

GRADE 8
Science Standards and Benchmark Proficiencies
Focus on Physical Science

I. MOTION

- *The velocity of an object is the rate of change of its position.*
-

II. FORCES

- *Unbalanced forces cause changes in velocity.*
-

III. STRUCTURE OF MATTER

- *Each of the more than 100 elements of matter has distinct properties and a distinct atomic structure. All forms of matter are composed of one or more of the elements.*
-

IV. EARTH IN THE SOLAR SYSTEM (Earth Science)

- *The structure and composition of the universe can be learned from studying stars and galaxies and their evolution.*
-

V. REACTIONS

- *Chemical reactions are processes in which atoms are rearranged into different combinations of molecules.*
-

VI. CHEMISTRY OF LIVING SYSTEMS (Life Science)

- *Principles of chemistry underlie the functioning of biological systems.*
-

VII. PERIODIC TABLE

- *The organization of the periodic table is based on the properties of the elements and reflects the structure of atoms.*
-

VIII. DENSITY AND BUOYANCY

- *All objects experience a buoyant force when immersed in a fluid.*
-

IX. INVESTIGATION AND EXPERIMENTATION

- *Scientific progress is made by asking meaningful questions and conducting careful investigations.*
-

Aligning the Instructional Program with the Grade Level Standards and Benchmarks

In order to align the instructional program with the prescribed content standards for the grade, it is critical that the standards and their affiliated benchmarks are reviewed regularly so as to become very familiar with them. At the outset of each quarter/trimester an initial decision must be made as to which standards and benchmark proficiencies will be included in the instructional program. At the end of each quarter/trimester the teacher should fill out the **response section next to each benchmark**. This activity will serve as a checkpoint and will help gauge what still needs to be taught or what should be re-taught.

Complete the Response Section

ST/B = Standard and Benchmark **P**: Priority benchmark **Q**: Quarter 1 or 2 or 3 or 4

At the start of the quarter/trimester, select the benchmarks you consider to be your “priority benchmarks.” Mark the box under the “P” code.

At the end of each quarter/trimester complete the response section **of the standard/benchmark listings, indicating to what extent students have mastered the benchmark.**

A: More than 75% of the students are proficient

B: About half of the students are proficient

C: fewer than 25% of the students are proficient

Sample Recording of the Response Form GRADE 2

I. PHYSICAL SCIENCE

The motion of objects can be observed and measured. As a basis for understanding this concept, students in the SECOND GRADE will ...

ST/B	P	ST/B: Standard/Benchmark P: Priority Benchmark	Q 1	Q 2	Q 3	Q 4
		Degree of Mastery: % of students at end of each Q: Quarter A= 75% or more B=about half C=fewer than 25%				
ST1.A	P	<i>know</i> that the position of an object can be described by locating it in relation to another object or to the background.	A	B	B	C
ST1.B		<i>know</i> that an object's motion can be described by recording the change in position of the object over time.	A	A	B	B

GRADE 8
Science Standards and Benchmark Proficiencies
Focus on Physical Science

I. MOTION

The velocity of an object is the rate of change of its position. As a basis for understanding this concept, students in the EIGHT GRADE will ...

ST/B	P	ST/B: Standard/Benchmark P: Priority Benchmark Degree of Mastery: % of students at end of each Q: Quarter A= 75% or more B=about half C=fewer than 25%	Q 1	Q 2	Q 3	Q 4
ST1.A		<i>know</i> that position is defined in relation to some choice of a standard reference point and a set of reference directions.				
ST1.B		<i>know</i> that 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.				
ST1.C		<i>know</i> how to solve problems involving distance, time, and average speed.				
ST1.D		<i>know</i> that the velocity of an object must be described by specifying both the direction and the speed of the object.				
ST1.E		<i>know</i> that changes in velocity may be due to changes in speed, direction, or both.				
ST1.F		<i>know</i> how to interpret graphs of position versus time and graphs of speed versus time for motion in a single direction.				

