

**VAN BUREN SCHOOL DISTRICT
CONCEPTUAL PHYSICAL SCIENCE**

WEEK	CHAPTER	TOPIC	SUB-TOPICS	LABS	FRAMEWORKS	ACT
1	1	MOTION	SPEED, VELOCITY, ACCELERATION, FREE-FALL	GRAPHING WITH SONAR	<p>P.6.PS.2 Explain how <i>motion</i> is relative to a <i>reference point</i></p> <p>P.6.PS.3 Compare and contrast among <i>speed</i>, <i>velocity</i> and <i>acceleration</i></p> <p>P.6.PS.4 Solve problems using the formulas for <i>speed</i> and <i>acceleration</i>:</p> $v = \frac{d}{t} \qquad a = \frac{\Delta v}{\Delta t}$ <p>Where <i>a</i> = acceleration, <i>v</i> = speed (velocity), Δt = change in time, Δv = change in velocity, <i>t</i> = time and <i>d</i> = distance</p>	*
2	2	NEWTON'S LAWS	FIRST LAW, SECOND LAW, THIRD LAW	DROPPING AND DRAGGING	<p>P.6.PS.6 Compare and contrast Newton's three laws of motion</p> <p>P.6.PS.7 Design and conduct investigations demonstrating Newton's first law of motion</p> <p>P.6.PS.8 Conduct investigations demonstrating Newton's second law of motion</p> <p>P.6.PS.9 Design and conduct investigations demonstrating</p>	*

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					Newton's third law of motion	
2, 3	3	MOMENTUM AND ENERGY	MOMENTUM, IMPULSE, CONSERVATION OF MOMENTUM, ENERGY, WORK, FORMS OF ENERGY, WORK-ENERGY THEOREM, CONSERVATION OF ENERGY, POWER, MACHINES, SOURCES OF ENERGY	ENERGY RAMP	P.6.PS.11 Relate the <i>Law of Conservation of Momentum</i> to how it affects	★
3	4	GRAVITY AND SATELLITE MOTION	UNIVERSAL GRAVITIOAN, TIDES, WEIGHT AND WEIGHTLESSNESS, PROJECTILES AND STELITES	BULLSEYE	Resolve two-dimensional <i>vectors</i> into their <i>components</i> : $d_x = d \cos \theta$ 8 Apply Newton's universal law of gravitation to find the gravitational force between two masses, satellites, and tides. $F_g = G \frac{m_1 m_2}{r^2}$.	★
3, 4	5	FLUID MECHANICS	DENSITY, PRESSURE, BUOYANCY, ARCHIMEDE'S PRINCIPLE, FLOTATION, PRESSURE IN A GAS, ATMOSPHERIC PRESSURE, BERNOULLI'S PRINCIPLE	TIRE PRESSURE IN 18 WHEELERS	P.6.PS.12 Compare and contrast the effects of forces on fluids: <ul style="list-style-type: none"> • <i>Archimedes' principle</i> • <i>Pascal's principl</i> • <i>Bernoulli's principle</i> 	★
4,5	6	THERMAL ENERGY	TEPERATURE, ABSOLUTE ZERO, THERMAL ENERGY, HEAT, SPECIFIC HEAT CAPACITY, THERMAL EXPANSION, CHANGE OF PHASE	SPIKED WATER	P.5.PS.1 Distinguish among <i>thermal energy, heat, and temperature</i> P.5.PS.2 Calculate changes in <i>thermal energy</i> using: $q = mc_p \Delta T$ Where q = heat energy, m = mass, c_p = specific heat, ΔT = change in temperature	★
5	7	HEAT TRANSFER AND THERMO-DYNAMICS	CONDUCTION, CONVECTION, RADIATION, FIRST LAW OF THERMODYNAMICS, SECOND LAW OF THERMODYNAMICS, ORDER TENDS TO DISORDER, ENTROPY	COOLING BY BOILING	HT.8.P.1 Describe how the first law of thermodynamics is a statement of <i>energy conversion</i> HT.7.P.1 Perform <i>specific heat capacity</i> calculations: HT.8.P.4	★

