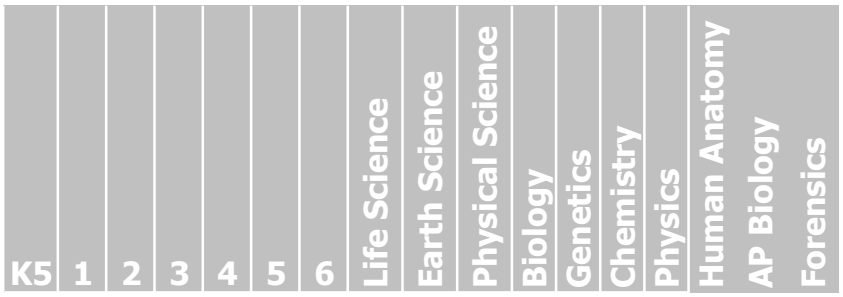
Scope & Sequence

Review & Edited, September 2024

Science Department

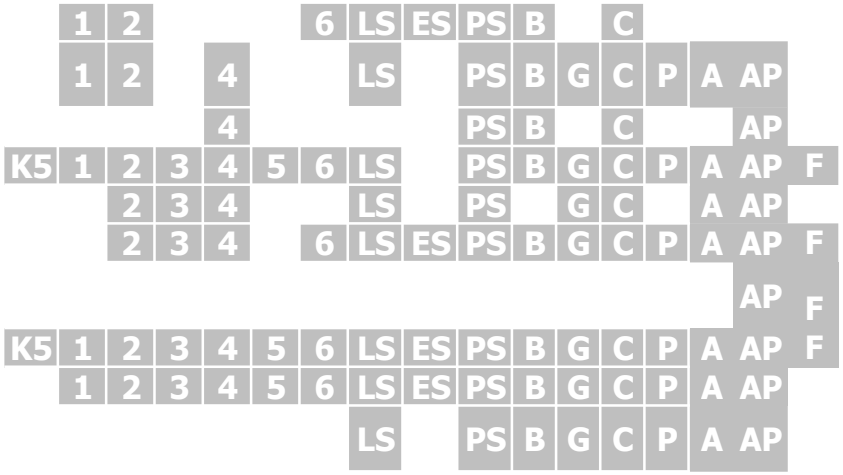


I. Scientific Method

A. Experimental Design

The student will be:

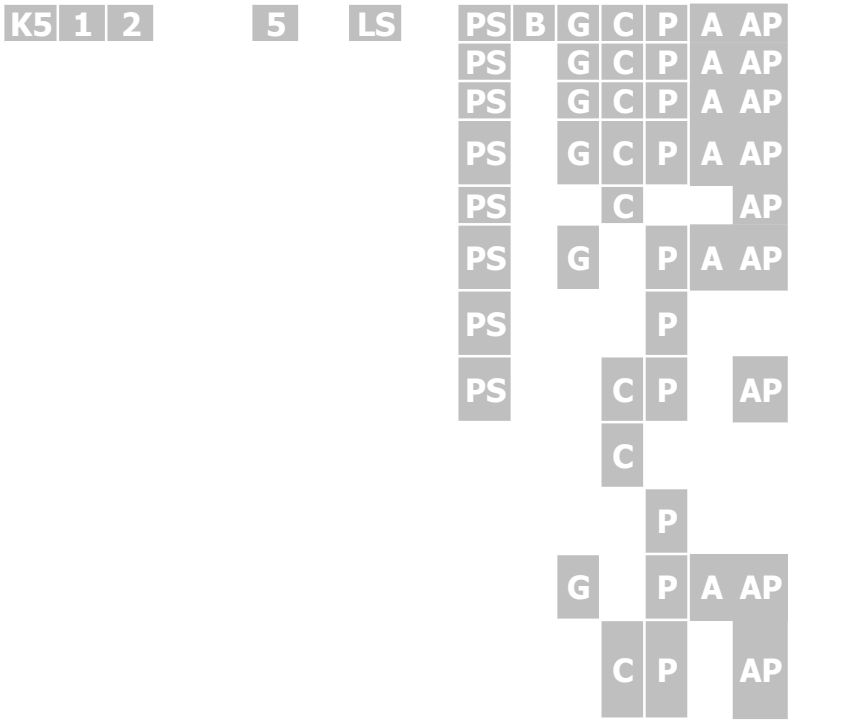
1. Defining terms in the scientific method
2. Drawing conclusions based upon their data
3. Designing an original experiment
4. Using their senses to make observations
5. Creating charts and graphs from data
6. Making hypothesis
7. Researching prior knowledge of research subject
8. Following guided instruction
9. Reading a chart and a graph
10. Distinguishing between dependent and independent variables



B. Measuring and Calculating

The student will be:

1. Using scientific equipment
2. Knowing and using the SI system
3. Converting quantities using SI prefixes
4. Expressing measurements in correct significant digits
5. Using scientific notation
6. Recognizing that all measured quantities have uncertainties
7. Distinguishing between accuracy and precision
8. Manipulating algebraic equations to solve for the unknown variable
9. Using the factor-label method in calculations
10. Using unit analysis to determine the validity of an equation
11. Graphing data points and determining a best fit curve
12. Recognizing linear and direct relationships and interpreting the slope of the curve



