

IMPLEMENTATION OF THE NATIONAL CURRICULAR GUIDELINES FOR HIGH SCHOOL EDUCATION
PHYSICO-CHEMICAL SCIENCES CURRICULAR AREA

School year: 2011/2012

9th grade

Primary Subjects / Content	Essential Skills	Educational Situations and Experience - Learning Process*	Classes Planned	Grading
1. IN TRANSIT		Questions to explore on the subject:		Weighting:
1.1. Studies of Motion		<ul style="list-style-type: none"> • <i>In what way can Science contribute to improving the quality of life?</i> • <i>In what way does quality of life imply security and prevention?</i> • <i>How are systems controlled and regulated?</i> • <i>How is the continuity and variability of systems processed?</i> 		> Cognitive mastery: 80% > Mastery of attitudes and values: 20%
1.1.1. Position, distance, and movement	<ul style="list-style-type: none"> • Recognize that rest and movement are related concepts • Understand the notion of frames of reference; • Identify situations of movement/rest relative to frames of reference; • Identify different types of trajectories; • Distinguish between scalar and vector magnitudes; • Understand that distance travelled is a scalar magnitude measured along a trajectory; • Define position and movement as vector magnitudes; • Distinguish between distance travelled and movement; 	<ul style="list-style-type: none"> • Analyze situations where a body may be at rest or in motion, depending on the chosen frame of reference. • Distinguish various trajectories • Transparencies • Problem solving • Textbook activities 	16	The types of assessment are used: > Diagnostic > Formative > Summative • Learning assessment tests.
1.1.2. Speed, velocity, and acceleration	<ul style="list-style-type: none"> • Define the concepts of average speed and average velocity; • Distinguish between average speed and average velocity; • Describe instantaneous velocity; • Define the concept of acceleration; 	<ul style="list-style-type: none"> • Transparencies • Problem solving • Textbook activities 		• Participation and productiveness in class (listening, speaking, reading and writing)
1.1.3. Rectilinear movements and their graphs	<ul style="list-style-type: none"> • Characterize uniform rectilinear movement • Interpret and build graphs for position x time, distance x time, and velocity x time; • Determine the distance travelled by a body by looking at velocity x time graphs; • Describe uniformly varying (fast and slow) rectilinear movement • Calculate reaction, braking, and safety distances from $v = f(t)$ graphs; • Interpret and construct acceleration x time graphs; • Determine average acceleration from a $v = f(t)$ graph. 	<ul style="list-style-type: none"> • Construct graphs and tables for position x time and distance x time • Interpret of $x = f(t)$, $d = f(t)$, $v = f(t)$ and $a = f(t)$ graphs • Transparencies • Problem solving • Textbook activities 		• Homework (quality of TPC)
1.2. Force				• Research work.
1.2.1. Resultant Force	<ul style="list-style-type: none"> • Find the various kinds of forces and their effects on bodies; • Understand that the action of forces alters the velocity of bodies; • Describe a force vector; • Determine the resultant of forces from two or more forces together; • Calculate the value of the resultant of two forces in the same direction or perpendicular to one another; • Define the concept of inertia; • Understand the proportional relation between resultant force applied and acceleration produced; • Identify weight with the force of gravity on the surface of the Earth; • Find action-reaction pairs; • Understand normal reaction as a force of interaction between the supporting surface and a given body; • Enunciate and apply Newton's Laws. 	<ul style="list-style-type: none"> • Experiments adding and subtracting two or more forces • Transparencies • Problem solving • Textbook activities 	12	• Reports on activities performed. • Daily journaling. • Independence - development of capacities and resources.
				• Organization and planning.
				• Experimental activities.
				• Communication.
				• Sense of responsibility: <ul style="list-style-type: none"> • Punctuality and assiduousness. • Personal organization. • Presentation of the required material. • Compliance with rules.
				• Interest/ dedication: <ul style="list-style-type: none"> • Attention/dedication (completion of TPC) • Participation in / collaboration on work.

