

II. LIFE SCIENCE

A. Creation and Evolution

The student will be:

1. Defending creationism against evolution 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		G		A	AP
				4	5	6	LS	ES	PS	B	G		A	AP
K5	1	2	3	4	5		LS	ES	PS	B	G		A	AP
											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				G		A	AP
							LS				G		A	AP
				4	5	6	LS		B	G				AP
K5	1	2	3	4		6	LS		B					
							LS		B	G				AP
							LS			G			A	AP

C. Genetics

The student will be:

1. Identifying the structure of a 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
										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
7. Differentiating between isotonic, hypotonic, and hypertonic solutions
8. Explaining how organisms cope in a hypotonic and hypertonic solution

						6	LS		B	G			A	AP
							LS		B	G			A	AP
							LS		B					AP
							LS		B					AP
						6	LS		B					AP
							LS		B				A	AP
									B				A	AP
									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	2	3	5	6	LS	B	AP
2. Classifying organisms into their main taxonomic categories					6	LS	B	AP
a. Kingdoms Eubacteria & Archaeoacteria						LS	B	AP
b. Kingdom Protista (single celled organisms)					6	LS	B	AP
c. Kingdom Fungi					6	LS	B	AP
d. Kindom Plantae	1	2			6	LS	B	AP
e. Kingdom Animalia		2						
1) Invertebrates								
a. All invertebrates			2		6	LS	B	AP
b. Insects	K5	1	2			LS	B	AP
c. Cnidarians (coral)						LS	B	AP
d. echinoderms (seastars)						LS	B	AP
e. Shellfish						LS	B	AP
f. Worms		1	2			LS	B	AP
2) fish	K5			5		LS	B	AP
3) reptiles						LS	B	AP
4) amphibians		1	2			LS	B	AP
5) birds		1	2			LS	B	AP
6) mammals		1	2	5		LS	B	AP
3. Explaining the dependence of organisms on one another			3			LS	B	AP
4. Studying birds		1						
a. Identifying them on sight								
b. Describing their habitats		1		4				
c. Explaining their movement patterns		1		4				
d. Discussing the structure of their wings		1		4			B	AP
5. Studying insects								
a. Identifying them on sight		1	2	4	6		B	
b. Differentiating between complete and incomplete metamorphosis				4	6		B	
c. Explaining how insects communicate		1		4	6		B	
d. Explaining how insects defend themselves		1		4	6		B	
e. Explaining the behaviors and homes of social insects		1		4	6		B	
6. Studying plants		1						
a. Identifying them on sight		1		4	6	LS		
b. Identifying the parts of a tree and plant		1		4	6	LS		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	AP
e. Explaining how seeds are planted	K5	1	2	3	5	6	LS	

- e. Explaining how plants germinate
- f. Distinguishing between poisonous and nonpoisonous plants

2	3	4	6	LS
		4	6	LS

AP

F. Ecology

B

AP

G. Human Biology

The student will be:

1. recognizing the organs in the human body

- a. Integumentary (skin)
- b. Skeletal
- c. Muscular
- d. Circulatory
- e. Digestive
- f. Excretory
- g. Nervous

	2			5
1		3		5
1		3		5
1			4	5
1			4	5

A	AP
A	AP
A	AP
A	AP
A	AP
A	AP

- 1. eyes
- 2. ears
- 3. nose
- 4. taste
- 5. touch

K5	1	2		5
K5	1	2	4	5
K5	1	2		5
K5	1	2		5
K5	1	2		5

A	AP
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A	AP
A	AP

h. Reproductive

2. Identifying the functions of organs in the human body

- a. Integumentary (skin)
- b. Skeletal
- c. Muscular
- d. Circulatory
- e. Digestive
- f. Excretory
- g. Nervous

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A	AP
A	AP
A	AP
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- 1. eyes
- 2. ears
- 3. nose
- 4. taste
- 5. touch

K5	1	2
K5	1	2
K5	1	2
K5	1	2
K5	1	2

A	AP
A	AP
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h. Reproductive

3. Explaining how the systems in the human body interrelate with each other

- 4. Recognizing the four food groups
- 5. Incorporating the food groups into a healthy diet