13. Recognizing quadratic and inverse relationship

P

II. LIFE SCIENCE

A. Creation and Evolution

The student will be:

1. Defending creationism against evoluation using scientific laws
2. Comparing scientific evidence for creationism and evolution
3. Explaining what the Bible says about creation
4. Recognizing the elements of humanism

4 5 LS ES PS B G C A AP
4 5 6 LS ES PS B G C A AP
K5 1 2 3 4 5 LS ES PS B G C A AP
B G

B. Biochemistry

The student will be:

1. Explaining the process of protein synthesis
2. Explaining the process of cellular respiration
3. Explaining the process of photosynthesis
4. Identifying the necessary components for plant growth
5. Recognizing the interrelationship between photosynthesis and cellular respiration
6. Comparing and contrasting the four organic compounds

LS B G A AP
LS B G A AP
4 5 6 LS B G AP
K5 1 2 3 4 6 LS B
LS B G AP
LS B G A AP

C. Genetics

The student will be:

molecule
2. Explaining the history in the development of the DNA model
3. Identifying the steps of meiosis
4. Explaining the inheritance of traits
5. Completing a Punnett square for monohybrid,dihybrid incomplete dominance, and sex-linked traits
6. Explaining how genetic mutations occur
7. identifying the causes of genetic disorders

LS B G AP
B G AP
LS B G A AP
LS B G A AP
6 LS B G AP
LS B G A AP
B G A AP

D. Cytology

The student will be:

1. Recognizing cellular structures
2. Identifying functions of cellular structures
3. Differentiating between prokaryotic and eukaryotic organisms
4. Explaining the development of the cell theory
5. Differentiating between plant and animal cells
6. Recognizing the hierarchy of cellular organization

6 LS B G A AP
LS B G A AP
LS B AP
LS B AP
3 6 LS B AP
LS B A AP

7. Differentiating between isotonic, hypotonic, and hypertonic solutions									B	A	AP
8. Explaining how organisms cope in a hypotonic and hypertonic solution									B		AP
9. Differentiating between passive and active transport								LS	B	A	AP
10. Identifying the steps of mitosis								LS	B	A	AP
E. Organisms											
The student will be:											
1. Identifying how organisms are classified		1		3		5	6	LS	B		AP
2. Classifying organisms into their main taxonomic categories							6	LS	B		AP
a. Kingdoms Eubacteria & Archaeloacteria								LS	B		AP
b. Kingdom Protista (single celled organisms)							6	LS	B		AP
c. Kingdom Fungi							6	LS	B		AP
d. Kindom Plantae		1					6	LS	B		AP
e. Kingdom Animalia			2								
1) Invertebrates											
a. All invertebrates			2		4		6	LS	B		AP
b. Insects	K5	1	2		4		6	LS	B		AP
c. Cnidarians (coral)							6	LS	B		AP
d. echinoderms (seastars)							6	LS	B		AP
e. Shellfish							6	LS	B		AP
f. Worms							6	LS	B		AP
2) fish	K5					5	6	LS	B		AP
3) reptiles							6	LS	B		AP
4) amphibians			2				6	LS	B		AP
5) birds		1	2				6	LS	B		AP
6) mammals		1	2			5	6	LS	B		AP
3. Explaining the dependence of organisms on one another				3				LS	B		AP
4. Studying birds		1		3							
a. Identifying them on sight											
b. Describing their habitats		1		3	4						
c. Explaining their movement patterns		1			4						
d. Discussing the structure of their wings		1			4				B		AP
5. Studying insects				3							
a. Identifying them on sight		1	2	3	4		6		B		
b. Differentiating between complete and incomplete metamorphesis					4		6		B		
c. Explaining how insects communicate					4		6		B		
d. Explaining how insects defend themselves					4		6		B		
e. Explaining the behaviors and homes of social insects					4		6		B		
6. Studying plants				3							
a. Identifying them on sight					4		6	LS			
b. Identifying the parts of a tree and plant					4		6	LS	B		AP