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1.2.2. Newton's Laws		<ul style="list-style-type: none"> Experiments with Newton's Laws Transparencies Problem solving Textbook activities 		<ul style="list-style-type: none"> Persistence. Independence / personal initiative.
1.2.3. Friction	<ul style="list-style-type: none"> Understand how the force of friction resists the relative movement of two surfaces in contact Understand the advantages and disadvantages of forces of friction; Identify the factors that determine friction; Identify the forces that act on a body in motion. 	<ul style="list-style-type: none"> Practical activities to demonstrate the existence of friction on bodies in motion Transparencies Problem solving Textbook activities 		<ul style="list-style-type: none"> Sociability: <ul style="list-style-type: none"> Group Integration. Cooperation and respect for others.
1.2.4 Rotational effect of force	<ul style="list-style-type: none"> Recognize rotational effects of force; Understand and apply the concept of a moment Identify the moment arm for a force Describe a couple Describe the moment of a couple 	<ul style="list-style-type: none"> Transparencies Problem solving Textbook activities 		
1.2.5 Friction	<ul style="list-style-type: none"> Understand how the force of friction resists the relative movement of two surfaces in contact Understand the advantages and disadvantages of forces of friction; Identify the factors that determine friction; Identify the forces that act on a body in motion. 	<ul style="list-style-type: none"> Practical activities to demonstrate the existence of friction on bodies in motion Transparencies Problem solving Textbook activities 		
1.2.6 Pressure and forces of pressure	<ul style="list-style-type: none"> Relate pressure to the intensity of forces on the surface of their application 	<ul style="list-style-type: none"> Analyze situations based on the concept of pressure Apply the concept of pressure to roadway safety Problem solving Textbook activities 		
1.2.7. Impulse and Archimedes' Principle	<ul style="list-style-type: none"> Describe impulsive force; Understand concepts of the apparent and real weight of a body Understand Archimedes' Principle Identify the factors impulse is based on Analyze equilibrium situations for fluid bodies based on relation between the density of the body and that of the fluid. 	<ul style="list-style-type: none"> Experiments to demonstrate the factors that the apparent weight of a body is based on. Experimental demonstration of Archimedes' Principle. Analysis of situations such as: <ul style="list-style-type: none"> Rising of hot-air balloons, floatation of boats and submarines Problem solving Textbook activities 		
2. CLASSIFICATION OF MATERIALS				
2.1 Atomic Structure				
2.1.1 Constitution of the Atom	<ul style="list-style-type: none"> Understand the parts and structure of an atom; Understand the characteristics of subatomic particles Understand how models of the atom developed Identify the electron cloud model Establish comparisons between the masses and/or dimensions of atoms and of subatomic particles. 	<ul style="list-style-type: none"> Presentation of small examples to give an idea of the size of an atom. Activities with transparencies/textbook images about the development of models of the atom Presentation of transparencies images of electron clouds Textbook activities: readings and figures Problem solving. 		
2.1.2 Atomic number and mass number	<ul style="list-style-type: none"> Identify the atomic number and mass number of an atom Find the parts of an atom by looking at its atomic number and mass number Understand that each chemical element is described by its atomic number Learn what isotopes are; Learn the unit of atomic mass and the notion of relative atomic mass. 	<ul style="list-style-type: none"> Textbook activities Problem solving. 	5	
2.1.3 Electron distribution of the elements	<ul style="list-style-type: none"> Understand how the electrons in an atom are distributed across several energy levels Perform electron distributions for atoms up to Z =20, understanding the principle of minimum energy Distinguish between an atom's fundamental state and its excited state Find the valence electrons of an atom 	<ul style="list-style-type: none"> Problem solving Textbook activities 		

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2.2 The Periodic Table and properties of the elements			
2.2.1. How the Periodic Table is organized	<ul style="list-style-type: none"> Understand why chemical elements need to be organized in ascending order by atomic number Relate atomic structure to the organization of the Periodic Table Distinguish the periods and groups in the Periodic Table Identify the alkali metals, the alkaline earth metals, halogens, and noble gases; Distinguish among metals, metalloids, and non-metals; Understand that metallic character is a periodic property Find the representative and transition elements on the periodic table 	<ul style="list-style-type: none"> Textbook activities: readings and figures Transparencies Presentation and analysis of the Periodic Table 	
2.2.2 The Periodic Table and electronic structure	<ul style="list-style-type: none"> Relate the position of the elements on the PT with the electronic structure of their atoms Recognize the similarities in electron configuration among elements in the same groups Locate an element on the PT based on its electron configuration Write out the electron configuration of an element based on its location in the PT Explain ion formation based on the electron configuration of an element Explain variations in the size of atoms within a single group and within a period Compare the sizes of atoms, the ions they give rise to, and of isoelectronic species. 	<ul style="list-style-type: none"> Textbook activities: readings and figures Transparencies Problem solving 	9
2.2.3 Properties of chemical elements	<ul style="list-style-type: none"> Understand the physical properties of the elements in groups 1, 2, 17, and 18 of the PT Understand the chemical behaviour of metal and non-metal oxides Write out the chemical equations for the reactions of alkali metals and alkaline earth metals with oxygen Write out the chemical equations for the reactions of metallic oxides with water Write out the chemical equations for the reactions of halogens with hydrogen and with metals Understand the stability of noble gases 	<ul style="list-style-type: none"> Experimental demonstration of the chemical behaviour of metals and non-metals (reactions with oxygen and with water) Experimental demonstration of the physical behaviour of metals and non-metals. Use of videos available online Textbook activities Problem solving. 	
2.3 Chemical Bonds			
2.3.1 Types of chemical bonds	<ul style="list-style-type: none"> Understand that atoms bond to one another to achieve greater stability Identify the types of chemical bonds that will form between given chemical elements, based on their location in the periodic table Distinguish ionic bonds from covalent and metallic bonds Distinguish the various types of covalent bonds: polar or apolar, simple, double, or triple Describe molecules using Lewis' notation and structural formula 	<ul style="list-style-type: none"> Use of videos available online Textbook activities Problem solving. 	
2.3.2. Molecular geometry	<ul style="list-style-type: none"> Relate the three-dimensional arrangement of atoms in a molecule to their stability Predict molecular geometry based on the structural formula of a simple molecule. 	<ul style="list-style-type: none"> Use of molecular models to represent molecules. Textbook activities: readings and figures. Transparencies: geometry and polarity of simple molecules 	8
2.3.3 Intermolecular interactions and types of solids	<ul style="list-style-type: none"> Identify the interactions between molecules according to their polarity Distinguish the various types of solids Learn a few characteristics of the various types of solids. 	<ul style="list-style-type: none"> Use of videos available online Textbook activities Transparencies Problem solving 	
2.4 Carbon Compounds	<ul style="list-style-type: none"> Learn the parts of hydrocarbons; Distinguish among alkanes, alkenes, and alkynes Distinguish among saturated and unsaturated hydrocarbons Learn the name, chemical formula, and structure of a simple hydrocarbon Understand the importance of hydrocarbon combustion reactions Identify other simple organic compounds based on functional group 	<ul style="list-style-type: none"> Working/research groups Use of videos available online Textbook activities Transparencies Problem solving 	6