1	2	3
	2	3

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A

6. Understanding personal hygiene

K5	1	2	3	5
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7. Identifying the basic first aid ailments

8. Implementing the correct first aid procedures

III. Earth Science

A. Astronomy

The student will be:

4. Discussing the process and effects of earthquakes and volcanoes
5. Explaining the degenerative forces of erosion, mass wasting, and weathering

3	4	5	6	ES
	4		6	ES

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. Describing glacial erosion and deposition
7. Explaining the groundwater system
8. Explaining cave formations caused by ground water

4			ES
4			ES
4			ES
4			ES
			ES
			ES
		6	ES

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 function of activation energy
7. Converting between energy units
8. Solving problems involving specific heat

4	5	6	ES	PS	C	P
4				PS	C	P
			ES	PS	C	
			ES	PS	C	
					C	
					C	
					C	P
					C	P

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
6. Distinguishing between hydrated ions and anhydrous substances

PS	C
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	C
	C

7. Describing the structure and properties of crystals, liquid crystals, and amorphous substances.

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C. Liquids

The student will be:

1. Explaining the properties of liquids and changes of state in terms of kinetic theory
2. Using LeChatelier's Principle to explain reversible changes of state in a closed system
3. Determining the relationship between energy and change of state, and perform related calculations
4. Using polarity to explain hydrogen bonding
5. Explaining the unique properties of water in terms of its molecular structure
6. Explaining surface tension and capillary rise on the basis of unbalanced surface forces

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D. Gases

The student will be:

1. Calculating molecular and molar mass
1. Relating pressure to molecular motion
2. Explaining how pressure, volume, and temperature are interrelated based on the Gas Laws of Boyle, Dalton, and Charles
3. Performing calculations using the Gas Laws of Boyle, Dalton and Charles
4. Explaining the concept of an ideal gas
5. Describing the conditions at STP
6. Explaining Graham's law and solve problems using it.
7. Solving problems involving the change of more than one condition for gases
8. Differentiating between an ideal gas and a real gas.
9. Relating temperature and energy transfer to molecular motion
10. Determining the relative velocities of gas molecules at the same temperature
11. Calculating the pressure of gases in both open-arm and closed-arm manometers
12. Stating Avogadro's principle
13. Defining molar volume
14. Explaining and using the ideal gas equation
15. Computing the molecular mass of a gas from its mass, temperature, pressure, and volume
16. Performing stoichiometry involving mass-gas volume relationships
17. Identifying the limiting reactant and be able to solve problems based upon it.

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E. Solutions/Colloids

The student will be:

1. Describing and explaining the process of solvation, dissociation, and dissolving
2. Discussing factors affecting the solubility of one substance in another

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3. Relating enthalpy of solution to endothermic and exothermic dissolving processes
4. Differentiating among and solve problems involving molarity, molality, mole fraction, and mass percent.
5. Distinguishing among colloids, solutions and suspensions
6. Classifying colloids.
7. Describing properties of colloids and explain how these properties depend upon particle size.

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
10. Calculating the effect of a solute on the boiling point, freezing point, and osmotic pressure of a solution
11. Determining the molecular mass of a solute from the freezing point, boiling point, or osmotic pressure data.

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12. Explaining the concept of osmotic pressure
13. Explaining the concept of solubility product and solving problems using the solubility product constant
14. Discussing the autoionization of water and solving problems using the ion product constant for water

AP

F. Atomic Theory and Structure

The student will be:

1. Differentiating between elements, compounds, and mixtures
2. Explaining the development of the modern atomic theory
3. Explaining the laws of multiple proportions and definite proportions
4. Determining the atomic number and atomic mass number of given isotopes
5. Differentiating among the major subatomic particles
6. Calculating the average atomic mass of a mixture of isotopes of an element
7. Describing the wave mechanical view of the hydrogen atom

