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ABSTRACT

The major program components of the Chemistry 30 curriculum are outlined in this document. These key elements include: (1) process skills; (2) psychomotor skills; (3) attitudes; and (4) concepts (subject matter). Each of the components has been assigned an emphasis rating (expressed in a percentage) and a priority rating (designated by a ranking of high, medium, or low). (ML)

DIPLOMA EXAMINATION

CURRICULUM SPECIFICATIONS
for
CHEMISTRY 30

Alberta
EDUCATION
April 1986

CHEMISTRY 30 CURRICULUM SPECIFICATIONS

A. Program Elements

The Chemistry program is based on four elements: process skills, psychomotor skills, attitudes, and concepts (subject matter). The percentage emphasis of each component for instruction in Chemistry 30 is listed in the table below. Even though each component is listed separately, instruction should integrate process skills, psychomotor skills, and attitudes with the development of concepts. Not all these elements have equal emphasis at each course level. Hence, development of these components should take place as the concepts are presented.

Content	Emphasis
Process Skills	30%
Psychomotor Skills	10%
Attitudes	10%
Concepts (Subject Matter)	50%

B. Priority Weightings

The following code is used in the specifications to indicate curriculum and instruction priority.

A = high priority
B = medium priority
C = low priority

CHEMISTRY 30 CURRICULUM SPECIFICATIONS

PROGRAM COMPONENTS

A. PROCESS SKILLS — 30%

PRIORITY RATING		EMPHASIS IN PER CENT
A	1. Questioning 1.1 Formulating and expressing relevant questions 1.2 Defining problem statements 1.3 Recognizing limitations to scientific investigation of given questions and problems	30%
A	2. Proposing Ideas 2.1 Formulating hypotheses 2.2 Stating predictions	
A	3. Designing Experiments 3.1 Defining operationally 3.2 Identifying and controlling variables 3.3 Determining procedures 3.4 Evaluating experimental designs and suggesting modifications	
B	4. Gathering Data 4.1 Observing accurately 4.2 Measuring accurately 4.3 Recording data clearly and completely 4.4 Estimating quantities and measures	

PROGRAM COMPONENTS Cont.

PRIORITY RATING		EMPHASIS IN PER CENT
B	5. Processing Data 5.1 Organizing and presenting data 5.2 Determining patterns and trends in data 5.3 Determining experimental error both for original data and for values derived from these data	Cont.
A	6. Interpreting Data 6.1 Identifying limits to interpretations 6.2 Generating appropriate explanations, theories and/or models 6.3 Generating ideas for extending knowledge related to the area of investigation	

B. PSYCHOMOTOR SKILLS	10%

PRIORITY RATING		EMPHASIS IN PER CENT
Equal priority	Develop and calibrate tools and instruments	10%
	Develop and manipulate various tools, instruments, apparatus, and materials proficiently	
	Carry out various accepted procedures and techniques, for example, laboratory work, field work, and preparations	
	Develop and follow safe practices and procedures	

C. ATTITUDES	10%

Equal priority	Awareness - Develop an awareness of the chemical factors related to issues of current interest.	10%
	Appreciation - Develop an appreciatic Chemistry as it contributes to meetin individual vocational and intellectual needs.	

D. CONCEPTS (SUBJECT MATTER) 50%

PRIORITY RATING	CONCEPT		EMPHASIS IN PER CENT
B		1. The enthalpy of a substance is the sum of the kinetic and potential energies of the molecules.	
A	Each substance has a definite and characteristic heat content or enthalpy	2. The heat of formation is the energy required or released as a substance is formed from its elements.	16%

PROGRAM COMPONENTS Cont.

PRIORITY RATING	CONCEPT		EMPHASIS IN PER CENT
B	Change in matter involves a change in energy	1. Changes that require energy are endothermic and those that release energy are exothermic.	Cont.
B		2. More energy is involved in a nuclear change than in a chemical change and, in general, more energy is involved in a chemical change than in a phase change.	
A		3. In a phase, chemical, or nuclear change, the change in energy is the energy of the products less the energy of the reactants.	
A		4. The ΔH of chemical and phase changes are determined calorimetrically.	
B		5. By addition of ΔH values for known reactions, ΔH values for new reactions can be predicted.	
A		6. The amount of energy released or absorbed in a phase, chemical, or nuclear change is related to the number of moles of reactants.	
B	Acids and bases can be defined in different ways	1. Acids taste sour, change the color of indicators, etc. Bases taste bitter, change the color of indicators, etc.	17%
B		2. Acids neutralize bases.	
B		3. Arrhenius defined acids as those substances that increase the $H_3O^+(aq)$ concentration and bases as those that increase the $OH^-(aq)$ concentration.	
A		4. Brønsted and Lowry defined acids as proton donors and bases as proton acceptors.	

PROGRAM COMPONENTS Cont.

PRIORITY RATING	CONCEPT		EMPHASIS IN PER CENT
A	The relative acidity of a solution can be measured	1. The strengths of acids and bases vary and are a measure of the equilibrium condition.	Cont.
A		2. The pH scale is a measure of the $H_3O^+(aq)$ concentration.	
B		3. Indicator color may be used to determine the pH.	
A	Acid-base reactions involve an exchange of protons	1. An acid-base reaction can be represented by a net ionic equation.	
A		2. The relative strengths of bases can be used to predict the equilibrium conditions.	
A		3. Titration is one of the main techniques used in quantitative measurement of acid-base reactions.	
A		4. The determination of quantitative relationships in acid-base reactions is part of stoichiometry.	
B	Redox reactions involve an exchange of electrons	1. Oxidation is defined as the loss of electrons. Reduction is defined as the gain of electrons.	17%
A		2. Oxidizing agents cause oxidation and reducing agents cause reduction to occur.	
A		3. A redox reaction can be represented by a net ionic equation.	

PROGRAM COMPONENTS Cont.

PRIORITY RATING	CONCEPT		EMPHASIS IN PER CENT
B	In a redox reaction the electron loss and gain must balance	1. Oxidation numbers of half-reactions illustrate the loss and gain of electrons.	Cont.
A		2. Oxidation numbers of half-reactions may be used to balance equations.	
B		3. Titration is one of the main techniques in quantitative measurement of redox reactions.	
A		4. The determination of quantitative relationships in redox reactions is part of stoichiometry.	
B	The electric potential of a redox reaction can be predicted and measured	1. Reduction potentials are relative potentials of reduction half-reaction.	
C		2. Oxidation potentials are negative reduction potentials.	
A		3. The relative strengths of oxidizing and reducing agents are compared in terms of a table of reduction potentials.	
A		4. The net potential of a redox reaction is the sum of the oxidation and reduction potentials.	
A		5. The spontaneity of a redox reaction can be predicted from the relative strengths of the oxidizing agents or from the positive sign of the net potentials.	

PROGRAM COMPONENTS Cont.

PRIORITY RATING	CONCEPT		EMPHASIS IN PER CENT
A	Redox reactions involve electrical energy	1. Electrochemical cells convert chemical energy to electrical energy.	Cont.
A		2. Electrolytic cells are used to convert electrical energy to chemical energy.	
B		3. There are many applications of electrochemical and electrolytic cells.	