II. FORCES

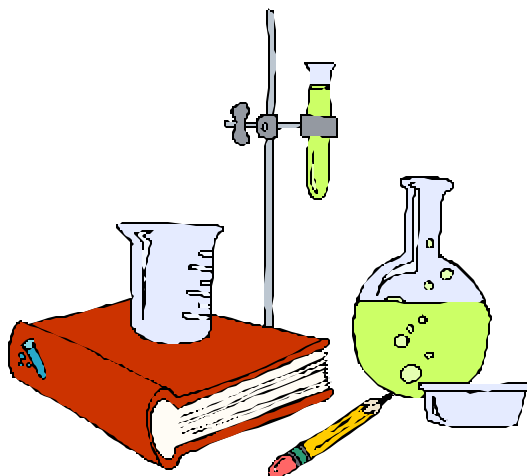
Unbalanced forces cause changes in velocity. As a basis for understanding this concept, students in the EIGHT GRADE will ...

ST/B	P	ST/B: Standard/Benchmark P: Priority Benchmark Degree of Mastery: % of students at end of each Q: Quarter A= 75% or more B=about half C=fewer than 25%	Q 1	Q 2	Q 3	Q 4
ST2.A		<i>know</i> that a force has both direction and magnitude.				
ST2.B		<i>know</i> that when an object is subject to two or more forces at once, the result is the cumulative effect of all the forces.				
ST2.C		<i>know</i> that when the forces on an object are balanced, the motion of the object does not change.				
ST2.D		<i>know</i> 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.				
ST2.E		<i>know</i> that when the forces on an object are unbalanced, the object will change its velocity (it will speed up, slow down, or change direction.)				
ST2.F		<i>know</i> that the greater the mass of an object, the more force is needed to achieve the same rate of change in motion.				
ST2.G		<i>know</i> the role of gravity in forming and maintaining the shapes of planets, stars, and the solar system.				

III. STRUCTURE OF MATTER

Each of the more than 100 elements of matter has distinct properties and a distinct atomic structure. All forms of matter are composed of one or more of the elements. As a basis for understanding this concept, students in the EIGHT GRADE will ...

ST/B	P	ST/B: Standard/Benchmark Degree of Mastery: % of students at end of each A= 75% or more B=about half C=fewer than 25%	P: Priority Benchmark	Q 1	Q 2	Q 3	Q 4
ST3.A		know the structure of the atom and know it is composed of protons, neutrons, and electrons.					
ST3.B		know that compounds are formed by combining two or more different elements and that compounds have properties that are different from their constituent elements.					
ST3.C		know that atoms and molecules form solids by building up repeating patterns, such as the crystal structure of NaCl or long-chain polymers. e.g..plastics.					
ST3.D		know that the states of matter (solid, liquid, gas) depend on molecular motion.					
ST3.E		know that ... <ul style="list-style-type: none"> • 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. • in gases the atoms and molecules are free to move independently, colliding frequently. 					
ST3.F		know how to use the periodic table to identify elements in simple compounds.					



IV. EARTH IN THE SOLAR SYSTEM (Earth Science)

The structure and composition of the universe can be learned from studying stars and galaxies and their evolution. As a basis for understanding this concept, students in the EIGHT GRADE will ...

ST/B	P	ST/B: Standard/Benchmark P: Priority Benchmark Degree of Mastery: % of students at end of each Q: Quarter A= 75% or more B=about half C=fewer than 25%	Q 1	Q 2	Q 3	Q 4
ST4.A		<i>know</i> that galaxies are clusters of billions of stars and may have different shapes.				
ST4.B		<i>know</i> that the Sun is one of many stars in the Milky Way galaxy and that stars may differ in size, temperature, and color.				
ST4.C		<i>know</i> how to use astronomical units and light years as measures of distances between the Sun, stars, and Earth.				
ST4.D		<i>know</i> 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.				
ST4.E		<i>know</i> the appearance, general composition, relative position and size, and motion of objects in the solar system, including planets, planetary satellites, comets, and asteroids.				

V. REACTIONS

Chemical reactions are processes in which atoms are rearranged into different combinations of molecules. As a basis for understanding this concept, students in the EIGHT GRADE will ...

ST/B.	P	ST/B: Standard/Benchmark P: Priority Benchmark Degree of Mastery: % of students at end of each Q: Quarter A= 75% or more B=about half C=fewer than 25%	Q 1	Q 2	Q 4	Q 4
ST5.A		<i>know</i> that reactant atoms and molecules interact to form products with different chemical properties.				
ST5.B		<i>know</i> that 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.				
ST5.C		<i>know</i> that chemical reactions usually liberate heat or absorb heat.				
ST5.D		<i>know</i> that physical processes include freezing and boiling, in which a material changes form with no chemical reaction.				
ST5.E		<i>know</i> how to determine whether a solution is acidic, basic, or neutral.				