c. distinguishing between broadleaf, needleleaf, and palm trees					4		6	LS				
d. Explaining the different ways that seeds travel		1	2		4	5	6	LS	B		AP	
e. Explaining how seeds are planted	K5	1	2	3		5	6	LS	B			
e. Explaining how plants germinate			2	3	4		6	LS	B		AP	
f. Distinguishing between poisonous and nonpoisonous plants					4		6	LS				
F. Ecology									B		AP	
G. Human Biology												
The student will be:												
1. reecognizing the organs in the human body				3				LS	B			F
a. Integumentary (skin)				3		5		LS	B	A	AP	
b. Skeletal		1	2	3		5		LS	B	A	AP	
c. Muscular		1	2	3	4	5		LS	B	A	AP	
d. Circulatory		1	2		4	5		LS	B	A	AP	
e. Digestive		1	2		4	5		LS	B	A	AP	
f. Excretory								LS	B	A	AP	
g. Nervous								LS	B			
1. eyes	K5	1	2		4	5		LS	B	A	AP	
2. ears	K5	1	2		4	5		LS	B	A	AP	
3. nose	K5	1	2			5		LS	B	A	AP	
4. taste	K5	1	2			5		LS	B	A	AP	
5. touch	K5	1	2			5		LS	B	A	AP	
h. Reporductive								LS	B	A	AP	
2. Identifying the functions of organs in the human body								LS	B			
a. Integumentary (skin)								LS	B	A	AP	
b. Skeletal			2	3	4			LS	B	A	AP	
c. Muscular			2		4			LS	B	A	AP	
d. Circulatory			2					LS	B	A	AP	
e. Digestive			2		4			LS	B	A	AP	
f. Excretory								LS	B	A	AP	
g. Nervous								LS	B			
1. eyes	K5	1	2					LS	B	A	AP	
2. ears	K5	1	2					LS	B	A	AP	
3. nose	K5	1	2					LS	B	A	AP	
4. taste	K5	1	2					LS	B	A	AP	
5. touch	K5	1	2					LS	B	A	AP	
h. Reporductive								LS	B	A	AP	
3. Explaining how the systems in the human body interrelate with each other								LS	B	A	AP	
4. Recognizing the four food groups		1	2	3				LS	B	A		
5. Incorporating the food groups into a healthy diet			2	3				LS	B	A		
6. Understanding personal hygiene	K5	1		3		5		LS	B	A		
7. Identifying the basic first aid ailments												

8. Implementing the correct first aid procedures

III. Earth Science

A. Astronomy

The student will be:

1. Identifying celestial bodies
   a. All celestial bodies — 6 ES
   b. Constellations — 3 5 6 ES
   c. Solar systems — 2 3 5 6 ES
   d. Sun — K5 1 2 3 5 6 ES
   e. Moon — K5 1 2 3 5 6 ES
   f. Stars — K5 1 2 3 5 6 ES
2. Identifying the structure and composition of the sun — 4 5 6 ES
3. Explaining the motion of celestial bodies using scientific laws — 6 ES P
   a. Solar system — 3 5 6 ES
   b. Earth/moon system — 3 5 6 ES
4. Differentiating between solar system components based on structure and composition — 6 ES
   a. Sun — ES
   b. Moon — ES
   c. Planets — ES
   d. Nonplanetary components — ES
5. Explaining scientific laws behind the function of telescopes — 6 ES
6. Explaining the history and use of rocketry in space exploration — 5 6 ES

B. Meteorology — 3

The student will be:

1. Differentiating between the four seasons — K5 1 5 ES
2. Understanding the relationship between the rotation of the earth and the four seasons, days, and years — 1 2 4 5 LS ES
2. Identifying the components and layers of the earth's atmosphere — 2 4 5 ES B
3. Recognizing the different types of clouds — 3 4 5 LS ES
3. Explaining the water cycle and its importance in weather patterns — K5 1 2 3 4 5 ES B
4. Differentiating between local and global weather patterns — 3 ES
5. Explaining scientific laws which create and control weather and climate — 3 ES
6. Identifying different types of weather and weather systems — K5 1 3 5 ES
7. Explaining tools and instruments used in weather predictions — 5 ES

C. Geology — 3

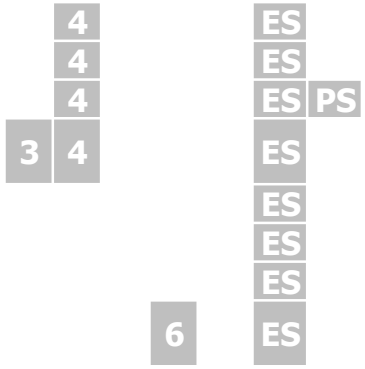
The student will be:

1. Identifying the layers of the earth
2. Explaining the properties of minerals and rocks
3. Describing mountains and moutain building processes
4. Discussing the process and effects of earthquakes and volcanoes
5. Explaining the degenerative forces of erosion, mass wasting, and weathering

D. Hydrography

The student will be:

1. Explaining the motions of oceans
2. Explaining seafloor topography
3. Identifying the composition of seawater
4. Explaining glacier formation and movement
5. Differentiating between types of glaciers
6. Describnig glacial erosion and deposition
7. Explaining the gruopd water system
8. Explaining cave formations caused by ground water

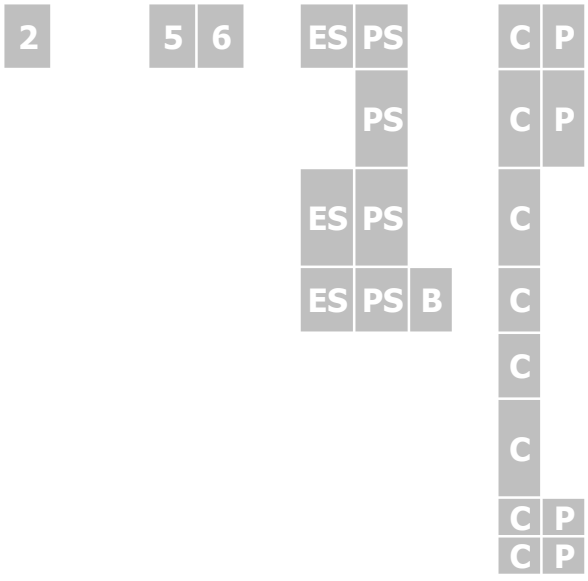


IV. Physical Science

A. Matter

The student will be:

1. Differentiating between the four states of matter
2. Explaining the changes and the characteristics in the states of matter according to the Kinetic Theory
3. Describing and distinguishing between heterogeneous and homogeneous materials, substances, mixtures, and solutions
4. Classifying changes in matter as physical or chemical
5. Distinguishing between extensive, intensive, physical and chemical properties
6. Describing exothermic and endothermic processes and stating the fucntion of activation energy
7. Converting between energy units
8. Solving problems involving specific heat



B. Solids

The student will be:

1. Describing characteristics of all solid substances
2. Distinguishing among cubic body-centered cubic, and face-centered cubic cells
3. Explaining the relationship of melting point to bonding type and to crystal type
4. Distinguishing between isomorphous and polymorphous crystals

5. Identifying and explaining the types of crystal defects				C	
6. Distinguishing between hydrated ions and anhydrous substances				C	
7. Describing the structure and properties of crystals, liquid crystals, and amorphous substances.				C	
C. Liquids					
The student will be:					
1. Explaining the properties of liquids and changes of state in terms of kinetic theory			PS	C	
2. Using LeChatilier's Principle to explain reversible changes of state in a closed system				C	
3. Determining the relationship between energy and change of state, and perform related calculations			PS	C	
4. Using polarity to explain hydrogen bonding				C	
5. Explaining the unique properties of water in terms of its molecular structure				C	
6. Explaining surface tension and capillary rise on the basis of unbalanced surface forces				C	
D. Gases					
The student will be:					
1. Calculating molecular and molar mass				C	
1. Relating pressure to molecular motion			PS	C	
2. Explaining how pressure, volume, and temperature are interrelated based on the Gas Laws of Boyle, Dalton, and Charles		4	PS	C	
3. Performing calculations using the Gas Laws of Boyle, Dalton and Charles				C	
4. Explaining the concept of an ideal gas				C	P
5. Describing the conditions at STP				C	P
6. Explaining Graham's law and solve problems using it.				C	
7. Solving problems involving the change of more than one condition for gases				C	
8. Differentiating between an ideal gas and a real gas.				C	P
9. Relating temperature and energy transfer to molecular motion				C	
10. Determining the relative velocities of gas molecules at the same temperature				C	
11. Calculating the pressure of gases in both open-arm and closed-arm manometers				C	
12. Stating Avogadro's principle				C	
13. Defining molar volume				C	
14. Explaining and using the ideal gas equation				C	

15. Computing the molecular mass of a gas from its mass, temperature, pressure, and volume			C		
16.Performing stoichiometry involving mass-gas volume relationships			C		
17. Identifying the limiting reactant and be able to solve problems based upon it.			C		
E. Solutions/Colloids					
The student will be:					
1. Describing and explaining the process of solvation, dissociation, and dissolving		PS	C		
2. Discussing factors affecting the solubility of one substance in another		PS	C		
3. Relating enthalpy of solution to endothermic and exothermic dissolving processes			C		
4. Differentiating among and solve problems involving molarity, molality, mole fraction, and mass percent.			C		
5. Distinguishing among colloids, solutions and suspensions			C		
6. Classifying colloids.			C		
7. Describing properties of colloids and explain how these properties depend upon particle size.			C		
8. Stating Raoult's law and using it to calculate the vapor pressure of a solution					
9. Identifying the effect of solute particles on the boiling point, freezing point, and osmotic pressure of a solution			C		
10. Calculating the effect of a solute on the boiling point, freezing point, and osmotic pressure of a solution			C		
11. Determining the molecular mass of a solute from the freezing point, boiling point, or osmotic pressure data.			C		
12. Explaining the concept of osmotic pressure			C	AP	
13. Explaining the concept of solubility product and solving problems using the solubility product constant			C		
14. Discussing the autoionization of water and solving problems using the ion product constant for water			C		
F. Atomic Theory and Structure					
The student will be:					
1. Differentiating between elements, compounds, and mixtures	6	PS	B C		
2. Explaining the development of the modern atomic theory		PS	C	P	
3. Explaining the laws of multiple proportions and definite proportions		PS	C		
4. Determining the atomic number and atomic mass number of given isotopes		PS	C	P	

5. Differentiating among the major subatomic particles		PS	C	P
6. Calculating the average atomic mass of a mixture of isotopes of an element			C	
7. Describing the wave mechanical view of the hydrogen atom				
8. Understanding the Heisenberg Uncertainty Principle to characterize the position and velocity of an electron in an atom		PS	C	P
9. Describing an electron cloud			C	
10. Characterizing the four quantum numbers			C	
11. Using the Pauli exclusion principle and the quantum numbers to describe an electron in an atom			C	
12. Determining the electron configurations of the elements			C	
13. Writing electron dot diagrams for the elements		PS	C	
G. Elements				
The student will be:				
1. Describing the early attempts at classifying elements		PS	C	
2. Using the periodic table to gather information about individual elements	6	PS	C	
a. Identifying metals, nonmetals, and metalloids		PS	C	
b. Identifying the number of valence electrons and energy levels in an atom		PS	C	
c. Using the periodic table to predict electron configurations of elements		PS	C	
d. Stating how atomic and ionic sizes change in groups and periods			C	
e. Predicting oxidation numbers of elements			C	
f. Stating the relationship between the activities of elements and their locations in the periodic table		PS	C	
4. Explaining the basis for arrangement of the modern periodic table		PS	C	
5. Predicting the chemical stability of atoms using the octet rule		PS	C	
6. Defining ionization energy and electron affinity, and describing the factors that affect these properties			C	
7. Using multiple ionization energies to predict oxidation numbers of elements			C	
8. Defining a family of group and explaining what members of a chemical family have in common.		PS	C	
9. Listing four ways in which hydrogen can bond and giving an example of each		PS	C	