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					Distinguish between <i>entropy</i> changes within systems and the <i>entropy</i> change for the universe as a whole	
5,6	8	ELECTRICITY	ELECTRICAL FORCE AND CHARGE, ELECTRIC FIELDS, ELECTRIC POTENTIAL, VOLTAGE SOURCES, ELECTRIC CURRENT, ELECTRICAL RESISTANCE, ELECTRIC CIRCUITS, ELECTRIC POWER	BATTERIES AND BULBS	EM.12.P.4 Construct a <i>circuit</i> to produce a pre-determined value of an Ohm's law variable P.8.PS.1 Calculate <i>voltage</i> , <i>current</i> , and <i>resistance</i> from a <i>schematic</i> diagram:	*
6,7	9	MAGNETISM	MAGNETIC POLES, MAGNETIC FIELDS, MAGNETIC DOMAINS, ELECTRIC CURRENT AND MAGNETIC FIELDS, MAGNETIC CHARGES ON MOVING FORCES, ELECTROMAGNETIC INDUCTION, GENERATORS AND ALTERNATING CURRENT, POWER PRODUCTION, FIELD INDUCTION	CRANKING IT UP	EM.13.P.1 Determine the strength of a <i>magnetic field</i> EM.13.P.4 Describe how the change in the number of <i>magnetic field</i> lines through a <i>circuit</i> loop affects the <i>magnitude</i> and direction of the induced <i>current</i>	*
8,9	10	SOUND WAVES	VIBRATIONS AND WAVES, WAVE MOTION, SOUND WAVES, FORCED VIBRATIONS, RESONANCE, INTERFERENCE, DOPPLER EFFECT, WAVE BARRIERS AND BOW WAVES, SHOCK WAVES AND THE SONIC BOOM, MUSICAL SOUNDS	SLOW MOTION TUNING FORKS	P.7.PS.3 Explain <i>Doppler effect</i> using examples P.7.PS.4 Calculate problems relating to <i>wave properties</i> : P.7.PS.1 Compare and contrast a <i>wave's speed</i> through various <i>mediums</i> P.7.PS.5 Describe how the <i>physical properties</i> of <i>sound waves</i> affect its perception	*
9	11	LIGHT WAVES	ELECTROMAGNETIC SPECTRUM, TRANSPARENT AND OPAQUE MATERIALS, COLOR, DIFFRACTION, INTERFERENCE, POLARIZATION	PINHOLE CAMERA	P.7.PS.7 Explain the formation of color by light and by pigments P.7.PS.8 Investigate the separation of white light into colors by <i>diffraction</i>	*