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C P
C P
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8. Understanding the Heisenberg Uncertainty Principle to characterize the position and velocity of an electron in an atom
9. Describing an electron cloud
10. Characterizing the four quantum numbers
11. Using the Pauli exclusion principle and the quantum numbers to describe an electron in an atom
12. Determining the electron configurations of the elements
13. Writing electron dot diagrams for the elements

PS	C	P
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PS	C	

G. Elements

The student will be:

1. Describing the early attempts at classifying elements
2. Using the periodic table to gather information about individual elements
 - a. Identifying metals, nonmetals, and metalloids
 - b. Identifying the number of valence electrons and energy levels in an atom
 - c. Using the periodic table to predict electron configurations of elements
 - d. Stating how atomic and ionic sizes change in groups and periods
 - e. Predicting oxidation numbers of elements
 - f. Stating the relationship between the activities of elements and their locations in the periodic table
4. Explaining the basis for arrangement of the modern periodic table
5. Predicting the chemical stability of atoms using the octet rule
6. Defining ionization energy and electron affinity, and describing the factors that affect these properties
7. Using multiple ionization energies to predict oxidation numbers of elements
8. Defining a family of group and explaining what members of a chemical family have in common.
9. Listing four ways in which hydrogen can bond and giving an example of each
10. Defining the shielding effect and explaining its importance to reactivity of atoms
11. Listing characteristics and giving uses for representative elements in the alkali metal, alkaline earth metal, and aluminum groups
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

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14. Listing characteristics and give uses for representative main group nonmetals
15. Defining transition metals and listing some of their uses
16. Listing representatives and some properties of lanthanoids and actinoids
17. Listing factors that influence electronegativity and recognize it as a periodic property of elements

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H. Compounds

The student will be:

1. Calculating molarity, percent composition, and empirical formulas
2. Determining the formulas of hydrates
3. Differentiating between the three types of bonds
4. Identifying the type of bonding between two elements given their electronegativities
5. Differentiating among properties of ionic, covalent, and metallic bonds
6. Distinguishing between polar and nonpolar covalent bonds
7. Using electronegativities to predict the comparative polarities of bonds.
8. Defining dipole and comparing the strengths of intermolecular forces based on dipole moments
9. Defining and describing the types of van der Waals forces and list the three factors contributing to them
10. Defining complex ion, ligand, coordination number, and coordinated compound
11. Naming complex ions given their formulas, and writing formulas for complex ions given their names
12. Naming coordination compounds given their formulas and writing formulas for coordination compounds given their names
13. Defining chromatography, mobile phase, and stationary phase
14. Defining, describing and naming uses for the different types of chromatography
15. Demonstrating proficiency in writing chemical formulas
16. Describing how to assign oxidation numbers to atoms in a compound
17. Determining oxidation numbers for monatomic ions and charges for polyatomic ions
18. Demonstrating proficiency in naming chemical compounds
19. Distinguishing between molecular and empirical formulas

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20. Demonstrating the use of coefficients to represent the number of formula units of a substance

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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
3. Discussing factors that affect the values of ionic radii and covalent radii
4. Using covalent radii and calculate bond lengths
5. Using models to explain the structure of a given organic or inorganic molecule
6. Describing hybrid orbitals and using hybridization theory to explain the bond angles in compounds
7. Differentiating between sigma and pi bonding and saturated and unsaturated carbon compounds
8. Naming and writing formulas for simple organic compounds
9. Defining, explaining, and giving examples of isomerism

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J. Chemical Reactions

The student will be:

1. Writing chemical equations to represent reactions
2. Using coefficients to balance chemical equations
3. Differentiating among five general types of chemical reactions
4. Performing stoichiometry in mass-mass and mass-energy relationships
5. Calculating percentage yield of a product
6. Distinguishing between thermodynamic stability and kinetic stability
7. Listing and describing the factors that influence the rate of reaction
8. Distinguishing among heterogeneous catalyst, homogeneous catalyst, and inhibitor
9. Describing and determining reaction mechanisms for simple reactions
10. Determining the equilibrium constant expression for a system at equilibrium
11. Using LeChatelier's principle to explain the effects of changes in concentration, pressure, and temperature on an equilibrium system
12. Relating relative amounts of product and reactant to the equilibrium constant