10. Defining the shielding effect and explaining its importance to reactivity of atoms		C	
11. Listing characteristics and giving uses for representative elements in the alkali metal, alkaline earth metal, and aluminum groups	PS	C	
12. Defining catenation and explaining how it affects the ability of carbon to form compounds			
13. Explaining the importance of nitrogen and phosphorus compounds to living things		C	A AP
14. Listing characteristics and give uses for representative main group nonmetals	PS	C	
15. Defining transition metals and listing some of their uses	PS	C	
16. Listing representatives and some properties of lanthanoidsd and actinoids		C	
17. Listing factors that influence electronegativity and recognize it as a periodic property of elements	PS	C	
H. Compounds			
The student will be:			
1. Calculating molarity, percent composition, and empirical formulas		C	
2. Determining the formulas of hydrates		C	
3. Differentiating between the three types of bonds	PS	C	A AP
4. Identifying the type of bonding between two elements given their electronegativities		C	
5. Differentiating among properties of ionic, covalent, and metallic bonds	PS	C	A AP
6. Distinguishing between polar and nonpolar covalent bonds	PS	C	A AP
7. Using electronegativities to predict the comparative polarities of bonds.	PS	C	
8. Defining dipole and comparing the strengths of intermolecular forces based on dipole moments		C	
9. Defining and describing the types of van der Waals forces and list the three factors contributing to them		C	AP
10. Defiing complex ion, ligand, coordination number, and coordinated compound		C	
11. Naming complex ions given their formulas, and writing formulas for complex ions given their names		C	
12. Naming coordination compounds given their formulas and writing formulas for coordination compounds given their names		C	
13. Defining chromatography, mobile phase, and stationary phase		C	
14. Defining, describing and naming uses for the different types of chromatography		C	

15.Demonstrating proficiency in writing chemical formulas	C	
16. Describing how to assign oxidation numbers to atoms in a compound	C	
17.Determining oxidations numbers for monatomic ions and charges for polyatomic ions	C	
18. Demonstrating proficiency in naming chemical compounds	C	
19. Distinguishing between molecular and empirical formulas	C	
20. Demonstrating the use of coefficients to represent the number of formula units of a sutstance	C	
I. Molecular Structure		
The student will be:		
1. Explaining the use of infrared and microwave spectroscopy to determine the structure of molecules		
2. Differentiating among atomic radii, ionic radii, covalent radii, and van der Waal radii	C	
3. Discussing factors that affect the values of ionic radii and covalent radii	C	
4. Using covalent radii and calculate bond lengths	C	
5. Using models to explain the structure of a given organic or inorganic molecule	C	
6. Describing hybrid orbitals and using hybridization theory to explain the bond angles in compounds	C	
7. Differentiating between sigma and pi bonding and saturated and unsaturated carbon compounds	C	
8. Naming and writing formulas for simple organic compounds	C	
9. Defining, explaining, and giving examples of isomerism	C	
J. Chemical Reactions		
The student will be:		
1. Writing chemical equations to represent reactions	C	AP
2. Using coeeficients to balance chemical equations	C	
3. Differentiating among five general types of chemical reactions	C	
4. Performing stoichiometry in mass-mass and mass-energy relationships	C	
5. Calculating percentage yield of a product	C	
6. Distinguishing between thermodynamic stability and kinetic stability	C	
7. Listing and describing the factors that influence the rate of reaction	C	AP
8. Distinguishing among heterogeneous catalyst, homogeneous catalyst, and inhibitor	C	

9. Describing and determining reaction mechanisms for simple reactions		C
10. Determining the equilibrium constant expression for a system at equilibrium		C
11. Using LeChatelier's principle to explain the effects of changes in concentration, pressure, and temperature on an equilibrium system		C
12. Relating relative amounts of product and reactant to the equilibrium constant		C
13. Calculating equilibrium constants and concentrations of reactants or products for a reaction		C
14. Comparing the process of oxidation with the process of reduction	PS	C
15. Explaining an oxidizing agent and a reducing agent		C
16. Stating how to identify oxidation-reduction reactions		C
17. Explaining the concept of half reactions		C
18. Determining how to balance redox equations by the half-reaction method		C
19. Stating two reasons why reactions occur		C
20. Calculating changes in internal energy		C
21. Stating the reasons that enthalpy changes occur in chemical reactions		C
22. Calculating enthalpies of formation and use them to calculate enthalpies of reaction		C
23. Describing and giving examples of changes in entropy		C
24 Relating Gibbs free energy to the spontaneity of reactions and to equilibrium		C
25. Performing calculations involving Gibbs free energy, entrophy, and equilibrium constants.		C
K. Acids, Bases, and Salts		
The student will be:		
1. Distinguishing between the definitions of acids and bases as outline in the theories of Arrhenius, Bronsted-Lawry, and Lewis		C
2. Naming acids and bases	PS	C
3. Defining acidic and basic anhydrides and writing formulas for them		C
4. Defining and giving examples of strong and weak acids and bases	PS	C
5. Explaining the concept of neutralization and the composition of a salt and be able to name salts		C
6. Writing net ionic equations		C
7. Deriving and using ionization constants		C
8. Computing the percent ionization of a weak electrolyte		C