VI. CHEMISTRY OF LIVING SYSTEMS (Life Science)

Principles of chemistry underlie the functioning of biological systems. As a basis for understanding this concept, students in the EIGHT GRADE will ...

ST/B.	P	ST/B: Standard/Benchmark P: Priority Benchmark Degree of Mastery: % of students at end of each Q: Quarter A= 75% or more B=about half C=fewer than 25%	Q 1	Q 2	Q 4	Q 4
ST6.A		<i>know</i> 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.				
ST6.B		<i>know</i> that living organisms are made of molecules consisting largely of carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulfur.				
ST6.C		<i>know</i> 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.				

VII. PERIODIC TABLE

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 in the EIGHT GRADE will ...

ST/B	P	ST/B: Standard/Benchmark P: Priority Benchmark Degree of Mastery: % of students at end of each Q: Quarter A= 75% or more B=about half C=fewer than 25%	Q 1	Q 2	Q 3	Q 4
ST7.A		<i>know</i> how to identify regions corresponding to metals, nonmetals, and inert gases.				
ST7.B		<i>know</i> that each element has a specific number of protons in the nucleus (the atomic number) and that each isotope of the element has a different but specific number of neutrons in the nucleus.				
ST7.C		<i>know</i> that substances can be classified by their properties, including their melting temperature, density, hardness, and thermal and electrical conductivity.				

VIII. DENSITY AND BUOYANCY

All objects experience a buoyant force when immersed in a fluid. As a basis for understanding this concept, students in the EIGHT GRADE will ...

ST/B	P	ST/B: Standard/Benchmark P: Priority Benchmark Degree of Mastery: % of students at end of each Q: Quarter A= 75% or more B=about half C=fewer than 25%	Q 1	Q 2	Q 3	Q 4
ST8.A		<i>know</i> that density is mass per unit volume.				
ST8.B		<i>know</i> how to calculate the density of substances (regular and irregular solids and liquids) from measurements of mass and volume.				
ST8.C		<i>know</i> 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.				
ST8.D		<i>know</i> how to predict whether an object will float or sink.				

IX. INVESTIGATION AND EXPERIMENTATION

Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students in the EIGHT GRADE will ...

ST/B	P	ST/B: Standard/Benchmark P: Priority Benchmark Degree of Mastery: % of students at end of each Q: Quarter A= 75% or more B=about half C=fewer than 25%	Q 1	Q 2	Q 3	Q 4
ST9.A		<i>plan</i> and conduct a scientific investigation to test a hypothesis.				
ST9.B		<i>evaluate</i> the accuracy and reproducibility of data.				
ST9.C		<i>distinguish</i> between variable and controlled parameters in a test.				
ST9.D		<i>recognize</i> the slope of the linear graph as the constant in the relationship $y = kx$ and apply this principle in interpreting graphs constructed from data.				
ST9.E		<i>construct</i> appropriate graphs from data and develop quantitative statements about the relationships between variables.				
ST9.F		<i>apply</i> 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).				
ST9.G		<i>distinguish</i> between linear and nonlinear relationships on a graph of data				

GRADE EIGHT

Standards Based Vocabulary for Science

Physical Science Motion

acceleration	motion	time	distance	plate
variable, dependent	International System of Units	reference point	variable, independent	meter
slope	speed	velocity		

Forces

acceleration	air resistance	ammeter	cell, dry	cell, electrochemical
cell, wet	circuit breaker	conduction	conservation of change	current, alternating
current, direct	density	efficiency	electric field	electric generator
electrical potential	electrode	electrolyte	electromagnetic induction	electroscope
energy	energy, kinetic	energy, law of conservation of	energy, potential	fluid
force	force, balanced	force, buoyant	force, centripetal	force, input
force, unbalanced	free fall	friction	fulcrum	fuse
gears	gravity	grounded	hydraulic system	inclined plane
induction	inertia	joule	lever	machine
machine, compound	mass	mechanical advantage	momentum	momentum, law of conservation of
Newton	Ohm's law	Pascal	potential difference	power
pressure	Principle, Archimedes'	Principle, Bernoulli's	Principle, Pascal's	projectile
pulley	screw	static discharge	static electricity	tendon
terminal battery	terminal velocity	transformer	transformer, step-down	transformer, step-up
turbine	voltage	watt	wedge	weight
wheel and axle	work			