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13. Calculating equilibrium constants and concentrations of reactants or products for a reaction
14. Comparing the process of oxidation with the process of reduction
15. Explaining an oxidizing agent and a reducing agent
16. Stating how to identify oxidation-reduction reactions
17. Explaining the concept of half reactions
18. Determining how to balance redox equations by the half-reaction method
19. Stating two reasons why reactions occur
20. Calculating changes in internal energy
21. Stating the reasons that enthalpy changes occur in chemical reactions
22. Calculating enthalpies of formation and use them to calculate enthalpies of reaction
23. Describing and giving examples of changes in entropy
24. Relating Gibbs free energy to the spontaneity of reactions and to equilibrium
25. Performing calculations involving Gibbs free energy, entropy, and equilibrium constants.

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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
2. Naming acids and bases
3. Defining acidic and basic anhydrides and writing formulas for them
4. Defining and giving examples of strong and weak acids and bases
5. Explaining the concept of neutralization and the composition of a salt and be able to name salts
6. Writing net ionic equations
7. Deriving and using ionization constants
8. Computing the percent ionization of a weak electrolyte
9. Explaining how the pH scale is used for measuring solution acidity
10. Describing the processes of hydrolysis and buffering
11. Stating the principles and uses of indicators
12. Explaining the process of titration and performing calculations using the data from titrations

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L. Physics in Action

The student will be:

1. Differentiating between the various forms of energy
2. Explaining conservation of energy and conservation of momentum

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M. Velocity

The student will be:

1. Defining and giving an example of a frame of reference
2. Calculating and interpreting average velocity
3. Solving velocity, time, and distance problems
4. Plotting and interpreting position-time graphs for positive and negative positions.
5. Calculating and interpreting the slope of a curve on a position-time graph
6. Distinguishing displacement from distance and velocity from speed
7. Plotting and interpreting a velocity-time graph
8. Calculating displacement from the area under the curve of a velocity-time graph
9. Determining relative velocities
10. Determining instantaneous velocity and distinguishing it from average velocity

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N Acceleration

The student will be:

1. Calculating average and instantaneous acceleration
2. Determining average and instantaneous acceleration from a velocity-time graph
3. Calculating final velocity for the case of uniform acceleration
4. Calculating displacement of an object undergoing uniform acceleration
5. Using kinematic equations to solve uniform acceleration motion problems

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O. Force

The student will be:

1. Naming the four fundamental forces, their relative strengths, and some familiar examples
2. Using Newton's second law in solving problems
3. Understanding the difference between net forces that cause acceleration and action-reaction pairs
4. Distinguishing between weight and mass and using the second law to relate them
5. Understanding the nature of frictional forces and using the coefficient of friction in solving problems
6. Calculating acceleration resulting from net force

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7. Understanding the definition of free-fall and the causes of air resistance and terminal velocity

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8. Calculating the speed, velocity, acceleration, and deceleration of objects

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9. Differentiating which law of motion is being applied in various situations

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10. Explaining the law of universal gravitation and its effects on moving bodies

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ES PS

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11. Recognizing various types of simple machines

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ES PS

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12. Explaining how simple machines reduce the amount of applied effort

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P. Vectors

The student will be:

1. Adding vectors graphically

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2. Understanding independence of perpendicular vectors

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3. Resolving vectors into perpendicular components

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4. Adding vectors algebraically

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5. Solving force vector addition problems

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6. Finding resultant and equilibrant vectors

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7. Solving incline plane problems

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Q. Motion in Two Dimensions

The student will be:

1. Solving horizontal projective motion problems

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2. Solving projective motion at an angle problems

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R. Angular Motion and Rotational Dynamics

The student will be:

1. Determining angular displacement, velocity, and acceleration

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2. Understanding and calculating centripetal acceleration

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3. Defining a rigid body and axis of rotation

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4. Understanding and calculating torque

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S. Simple Harmonic Motion

The student will be:

1. Relating uniform circular motion to simple harmonic motion

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2. Understanding and giving examples of simple harmonic motion