9. Explaining how the pH scale is used for measuring solution acidity						PS	C		AP
10. Describing the processes of hydrolysis and buffering							C		
11. Stating the principles and uses of indicators							C		
12. Explaining the process of titration and performing calculations using the data from titrations							C		
L. Physicis in Action									
The student will be:									
1. Differentiating between the various forms of energy	1	2	4	5	ES	PS		P	
2. Explaining conservation of energy and conservation of momentum						PS		P	
M. Velocity									
The student will be:									
1. Defining and giving an example of a frame of reference						PS		P	
2. Calculating and interpreting average velocity								P	
3. Solving velocity, time, and distance problems						PS		P	
4. Plotting and interpreting position-time graphs for positive and negative positions.								P	
5. Calculating and interpreting the slope of a curve on a position-time graph								P	
6. Distinguishing displacement from distance and velocity from speed								P	
7. Plotting and interpreting a velocity-time graph								P	
8. Calculating displacement from the area under the curve of a velocity-time graph								P	
9. Determining relative velocities								P	
10. Determining instantaneous velocity and distinguishing it from average velocity								P	
N Acceleration									
The student will be:									
1. Calculating average and instantaneous acceleration								P	
2. Determining average and instantaneous acceleration from a veloity-time graph								P	
3. Calculating final velocity for the case of uniform acceleration								P	
4. Calculating displacement of an object undergoing uniform acceleration								P	
5. Using kinematic equations to solve uniform acceleration motion problems								P	
O. Force									
The student will be:									
1. Naming the four fundamental forces, their relative strengths, and some familiar examples						PS		P	

2. Using Newton's second law in solving problems					PS	P
3. Understanding the difference between net forces that cause acceleration and action-reaction pairs						P
4. Distinguishing between weight and mass and using the second law to relate them					PS	P
5. Understanding the nature of frictional forces and using the coefficient of friction in solving problems						P
6. Calculating acceleration resulting from net force						P
7. Understanding the definition of free-fall and the causes of air resistance and terminal velocity						P
8. Calculating the speed, velocity, acceleration, and deceleration of objects					PS	P
9. Differentiating which law of motion is being applied in various situations			6	ES	PS	P
10. Explaining the law of universal gravitation and its effects on moving bodies		3	6	ES	PS	P
11. Recognizing various types of simple machines			6		PS	
12. Explaining how simple machines reduce the amount of applied effort		3			PS	
P. Vectors						
The student will be:						
1. Adding vectors graphically						P
2. Understanding independence of perpendicular vectors						P
3. Resolving vectors into perpendicular components						P
4. Adding vectors algebraically						P
5. Solving force vector addition problems						P
6. Finding resultant and equilibrant vectors						P
7. Solving incline plane problems						P
Q. Motion in Two Dimensions						
The student will be:						
1. Solving horizontal projective motion problems						P
2. Solving projective motion at an angle problems						P
R. Angular Motion and Rotational Dynamics						
The student will be:						
1. Determining angular displacement, velocity, and acceleration						P
2. Understanding and calculating centripetal acceleration						P
3. Defining a rigid body and axis of rotation						P
4. Understanding and calculating torque						P
S. Simple Harmonic Motion						
The student will be:						

1. Relating uniform circular motion to simple harmonic motion		P
2. Understanding and giving examples of simple harmonic motion		P
3. Understanding and using Hooke's law to relate a restoring force to diplacement		P
4. Solving problems involving a pendulum's period, length, and gravitational acceleration		P
T. Universal Gravitation		
The student will be:		
1. Listing and using Kepler's Laws of planetary motion		P
2. Recognizing the relationship between Kepler's laws and Newton's law of universal gravitation		P
3. Calculating periods and velocities of orbiting objects		P
4. Understanding that gravitational force is directly proportional to the masses and inversely proportional to the square of the distance between the masses		P
5. Relating the motion of satellites in circular orbit to uniform circular motion		P
6. Solving problems involving orbital velocity and period		P
7. Understanding the term "weightlessness" as being in a state of free fall		P
8. Understanding and using the field concept of gravity		P
9. Understanding Einstein's concept of gravity	PS	P
U. Momentum		
The student will be:		
1. Defining momentum and impulse	PS	P
2. Using the momentum-impluse theorem to calculate changes in momentum		P
3. Recognizing the relationship between Newton's Third Law and the conservation of momentum	PS	P
4. Using the definition of a closed, isolated system		P
5. Using conservation of momentum to solve collision problems		P
6. Distinguishing between external and internal forces and using the distinction to solve problems		P
7. Using vectors to solve two dimensional collision problems		P
V. Work and Energy		
The student will be:		
1. Calculating work done by a force	PS	P
2. Identifying the force that performs work	PS	P