Structure of Matter

absolute zero	atom	bimetallic strip	change of state	change, chemical
change, physical	chemical bond	compound	condensation	conduction
conductor	convection current	covalent	density	electrode
electrolysis	electron	electron, valence	element	evaporation
gas	heat	insulator	ionic	Law, Boyles'
Law, Charles'	mass	mixture	molecule	nucleus
ore	point of boiling	point of freezing	point of melting	pressure
proportional, directly	proportional, inversely	proton	radiation	Scale, Celsius
scale, Fahrenheit	scale, Kelvin	solution	specific heat	sublimation
temperature	thermal expansion	thermostat	vaporization	viscosity
volume	weight			

Earth in the Solar System (Earth Science)

asteroid	asteroid belt	astronomy	axis	big bang
black hole	chromosphere	comet	constellation	convex lens
core	corona	crater	diagram, Hertzsprung-Russel	eclipse
eclipse, lunar	eclipse, solar	eclipsing binary	electromagnetic	spectrum
ellipse	equinox	galaxy	galaxy, elliptical	galaxy, irregular
galaxy, spiral	gas giant	geocentric	giant star	gravity
greenhouse effect	heliocentric	inertia	latitude	light year
magnitude, absolute	magnitude, apparent	main sequence	maria	meteor
meteorite	meteoroid	nebula	nuclear fusion	observatory
orbit	orbit, geosynchronous	parallax	penumbra	phase
photosphere	prominence	pulsar	quasar	revolution
rotation	rotation, retrograde	satellite	solar flare	solar wind
solstice	spectrograph	star, binary	star, neutron	star, proto
sunspot	supernova	telescope	telescope, radio	telescope, reflecting
telescope, refracting	terrestrial planets	tide	tide, neap	tide, spring
umbra	universe	visible light	wavelength	white dwarf

Reactions

acid	acid rain	activation energy	atomic number	base
bond, covalent	bond, double	bond, ionic	catalyst	chemical equation
chemical formula	chemical reaction	coefficient	concentration	conservation of mass
corrosive	crystal	decomposition	digestion	digestion, chemical
digestion, mechanical	electron	electron dot diagram	electron, valence	enzyme
family	group	Halogen	hydrogen (H ⁺)	hydroxide ion (H ⁻)
indicator	inhibitor	ion	ion, polyatomic	molecular compound
neutralization	neutron	nucleus	period	PH scale
polar, non-polar	precipitate	products	proton	reactants
reaction, endothermic	reaction, exothermic	reaction, replacement	salt	solubility
solute	solution	solution, concentrated	solution, dilute	solution, saturated
solution, unsaturated	solvent	subscript	suspension	symbol
synthesis				

Chemistry of Living Systems (Life Science)

acid, amino	acid, fatty	acid, nucleic	alcohol	carbohydrate
carbohydrate, complex	cellulose	cholesterol	diamond	digestion
DNA	ester	formula, molecular	formula, structural	fullerene
glucose	graphite	group, carboxyl	group, hydroxyl	hydrocarbon
hydrocarbon, saturated	hydrocarbon, substituted	hydrocarbon, unsaturated	isomer	lipid
mineral	monomer	nucleotide	nutrient	organic acid
organic compound	polymer	protein	RNA	starch
subscript	vitamin			

Periodic Table

actinide	alloy	atomic mass	atomic mass unit (amu)	atomic number
chemical symbol	conductor	corrosion	diatomic molecule	ductile
electron	electron, valence	family	group	half-life
halogen family	isotopes	lanthanide	magnetic	malleable
metal, alkali	metal, alkaline earth	metal, transition	metalloid	neutron
noble gas	nonmetal	nuclear fusion	nuclear reaction	nucleus
particle, alpha	particle, beta	period	periodic table	plasma
proton	radiation therapy	radiation, gamma	radiation, nuclear	radioactive dating
radioactive decay	reactivity	semiconductor	supernova	tracer

Density and Buoyancy

Archimedes	buoyant force	density	fluid	graduated cylinder
gravity	mass	principle	volume	