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3. Understanding and using Hooke's law to relate a restoring force to displacement

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4. Solving problems involving a pendulum's period, length, and gravitational acceleration

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T. Universal Gravitation

The student will be:

1. Listing and using Kepler's Laws of planetary motion

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2. Recognizing the relationship between Kepler's laws and Newton's law of universal gravitation
3. Calculating periods and velocities of orbiting objects
4. Understanding that gravitational force is directly proportional to the masses and inversely proportional to the square of the distance between the masses
5. Relating the motion of satellites in circular orbit to uniform circular motion
6. Solving problems involving orbital velocity and period
7. Understanding the term "weightlessness" as being in a state of free fall
8. Understanding and using the field concept of gravity
9. Understanding Einstein's concept of gravity

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U. Momentum

The student will be:

1. Defining momentum and impulse
2. Using the momentum-impulse theorem to calculate changes in momentum
3. Recognizing the relationship between Newton's Third Law and the conservation of momentum
4. Using the definition of a closed, isolated system
5. Using conservation of momentum to solve collision problems
6. Distinguishing between external and internal forces and using the distinction to solve problems
7. Using vectors to solve two dimensional collision problems

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V. Work and Energy

The student will be:

1. Calculating work done by a force
2. Identifying the force that performs work
3. Understanding the relationship between work done and energy transferred
4. Differentiating between work and power and calculating power
5. Defining kinetic and potential energy
6. Calculating kinetic energy and applying the work-energy theorem
7. Solving problems involving gravitational potential energy
8. Solving problems using the law of conservation of energy
9. Distinguishing between elastic and inelastic collisions

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10. Distinguishing between conservative and nonconservative forces

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W. Thermal Energy

The student will be:

1. Understanding and describing the modes of heat transfer

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2. Relating temperature measurement to thermal equilibrium

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3. Relating Celsius and Kelvin temperature scales 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

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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

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2. Relating pressure, force, and area of calculating pressure using correct units

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3. Relating Pascal's and Archimedes' principles to hydrostatic applications

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4. Relating Bernoulli's principle to hydrodynamic applications

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5. Comparing and contrasting liquids and gases

C P

6. Relating cohesive and adhesive forces to surface tension and capillary 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

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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

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11. Calculating linear and nonlinear thermal expansion

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12. Investigating problems and uses of thermal expansion

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Y. Waves

The student will be:

1. Recognizing mechanics of energy transfer by waves

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2. Distinguishing between transverse, longitudinal and surface waves

PS

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3. Distinguishing between wave pulse and continuous wave

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4. Describing waves using amplitude, wavelength, frequency and period

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C P

5. Relating wavespeed to frequency and wavelength in problem solving applications

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6. Understanding wavespred's dependency on medium

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7. Understanding waves behavior at boundaries between media

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8. Applying principle of superposition to wave interference

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9. Understanding and using the principles of reflection, refraction, and diffraction to predict transmitted wave properties

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10. Explaining the characteristics and movements of electromagnetic waves

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Z. Sound

The student will be:

1. Understanding sound as a longitudinal pressure wave

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2. Understanding rarefaction and compression

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3. Solving problems involving frequency, waqvelength and velocity of sound

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4. Recognizing and calculating Doppler shift

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5. Understanding applications of Dopplet shift

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6. Understanding and using terms associated with sound, such as pitch, loudness, octave, and decibel

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7. Describing origin of sound from musical instruments

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8. Applying concepts of resonance and standing waves to harmonics

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9. Calculating bneat frequencies

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10. Explaining the characteristics and movements of sound waves

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11. Explaining sound phenomena of acoustics, resonance, and beats

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12. Applying knoledge of sound waves to everyday life applications

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AA. Light

The student will be:

1. Understanding visible light as a limited range in the electromagnetic spectrum
2. Using the concept of light rays in applications involving behavior of light
3. Understanding and using the speed of light in a vacuum in problem solving
4. Understanding and using quantities describing light such as intensity, flux, and illuminance in problems
5. Defining transparent, translucent and opaque
6. Distinguishing between colors and pigments and the additive and subtractive nature of mixtures of each, respectively
7. Recognizing and understanding phenomenon of thin-film interference
8. Recognizing and understanding phenomenon of polarization