3. Understanding the relationship between work done and energy transferred							P
4. Differentiating between work and power and calculating power				PS			P
5. Defining kinetic and potential energy	6		ES	PS			P
6. Calculating kinetic energy and applying the work-energy theorem				PS			P
7. Solving problems involving gravitational potential energy							P
8. Solving problems using the law of conservation of energy							P
9. Distinguishing between elastic and inelastic collisions							P
10. Distinguishing between conservative and nonconservative forces							
11. Analyze different energy forms				PS			
Use engineering desing prosess to plan, build, test and improve their own Rube Goldberg machine				PS			
Analyze role of friction and other resistive forces				PS			
W. Thermal Energy							
The student will be:							
1. Understanding and describing the modes of heat transfer				PS			P
2. Relating temperature measurement to thermal equilibrium							P
3. Relating Celsius and Kelvin temperature sclaes and converting between the two.				PS		C	P
4. Calculating heat transfer using physical characteristic of specific heat						C	P
5. Applying conservation of energy to heat transfer						C	P
6. Calculating temperature changes due to heat transfer						C	P
7. Solving calorimeter problems						C	P
8. Understanding and using the physical characteristics of heat of fusion and heat of vaporization				PS		C	P
9. Describing changes of state using kinetic theory				PS		C	P
10. Calculating heat transfers in changes of state						C	P
11. Relating internal energy, heat and work to a closed, isolated system							P
12. Understanding the physical quantity of entropy						C	P
13. Understanding and applying the first and second laws of thermodynamics to closed systems						C	P
X. States of Matter							
The student will be:							
1. Using the kinetic theory to define pressure				PS			P

2. Relating pressure, force, and area of calculating pressure using correct units			P
3. Relating Pascal's and Archimedes' principles to hydrostatic applications			P
4. Relating Bernoulli's principle to hydrodynamic applications			P
5. Comparing and contrasting liquids and gases		C	P
6. Relating cohesive and adhesive forces to surface tension and caplliary action			P
7. Using kinetic theory to describe evaporation and condensation	PS	C	P
8. Using kinetic theory to describe the physical state of plasma	PS		P
9. Using kinetic theory to distinguish between liquid and solid states	PS	C	P
10. Understanding and relating the physical properties of stress and strain to elasticity of solids			P
11. Calculating linear and nonlinear thermal expansion			P
12. Investigating problems and uses of thermal expansion			P
Y. Waves			
The student will be:			
1. Recognizing mechanics of energy transfer by waves			P
2. Distinguishing between transverse, longitudinal and surface waves	PS		P
3. Distinguishing between wave pulse and continuous wave			P
4. Describing waves using amplitude, wavelength, frequency and period	PS	C	P
5. Relating wavespeed to frequency and wavelength in problem solving applications			P
6. Understanding wavespred's dependency on medium			P
7. Understanding waves behavior at boundaries between media			P
8. Applying principle of superposition to wave interference			P
9. Understanding and using the principles of reflection, refraction, and diffraction to predict transmitted wave properties			P
10. Explaining the characteristics and movements of electromagnetic waves	PS		P
Z. Sound			
The student will be:			
1. Understanding sound as a longitudinal pressure wave	PS		P
2. Understanding rarefaction and compression	PS		P
3. Solving problems involving frequency, waqelength and velocity of sound	PS		P

4. Recognizing and calculating Doppler shift							P
5. Understanding applications of Dopplet shift							P
6. Understanding and using terms associated with sound, such as pitch, loudness, octave, and decibel					PS		P
7. Describing origin of sound from musical instruments					PS		P
8. Applying concepts of resonance and standing waves to harmonics							P
9. Calculating beat frequencies							P
10. Explaining the characteristics and movements of sound waves	3	4	5		PS		P
11. Explaining sound phenomena of acoustics, resonance, and beats	3	4			PS		P
12. Applying knowledge of sound waves to everday life applications	3	4	5		PS		P
AA. Light							
The student will be:							
1. Understanding visible light as a limited range in the electromagnetic spectrum					PS	C	P
2. Using the concept of light rays in applications involving behavior of light							P
3. Understanding and using the speed of light in a vacuum in problem solving						C	P
4. Understanding and using quantities describing light such as intensity, flux, and illuminance in problems							P
5. Defining transparent, translucent and opaque					PS		P
6. Distinguishing between colors and pigments and the additive and substractive nature of mixtures of each, respectively							P
7. Recognizing and understanding phenomenon of thin-film interference							P
8. Recognizing and understanding phenomenon of polarization							P
BB. Reflection and Refraction							
The student will be:							
1. Distinguishing between regular and diffuse reflection							P
2. Solving refraction problems using Snell's Law							P
3. Solving problems involving index of refraction and speed of light through a medium							P
4. Determining the critical angle required for total internal reflection							P
5. Drawing ray diagrams of light through mediums of differing refractive indices							P
6. Understanding dispersion as a consequence of refraction and its relation to rainbows				6			P