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9	12	PROPERTIES OF LIGHT	REFLECTION, REFRACTION, DISPERSION, TOTAL INTERNAL REFLECTION, LENSES, WAVE-PARTICLE DUALITY	MIRROR MIRROR ON THE WALL	P.7.PS.11 Differentiate between the <i>refracted images</i> produced by <i>concave</i> and <i>convex lenses</i>	★
10	13	STRUCTURE OF THE ATOM	ELEMENTS, ELECTRONS, NUCLEUS, PROTONS AND NEUTRONS, BOHR'S MODEL, QUANTUM MECHANICS, ELECTRON WAVE-CLOUD MODEL, QUANTUM MODEL	THICKNESS OF A BB PANCAKE	C.1.PS.3 Discuss and <i>model</i> the relative size and placement of <i>sub-atomic particles</i> . Name and describe the three subatomic particles Define the term atom. List the postulates of Dalton's theory. Discuss how atoms are related to electricity. Explain what studies of cathode rays and radioactivity revealed about atoms. Discuss Rutherford's alpha-scattering experiment and how it showed the existence of the nucleus	★
10	14	THE ATOMIC NUCLEUS	RADIATION, THE NUCLEUS, ISOTOPES, HALF-LIFE, TRANSMUTATION, NUCLEAR FISSION, MASS-ENERGY RELATIONSHIP, NUCLEAR FUSSION	BRIGHT LIGHTS	NP.15.P.1 Calculate the binding <i>energy</i> of various nuclei NP.15.P.3 Calculate the decay constant and the <i>half-life</i> of a radioactive substance Compare and contrast <i>fission</i> and <i>fusion</i> NC.30.C.1 bDescribe the following radiation emissions: <ul style="list-style-type: none"> • alpha particles • beta particles • gamma rays • positron particles 	★
11	15	ELEMENTS OF CHEMISTRY	PHASES OF MATTER (A MOLECULAR VIEW), PHYSICAL AND CHEMICAL PROPERTIES, ELEMENTS, COMPOUNDS, MIXTURES, CLASSIFICATION OF MATTER	A ROPING OF EXPERIENCE	Compare and contrast <i>chemical</i> and <i>physical changes</i> , including but not limited to rusting, burning, <i>evaporation</i> , <i>boiling</i> and <i>dehydration</i> Distinguish among <i>atoms</i> , <i>ions</i> , and <i>isotopes</i>	★
11	16	THE PERIODIC TABLE	ORGANIZING THE ELEMENTS, GROUPS AND PERIODS, NOBLE GAS SHELLS, PERIODIC TRENDS	CHEMICAL PERSONALITIES	P.6.C.5 Explain the role of <i>valence electrons</i> in determining <i>chemical properties</i> Explain the role of <i>valence electrons</i> in forming <i>chemical bonds</i>	★
12	17	CHEMICAL BONDING	METALS AND ALLOYS, IONIC BONDS, COVALENT BONDS, COVALENT BOND POLARITY, MOLECULAR POLARITY	MOLECULES BY ACME	B.11.C.2 Model bonding: <ul style="list-style-type: none"> • <i>ionic</i> • <i>covalent</i> • <i>metallic</i> Name <i>ionic</i> and <i>covalent compounds</i>	★

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					<p>P.5.C.1 Write formulas for <i>ionic</i> and <i>covalent</i> compounds</p> <p>Explain the role of <i>valence electrons</i> in forming <i>chemical bonds</i></p> <p>B.9.C.4 identify the strengths and effects of intermolecular forces (van der Waals):</p>	
12	18	MOLECULAR MIXING	MOLECULAR INTERACTIONS, SOLUTIONS, SOLUBILITY, SURFACE TENSION AND CAPILLARY ACTION	SUGAR AND SAND	<p>Identify the observable evidence of a <i>chemical reaction</i>:</p> <ul style="list-style-type: none"> • formation of a <i>precipitate</i> • production of a <i>gas</i> • color change • changes in <i>heat</i> and light <p>P.6.C.1 Compare and contrast <i>matter</i> based on uniformity of particles:</p> <ul style="list-style-type: none"> • pure substances • <i>solutions</i> • heterogeneous mixtures 	★
13	19	CHEMICAL REACTIONS	EQUATIONS, ENERGY AND REACTIONS, EQUILIBRIUM, RELATIVE MASSES OF ATOMS AND MOLECULES, AVOGADRO'S NUMBER AND THE MOLE	MYSTERY POWDERS	<p>S.12.C.2 Use balanced reaction equations to obtain information about the amounts of <i>reactants</i> and <i>products</i></p> <p>S.13.C.1 Apply the <i>mole</i> concept to calculate the number of particles and the amount of substance:</p> <p>S.14.C.1 Given the <i>products</i> and <i>reactants</i> predict <i>products</i> for the following types of <i>reactions</i>:</p> <ul style="list-style-type: none"> • <i>synthesis</i> • <i>decomposition</i> • <i>single displacement</i> • <i>double displacement</i> <p>KE.23.C.1 Define <i>enthalpy</i> and <i>entropy</i> and explain the relationship to exothermic and endothermic reactions:</p> <p>E.23.C.6 Explain the role of <i>activation energy</i> and collision theory in <i>chemical reaction</i></p> <p>E.24.C.1 . list and explain the factors which affect the rate of a reaction and the relationship of these factors to chemical equilibrium:</p> <ul style="list-style-type: none"> • <i>reversible reactions</i> • reaction rate • nature of <i>reactants</i> • <i>concentration</i> • <i>temperature</i> <p>catalysis,;</p>	★