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BB. Reflection and Refraction

The student will be:

1. Distinguishing between regular and diffuse reflection
2. Solving refraction problems using Snell's Law
3. Solving problems involving index of refraction and speed of light through a medium
4. Determining the critical angle required for total internal reflection
5. Drawing ray diagrams of light through mediums of differing refractive indices

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6. Understanding dispersion as a consequence of refraction and its relation to rainbows
7. Differentiating between reflection, refraction, dispersion and absorption of light

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CC. Mirrors and Lenses

The student will be:

1. Using ray tracing techniques, locate images in plane, concave and convex mirrors
2. Understanding spherical aberration and the use of parabolic mirrors
3. Distinguishing between real and virtual images
4. Using the mirror equations to calculate location and magnification
5. Distinguishing between concave and convex lenses
6. Using ray tracing techniques locate images formed by concave and convex lenses
7. Describing the operation of microscopes and telescopes

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DD. Diffraction and Interference

The student will be:

1. Describing the diffraction of light
2. Investigating the single-slit and two-slit interference patterns qualitatively and quantitatively
3. Calculating wavelength of light from measurements of the single-slit and two-slit interference patterns
4. Extending diffraction concepts to applications of diffraction gratings

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EE. Static Electricity

The student will be:

1. Understanding causes and properties of static charges
2. Distinguishing between charging by conduction and charging by induction
3. Solving problems using Coulomb's Law
4. Differentiating between static and electric current

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FF. Electric Fields

The student will be:

1. Defining and measuring an electric field
2. Solving problems relating field, force, and charges
3. Describing fields using field lines
4. Defining and calculating electric potential difference
5. Distinguishing between potential and potential difference
6. Calculating potential in uniform electric fields
7. Relating sharing of charges to minimization of energy
8. Relating sharing of charges to electrical grounding
9. Understanding charge distribution on solid objects and relating it to field strength
10. Solving problems involving capacitance

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GG. Current Electricity

The student will be:

1. Describing and defining electric current and units associated with it
2. Sketching and analyzing electric circuits
3. Solving problems involving current, voltage, resistance and power
4. Correctly connecting and using ammeters and voltmeters
5. Understanding and calculating conversion between electrical and thermal energy
6. Understanding use of capacitors in circuits and calculating capacitance

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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	2		PS	P
HH. Series and Parallel 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. Understanding 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			PS	P
2. Investigating properties of magnetic fields around current carrying wires, loops, and coils			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 1	4 5 6	PS	
12. Differentiating between types of magnets		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

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6. Understanding the nature and application of self-inductance

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7. Understanding the construction and operation of a transformer and solving related problems

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8. Understanding the generation of electromagnetic fields and waves

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9. Explaining the relationship between electricity and magnets

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KK. Quantum Theory

The student will be:

1. Understanding thermal radiation and the usage of the Stefan-Boltzmann law

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2. Calculating the frequency of maximum intensity in blackbody radiation

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3. Calculating the frequency of maximum intensity in blackbody radiation

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4. Calculating the frequency of maximum intensity in blackbody radiation

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5. Calculating the frequency of maximum intensity in blackbody radiation

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6. Understanding the Compton effect and solving related problems

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7. Describing the dual nature of matter and light and solving related problems

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LL. Modern Physics

The student will be:

1. Describing the quantum model of the atom

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2. Understanding the generation and properties of laser light

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3. Comparing and contrasting the four fundamental forces

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4. Understanding the classification and properties of elementary particles

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5. Understanding the type of elementary particles that carry or mediate the four fundamental forces

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6. Describing basic concepts associated with quantum mechanics

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MM. Wave and Particle Motion

The student will be:

1. Explaining the kinetic theory of thermal energy

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2. Distinguishing between temperature and thermal energy

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3. Measuring thermal energy

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4. Differentiating between types of heat transfer

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5. Explaining how heat affects objects in expansion and contracting

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