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3. ELECTRICAL AND ELECTRONIC SYSTEMS			
3.1 Electric circuits			
3.1.1 Establishment of electric current	<ul style="list-style-type: none"> Understand friction electrification phenomena Associate the electrification from one material to another with the transfer of electrons Identify an electrical current as an ordered flow of charges; Distinguish between good and poor electrical current conductors Understand the concept of electrical potential difference Define electric potential Define current intensity Understand the SI units for potential difference and current intensity 	<ul style="list-style-type: none"> Experiments to demonstrate electrification by friction Experiments to demonstrate good and poor conductors Textbook activities Problem solving. 	19
3.1.2 Electrical circuits	<ul style="list-style-type: none"> Understand safety rules for the use of electrical devices and materials Understand how the flow of electrical charges is associated with energy transport Identify the basic components of an electric circuit by their symbols Distinguish between sources and receivers of electrical energy Identify the poles on a battery Draw schematics for simple electrical circuits Indicate the real and conventional directions of electric current 	<ul style="list-style-type: none"> Discussion of safety rules for the use of electrical devices and materials Assembly of simple electric circuits Textbook activities Problem solving. 	
3.1.3 Circuits in series and in parallel	<ul style="list-style-type: none"> Distinguish between circuits in series and in parallel Understand how in a serial connection the current intensity is the same but the potential difference is divided Understand how in a parallel connection the current intensity is divided but the potential difference is the same Understand how to install measurement devices into a circuit 	<ul style="list-style-type: none"> Assembly of electrical circuits in series and in parallel Use of ammeters and voltmeters to properly measure the magnitudes of current intensity and potential difference Textbook activities Problem solving 	
3.1.4 Electrical resistance and Ohm's law	<ul style="list-style-type: none"> Understand the concept of electrical resistance Learn the SI unit for electrical resistance Associate low/high resistance values with good/poor electrical conductors Understand the factors that determine the resistance of a conductor Understand how to measure electrical resistance Understand and apply Ohm's law Distinguish between ohmic and non-ohmic conductors 	<ul style="list-style-type: none"> Experiments to determine the electrical resistance of various conductors and its relationship with Ohm's law Analysis of $U = f(I)$ graphs Textbook activities Problem solving 	
3.1.5 Potential and electrical energy	<ul style="list-style-type: none"> Define the magnitude of electric potential Understand the SI unit for potential Relate electrical potential to potential difference and current intensity Understand kWh as a practical unit of energy Understand the Joule effect 	<ul style="list-style-type: none"> Textbook activities Problem solving Observation of the Joule effect in electrical devices 	
3.2 Electromagnetism			
3.2.1 Electricity and magnetism	<ul style="list-style-type: none"> Understand the notion of a field Describe the interactions between electrical charges Describe a few properties of magnets Understand the magnetic effect of electrical current Analyze the factors that determine the magnetic field created by an electrical current Recognize the magnetic induction phenomenon Describe an induced current according to the conditions in which it is obtained. 	<ul style="list-style-type: none"> Textbook activities Transparencies Problem solving Experiments to demonstrate the magnetic effect of electrical current Experiments to produce induced current 	7
3.2.2 Applications of electromagnetism	<ul style="list-style-type: none"> Understand a few applications of electromagnetism Understand how a galvanometer works Learn the parts of an electromagnet Distinguish between dynamos and alternators Distinguish between direct current and alternating current Understand how a transformer works Relate the number of primary and secondary windings on a transformer to its input and output potential difference 	<ul style="list-style-type: none"> Textbook activities Transparencies Problem solving Experiments to demonstrate the existence of alternating currents and distinguish them from direct currents 	

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3.3 Electronic Components	<ul style="list-style-type: none">• Understand a few characteristics of electronic components• Identify electronic components by their symbols.	<ul style="list-style-type: none">• Textbook activities• Transparencies• Problem solving	2	
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