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13	20	ACID,BASE, AND REDOX REACTIONS	ACIDS AND BASES, ACID STRENGTH, THE pH SCALE, BUFFERS, OXIDATION- REDUCTION	UPSET STOMACH	AB.21.C.3 Explain the role of the <i>pH</i> scale as applied to <i>acids</i> and <i>bases</i> Name and write formulas for <i>acids</i> , <i>bases</i> and <i>salts</i> AB.19.C .Compare and contrast the following acid/base theories: <ul style="list-style-type: none"> • Arrhenius Theory • Bronsted-Lowry Theory • Lewis Theory AB.22.C.3 Investigate the role of <i>buffers</i>	*
14	21	ORGANIC CHEMISTRY	HYDROCARBONS, NONCARBON ATOMS IN ORGANIC MOLECULES, ALCOHOLS,PHENOLS, ETHERS, AMINES, SYNTHETIC POLYMERS	SENSING pH	OC.28.C.1 Describe the functional groups in organic chemistry: <ul style="list-style-type: none"> • hydrocarbons • alcohols • ethers • aldehydes • ketones • carboxylic acids • esters • amines • amides • amino acids • nitro compounds Differentiate among the biochemical functions of proteins, <i>carbohydrates</i> , <i>lipids</i> , and <i>nucleic acids</i>	*
15	24	WATER AND SURFACE PROCESSES	HYDROLOGIC CYCLE, GROUNDWATER, WATER QUALITY, DRAINAGE, GLACIERS, OCEANS, SHORELINES	TOP THIS	Uses for Water Water Resources Water Treatment The Water Pollution Problem Chemical Pollutants Radioactivity and Thermal Pollution Controlling Water Pollution Water cycle, evaporation rate	*
15,16	26	THE ATMOSPHER E, OCEANS, AND THEIR INTER-	CREATION OF THE EARTH'S ATMOSPHERE AND OCEANS, COMPONENTS OF EARTH'S ATMOSPHERE, SOLAR ENERGY, COMPONENTS OF EARTH'S OCEANS, DRIVING FORCE OF	SOLAR POWER I AND II	Formation of the solar system of earth and earth's oceans and atmosphere. The percentages of the different gases in the atmosphere. Unequal absorption of solar energy as the driving force	*

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		ACTIONS	AIR MOTION, GLOBAL CIRCULATION PATTERNS		for weather formation, different wind cells.	
16	27	WEATHER	ATMOSPHERIC MOISTURE, AIR BEHAVIOR AND ATMOSPHERIC STABILITY, CLOUD DEVELOPMENT, AIR MASSES, FRONTS AND STORMS, VIOLENT WEATHER, WEATHER FORECASTING	INDOOR CLOUDS		*
17	28	THE SOLAR SYSTEM	THE MOON, ECLIPSES, THE SUN, THE PLANETS, ASTEROIDS, METEORIDS, COMETS	SUNBALLS		*
17	29	THE STARS	BIRTH OF STARS, LIFE OF STARS, DEATH OF STARS, BLACK HOLES, GALAXIES, QUASARS	ELLIPSES		*
18	30	RELATIVITY AND THE UNIVERSE	SPACETIME, SPECIAL RELATIVITY, TIME DILATION, LENGTH CONTRACTION, RELATIVISTIC, MOMENTUM, MASS AND ENERGY($E=mc^2$), GENERAL RELATIVITY			

*This course correlates to the ACT during the entire term by always exposing the following areas.

Interpretation of data; Data representation; Identification in patterns, trends, and Relationships of data; Purpose of experimental procedures; Process of scientific investigation; Identification of conclusions, hypothesis, models, or predictions.