution.

4.1 Objective: Understand that the galaxies are clusters of billions of stars and may have different shapes.

4.1.1 Performance Indicator: Students will be able to define a star system.

4.1.2 Performance Indicator: Students will be able to identify the major types of galaxies.

4.2 Objective: Understand that the Sun is one of many starts in the Milky Way galaxy and the stars may differ in size, temperature, and color.

4.2.1 Performance Indicator: Students will be able to explain how stars are classified.

4.2.2 Performance Indicator: Students will be able to compare and contrast apparent brightness to absolute brightness.

4.2.3 Performance Indicator: Students will be able to explain how the H-R diagram is used.

4.3 Objective: Understand how to use astronomical units and light years as measures of distances between the Sun, stars, and Earth.

4.3.1 Performance Indicator: Students will be able to define an astronomical unit.

4.3.2 Performance Indicator: Students will be able to define a light year.

4.3.3 Performance Indicator: Students will be able to how astronomers use parallax to measure distances to nearby stars.

4.4 Objective: Understand that stars are the source of light for all bright objects in outer space and that the Moon and planets shine by reflected sunlight, not by their own light.

4.4.1 Performance Indicator: Students will be able to explain how a star is born.

4.4.2 Performance Indicator: Students will be able to explain the lifetime of a star.

4.4.3 Performance Indicator: Students will be able to explain how the sun produces energy.

4.4.4 Performance Indicator: Students will be able to describe the death of a star.

4.4.5 Performance Indicator: Students will be able to describe solar and lunar eclipses.

4.5 Objective: Understand that the appearance, general composition, relative position and size, and motion of objects in the solar system, including planets, planetary satellites, comets, and asteroids.

4.5.1 Performance Indicator: Students will be able to identify the geocentric and heliocentric systems.

4.5.2 Performance Indicator: Students will be able to identify the objects that make up the solar system.

4.5.3 Performance Indicator: Students will be able to demonstrate how Earth moves in space.

4.5.4 Performance Indicator: Students will be able to describe features found on the moon’s surface.

4.5.5 Performance Indicator: Students will be able to identify some characteristics of the moon.

4.5.6 Performance Indicator: Students will be able to explain how the moon formed.

4.5.7 Performance Indicator: Students will be able to describe the characteristics that the inner planets have in common.

4.5.8 Performance Indicator: Students will be able to identify the main characteristics that distinguish each of the inner planets.

4.5.9 Performance Indicator: Students will be able to describe characteristics that the gas giants have in common.

4.5.10 Performance Indicator: Students will be able to identify characteristics that distinguish each outer planet.

4.5.11 Performance Indicator: Students will be able to describe the characteristics of comets.

4.5.12 Performance Indicator: Students will be able to identify where most asteroids are found.

4.5.13 Performance Indicator: Students will be able to explain what meteoroids are and how they form.

Standard 5 (Reactions) - Students will have a working knowledge of chemical reactions being processes in which atoms are rearranged into different combinations of molecules.

5.1 Objective: Understand how reactant atoms and molecules interact to form products with different chemical properties.

5.1.1 Performance Indicator: Students will be able to define reactants and products in a chemical reaction.

5.1.2 Performance Indicator: Students will be able to explain how chemical changes occur.

5.1.3 Performance Indicator: Students will be able to identify the symbols used in a chemical equation.

5.2 Objective: Understand how the idea of atoms explains the conservation of matter: In chemical reactions the number of atoms stays the same no matter how they are arranged, so their total mass stays the same.

5.2.1 Performance Indicator: Students will be able to explain the law of conservation of matter.

5.2.2 Performance Indicator: Students will be able to balance simple chemical equations.

5.3 Objective: Understand that chemical reactions usually liberate heat or absorb heat.

5.3.1 Performance Indicator: Students will be able to define activation energy.

5.3.2 Performance Indicator: Students will be able to explain the difference between an exothermic and an endothermic reaction.

5.4 Objective: Understand how physical processes include freezing and boiling, in which a material changes form with no chemical reaction.

5.4.1 Performance Indicator: Students will be able to explain that changes of state are physical changes in which no new substances are formed.

5.5 Objective: Understand how to determine whether a solution is acidic, basic, or neutral.

5.5.1 Performance Indicator: Students will be able to name the properties of acids and bases.

5.5.2 Performance Indicator: Students will be able to identify where acids and bases are commonly used.

5.5.3 Performance Indicator: Students will be able to state what kinds of ions acids and bases form in water.

5.5.4 Performance Indicator: Students will be able to explain what pH tells you about a solution.

5.5.5 Performance Indicator: Students will be able to describe what happens in a neutralization reaction.

Standard 6 (Chemistry of Living Systems) - Students will understand the principles of chemistry that underlie the functioning of biological systems.

6.1 Objective: Understand that 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.

6.1.1 Performance Indicator: Students will be able to describe how carbon is able to form a huge variety of compounds.

6.1.2 Performance Indicator: Students will be able to identify four forms of pure carbon.

6.1.3 Performance Indicator: Students will be able to identify some properties of organic compounds.

6.1.4 Performance Indicator: Students will be able to list the four main classes of organic compounds required by living things.

6.1.5 Performance Indicator: Students will be able to explain why living things need water, vitamins, minerals, and salts.