7. Differentiating between reflection, refraction, dispersion and absorption of light			5 6 LS		PS		P
CC. Mirrors and Lenses							
The student will be:							
1. Using ray tracing techniques, locate images in plane, concave and convex mirrors							P
2. Understanding spherical aberration and the use of parabolic mirros							P
3. Distinguishing between real and virtual images					PS		P
4. Using the mirror equations to calculate location and magnification							P
5. Distinguishing between concave and concave lenses					PS		P
6. Using ray tracing techniques locate images formed by concave and convex lenses							P
7. Describing the operation of microscopes and telescopes						B	P
DD. Diffraction and Interference							
The student will be:							
1. Describing the diffraction of light					PS		P
2. Investigating the single-slit and two-slit interference patterns qualitatively and quantitatively							P
3. Calculating wavelength of light from measurements of the single-slit and two-slit interference patterns							P
4. Extending diffraction concepts to applications of diffraction gratings							P
EE. Static Electricity							
The student will be:							
1. Understanding causes and properties of static charges		3			PS		P
2. Distingushing between charging by conduction and charging by induction					PS		P
3. Solving problems using Coulomb's Law							P
4. Differentiating between static and electric current					PS		P
5. Explaining the law of charges					PS		P
FF. Electric Fields							
The student will be:							
1. Defining and measuring an electric field							P
2. Solving problems relating field, force, and charges							P
3. Describing fields using field lines							P
4. Defining and calculating electric potential difference							P
5. Distingushing between potential and potential difference							P
6. Calculating potential in uniform electric fields							P

7. Relating sharing of charges to minimzation of energy				P
8. Relating sharing of charges to electrical grounding				P
9. Understanding charge distribution on solid objects and relating it to field strength				P
10. Solving problems involving capacitance				P
GG. Current Electricity				
The student will be:				
1. Describing and defining electric current and units associated with it			PS	P
2. Sketching and analyzing electric circuits				P
3. Solving problems involving current, voltage, resistance and power			PS	P
4. Correctly connecting and using ammeters and voltmeters				P
5. Understanding and calculating conversion between electrical and thermal energy				P
6. Understanding use of capacitors in circuits and calculating capacitance				P
7. Understanding optimal conditions for electrical power transmission				P
8. Solving problems involving the use of cost of electrical energy in kilowatt-hours				P
9. Differentiating between good and poor conductors			PS	P
HH. Series and Paralle Circuits				
The student will be:				P
1. Performing circuit analysis of series and parallel connected circuits				P
2. Calculating equivalent resistance of a combination circuit				P
3. Undersatnding typical applications of combination series-parallel circuits				
4. Differentiating between series and parallel circuits		6	PS	P
II. Magnetic Fields				
The student will be:				
1. Investigating properties of magnetic fields around permanent magnets	3		PS	P
2. Investigating properties of magnetic fields around current carrying wires, loops, and coils	3		PS	P
3. Using right-hand rule to determine direction of field lines			PS	P
4. Describing magnetism on a microscopic level				P
5. Calculating magnitude and direction of force on a current-carrying wire in a magnetic field				P
6. Explaining the design, operation, and use of a galvanometer				P

7. Explaining the design and operation of an electric motor							PS		P
8. Building an electric motor									P
9. Calculating magnitude and direction of force on a moving charge in a magnetic field									P
10. Understanding and describing the operation of a mass spectrometer									P
11. Understanding what magnets can do	K5	2	3	4	5	6	PS		
12. Differentiating between types of magnets		2			5	6	PS		P
JJ. Electromagnetic Induction									
The student will be:									
1. Understanding and calculating the induced EMF from a time-varying magnetic field									P
2. Explaining the principle of operation and construction of an electric generator									P
3. Comparing and contrasting motors and generators							PS		P
4. Understanding and calculating peak and effective values associated with alternating current									P
5. Understanding Lenz's law and the concept of back-EMF associated with motors and generators									P
6. Understanding the nature and application of self-inductance									P
7. Understanding the construction and operation of a transformer and solving related problems									P
8. Understanding the generation of electromagnetic fields and waves									P
9. Explaining the relationship between electricity and magnets						6	PS		P
KK. Quantum Theory									
The student will be:									
1. Understanding thermal radiation and the usage of the Stefan-Boltzmann law									P
2. Calculating the frequency of maximum intensity in blackbody radiation									P
3. Calculating the frequency of maximum intensity in blackbody radiation									P
4. Calculating the frequency of maximum intensity in blackbody radiation									P
5. Calculating the frequency of maximum intensityu in blackbody radiation									P
6. Understanding the Compton effect and solving related problems									P
7. Describing the dual nature of matter and light and solving related problems									P
LL. Modern Physics									
The student will be:									
1. Describing the quantum model of the atom									

2. Understanding the generation and properties of laser light			P
3. Comparing and contrasting the four fundamental forces			P
4. Understanding the classification and properties of elementary particles			P
5. Understanding the type of elementary particles that carry of mediate the four fundamental forces			P
6. Describing basic concepts associated with quantum mechanics			P
MM. Wave and Particle Motion			
The student will be:			
1. Explaining the kinetic theory of thermal energy	PS		P
2. Distinguishing between temperature and thermal energy	PS	C	
3. Measuring thermal energy	PS	C	P
4. Differentiating between types of heat transfer	PS	C	P
5. Explaining how heat affects objects in expansion and contracting	PS	C	P