6.2 Objective: Understand that living organisms are made of molecules consisting largely of carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulfur.

6.2.1 Performance Indicator: Students will be able to identify some properties of hydrocarbons.

6.2.2 Performance Indicator: Students will be able to describe the structure and bonding of hydrocarbons.

6.2.3 Performance Indicator: Students will be able to list characteristics of substituted hydrocarbons, esters, and polymers.

6.3 Objective: Understand that living organisms have many different kinds of molecules, including small ones, such as water and salt, and very large ones, such as carbohydrates, fats, proteins, and DNA.

6.3.1 Performance Indicator: Students will be able to explain how polymers form.

6.3.2 Performance Indicator: Students will be able to distinguish natural polymers from synthetic polymers.

6.3.3 Performance Indicator: Students will be able to define a carbohydrate and its use in the human body.

6.3.4 Performance Indicator: Students will be able to define a protein and its use in the human body.

6.3.5 Performance Indicator: Students will be able to define a lipid and its use in the human body.

6.3.6 Performance Indicator: Students will be able to give examples of nucleic acids.

Standard 7 (Periodic Table) – Students will have a working knowledge of the organization of the periodic table being based on the properties of the elements and reflecting the structure of atoms.

7.1 Objective: Understand how to identify regions corresponding to metals, nonmetals, and inert gases.

7.1.1 Performance Indicator: Students will be able to explain the history of the periodic table and Mendeleev's contributions to the modern periodic table.

7.1.2 Performance Indicator: Students will be able to explain the pattern of the periodic table and its arrangement based upon properties and increasing atomic mass.

7.1.3 Performance Indicator: Students will be able to differentiate between periods and groups.

7.1.4 Performance Indicator: Students will be able to identify metal, nonmetals, and inert gases on a periodic table.

7.1.5 Performance Indicator: Students will be able to list characteristics of alkali metals, alkaline earth metals, synthetic metals, nonmetals, and inert gases.

7.1.6 Performance Indicator: Students will be able to define valence electrons.

7.1.7 Performance Indicator: Students will be able to make predictions about what the periodic table tells us about atoms and the properties of elements.

7.2 Objective: Understand how each element has a specific number of protons in the nucleus (the atomic number) and each isotope of the element has a different but specific number of neutrons in the nucleus.

7.2.1 Performance Indicator: Students will be able to determine the number of protons in the nucleus of an atom based upon the atomic number.

7.2.2 Performance Indicator: Students will be able to determine the atomic number of an element using a periodic table.

7.2.3 Performance Indicator: Students will be able to define an isotope of an element.

7.2.4 Performance Indicator: Students will be able to determine the number of protons and neutrons in an isotope based on its mass number.

7.2.5 Performance Indicator: Students will be able to define radioactivity.

7.3 Objective: Understand how substances can be classified by their properties, including their melting temperature, density, hardness, and thermal and electrical conductivity.

7.3.1 Performance Indicator: Students will be able to list the physical properties of metals.

7.3.2 Performance Indicator: Students will be able to explain how the reactivity of metals changes across the periodic table.

7.3.3 Performance Indicator: Students will be able to describe the properties of nonmetals and inert gases.

Standard 8 (Density and Buoyancy) – Students will understand that all objects experience a buoyant force when immersed in a fluid.

8.1 Objective: Understand that density is mass per unit volume.

8.1.1 Performance Indicator: Students will be able to identify the SI units of measure for mass, volume, and density.

8.2 Objective: Understand to how to calculate the density of substances (regular and irregular solids and liquids) from measurements of mass and volume.

8.2.1 Performance Indicator: Students will be able to calculate the density of substances from mass and volume measurements.

8.2.2 Performance Indicator: Students will be able to calculate the volume of an irregularly shaped solic using water displacement as well as using length x width x height.

8.3 Objective: Understand that the buoyant force on an object in a fluid is an upward force equal to the weight of the fluid the object has displaced.

8.3.1 Performance Indicator: Students will be able to explain how the density of an object determines whether it sinks or floats.

8.3.2 Performance Indicator: Students will be able to describe the effect of the buoyant force.

8.4 Objective: Understand how to predict whether an object will float or sink.

8.4.1 Performance Indicator: Students will be able to predict if an object will float or sink, given their respective densities.

Investigation and Experimentation

Objective: Students will have a working knowledge that scientific progress is made by asking meaningful questions and conducting careful investigations.

1.a Performance Indicator: Students will understand how to plan and conduct a scientific investigation to test a hypothesis.

1.b Performance Indicator: Students will understand how to evaluate the accuracy and reproducibility of data.

1.c Performance Indicator: Students will understand how to distinguish between variable and controlled parameters in a test.

1.d Performance Indicator: Students will understand how to recognize the slope of the linear graph as the constant in the relationship y=kx and apply this principle in interpreting graphs constructed from data.

1.e Performance Indicator: Students will understand how to construct appropriate graphs from data and develop quantitative statements about the relationships between variables.

1.f Performance Indicator: Students will understand how to apply simple mathematic relationships to determine a missing quantity in a mathematic expression, given the two remaining terms (including speed = distance/time, density = mass/volume, force = pressure x area, volume = area x height).

1.g Performance Indicator: Students will understand how to distinguish between linear and nonlinear relationships on a graph of data.