

SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO



Sault College

COURSE OUTLINE

COURSE TITLE: FUNDAMENTALS OF BIOLOGY AND CHEMISTRY
CODE NO. : SCI110 **SEMESTER:** I AND II
PROGRAM: GENERAL ARTS AND SCIENCE
AUTHOR: DAVID TROWBRIDGE
DATE: AUG '03 **PREVIOUS OUTLINE DATED:** JAN '03
APPROVED: _____
DEAN **DATE**
TOTAL CREDITS: 5
PREREQUISITE(S): NONE
HOURS/WEEK: 3 HOURS LECTURE, 2 HOURS LAB

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School of Technology, Skilled Trades & Natural Resources

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I. COURSE DESCRIPTION:

This is an introduction to scientific principles and the scientific process. In both theory and laboratory sessions, students will be presented with topics covering life science including plant, animal and human biology, and chemistry. This course will be an appropriate starting point for students who have not had a recent high school science and wish to pursue career paths where a science credit is required. Practical lab activities will be incorporated to illustrate the concepts discussed in the classroom.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:**A. Learning Outcomes:**

(Generic Skills Learning Outcomes placement on the course outline will be determined and communicated at a later date.)

Upon successful completion of this course the student will demonstrate the ability to:

1. Convert given units within the metric and Imperial systems of measurement and from one system to the other.
2. Identify the scientific method and the fundamental life processes including the organization of living organisms.
3. Be able to identify the characteristics that define life, hereditary traits and the functioning of the human body.
4. State and describe the properties and atomic structure of matter.
5. Interpret the language of chemistry including chemical symbols for the elements, compounds and chemical equations.

B. Learning Outcomes and Elements of the Performance:

Upon successful completion of this course, students will demonstrate the ability to:

1. Convert given units within the metric and Imperial systems of measurement and from one system to the other.

Potential Elements of the Performance

- identify and write abbreviations for the various units;
- convert given units of length (distance), mass (weight), area, volume, capacity and temperature within and between the SI and Imperial systems;
- measure and calculate given objects to given degrees of accuracy;
- solve given measurement problems.

LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE (Continued):

2. Identify the scientific method and the fundamental life processes including the organization of living organisms.

Potential Elements of the Performance

- state the principles of the scientific method
- recognize control and experimental factors
- formulate hypotheses and theories
- identify the characteristics that define life;
- describe a cell and its parts;
- compare plant and animal cells;
- describe the characteristics of some one-celled organisms;
- describe the levels of organization in a multi-celled organism;
- explain the process of photosynthesis;
- compare respiration and photosynthesis;
- describe the features of a scientific classification system;
- explain why a classification system is used;
- identify the general characteristics of the five kingdoms;
- give examples of organisms in each kingdom;
- describe viruses;
- explain immunization.

3. Identify the characteristics that define life, hereditary traits and the functioning of the human body.

Potential Elements of the Performance

- identify traits that are passed from generation to generation;
- describe the process of mitosis;
- describe several methods of asexual reproduction;
- describe how sexual reproduction differs from asexual reproduction;
- explain the function of meiosis;
- describe reproduction in flowering plants;
- describe the inheritance of dominant and recessive traits;
- describe the function of genes;
- explain the difference between a pure trait and a hybrid trait;
- identify the sex chromosomes and explain the inheritance of sex-linked traits;
- describe the structure of DNA;
- identify the role of DNA in inheritance;
- identify what mutations are and how they occur;
- describe how people have developed breeds of plants and animals with desirable traits;
- describe what bones and muscles are like and how they work in the body;
- identify parts of the circulatory system and their functions;
- describe the actions involved in breathing;

LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE(Continued):

- explain the function of breathing;

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- explain how food is digested and absorbed by the body;
- describe the structure and function of the excretory system;
- identify the parts of the nervous system;
- explain the function of the nervous system;
- describe the function of different hormones;
- identify the effects of alcohol, tobacco and other drugs on the body;

4. State the properties of matter and describe the atomic structure of matter.

Potential Elements of the Performance

- define mass and volume as properties of matter and describe ways of measuring them;
- define density;
- describe the three states of matter;
- define melting point and boiling point;
- predict the state of a substance at a certain temperature, given its melting and boiling points;
- discuss the properties of mixtures and solutions;
- define solubility and describe how it can be used to identify a substance;
- describe the effect of temperature on solubility;
- distinguish between mixtures and pure substances;
- give examples of the ways different types of mixtures can be separated;
- explain how chemical and physical changes differ;
- state the law of definite proportions;
- define and give examples of combustion;
- discuss the dangers of fire and some fire safety rules.
- explain what is meant by a scientific model;
- describe Dalton's atomic model;
- define atoms and molecules;
- describe how chemical symbols are used;
- define a chemical formula;
- determine the number of atoms of each element in a chemical formula;
- explain what happens during a chemical reaction;
- identify the parts of a chemical equation;
- state the law of conservation of mass;
- tell whether a chemical equation is balanced;
- describe Thomson's model of the atom;
- describe Rutherford's model of the atom;
- define electrons, neutrons and protons;
- explain how elements can be identified by the light they give off;
- describe the Bohr model of the atom;
- define electrons, neutrons and protons;
- explain how elements can be identified by the light they give off;
- describe the Bohr model of the atom;
- compare the current model of the atom with the Bohr model.

LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE (Continued):

5. Interpret the language of chemistry including chemical symbols for the elements, compounds and chemical equations.

Potential Elements of the Performance

- describe typical physical properties of metals and nonmetals;
- give examples of metals and nonmetals and state some of their uses;
- define and give examples of metalloids;
- identify similarities in properties among the noble-gas elements;
- describe some uses of the noble gases;
- explain why the noble gases are non-reactive;
- identify similarities in properties among the family of the halogens;
- describe some uses for halogens and halides;
- explain why the atoms of halogens tend to gain or share electrons;
- identify similarities in properties among the family of the alkali metals;
- describe some uses for the alkali metals;
- explain why the atoms of alkali metals tend to lose one electron;
- explain the use of the periodic table;
- describe how ionization energy varies;
- explain how ionic bonding occurs;
- state how covalent bonding occurs;
- describe polar molecules;
- explain why there are so many carbon compounds;
- state what a structural formula represents.
- contrast the particle motions in the three states of matter;
- describe the energy changes that occur when matter changes state;
- explain what happens to its particles when matter changes state;
- explain why the energy associated with chemical changes is, in general, greater than that associated with physical changes;
- explain the difference between exothermic and endothermic reactions;
- define oxidation and reduction;
- give examples of oxidation-reduction reactions;
- describe how electrochemical cells work;
- explain how unwanted electrochemical reactions can cause corrosion;
- describe some ways of preventing corrosion;
- state the properties of acids and bases;
- describe what happens when an acid and a base react;
- explain what is meant by the pH of a solution;
- state and explain the factors that affect the rate of a chemical reaction;

LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE (Continued):

6. Utilize correct laboratory techniques and safe working practices in a laboratory setting.

Potential Elements of the Performance:

- discuss and apply safe lab procedures including the handling of dangerous materials;
- demonstrate knowledge of the Workplace Hazardous Materials Information System (WHMIS);
- demonstrate use of balances, pH measuring devices, burettes, and common lab glassware;
- determine to within acceptable accuracy an unknown quantity by following a laboratory procedure;

III. TOPICS:**MEASUREMENT**

Metric System

BIOLOGY

- 1 Introduction to Life
- 2 Heredity
- 3 The Human Body

CHEMISTRY

- 4 Properties of Matter
- 5 Atoms and Molecules
- 6 Chemical Elements
- 7 Chemical Reactions

IV. REQUIRED RESOURCES / TEXTS / MATERIALS:

Text: General Science, Allyn and Bacon, Current Edition,

Workbook for General Science, Allyn and Bacon

v. EVALUATION PROCESS / GRADING SYSTEM

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The final grade will be determined according to the following components and weighting:

Lab assignments and projects	40%
Term tests (three tests of equal value)	50%
Final exam	10%

Total	100%

The following semester grades will be assigned to students in postsecondary courses:

<u>Grade</u>	<u>Definition</u>	<u>Grade Point Equivalent</u>
A+	90 - 100%	4.00
A	80 - 89%	3.75
B	70 - 79%	3.00
C	60 - 69%	2.00
F (Fail)	59% and below	0.00

NOTE: Students may be assigned an "R" grade early in the course for unsatisfactory performance.

CR (Credit)	Credit for diploma requirements has been awarded.
S	Satisfactory achievement in field /clinical placement or non-graded subject area.
U	Unsatisfactory achievement in field/clinical placement or non-graded subject area.
X	A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.
NR	Grade not reported to Registrar's office.
W	Student has withdrawn from the course without academic penalty.

VI. SPECIAL NOTES:

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Special Needs:

If you are a student with special needs (e.g. physical limitations, visual impairments, hearing impairments, or learning disabilities), you are encouraged to discuss required accommodations with your instructor and/or the Special Needs office. Visit Room E1204 or call Extension 493 so that support services can be arranged for you.

Retention of course outlines:

It is the responsibility of the student to retain all course outlines for possible future use in acquiring advanced standing at other postsecondary institutions.

Plagiarism:

Students should refer to the definition of “academic dishonesty” in *Student Rights and Responsibilities*. Students who engage in “academic dishonesty” will receive an automatic failure for that submission and/or such other penalty, up to and including expulsion from the course/program, as may be decided by the professor/dean. In order to protect students from inadvertent plagiarism, to protect the copyright of the material referenced, and to credit the author of the material, it is the policy of the department to employ a documentation format for referencing source material.

Course outline amendments:

The Professor reserves the right to change the information contained in this course outline depending on the needs of the learner and the availability of resources.

Substitute course information is available in the Registrar's office.

VII. PRIOR LEARNING ASSESSMENT:

Students who wish to apply for advanced credit in the course should consult the professor. Credit for prior learning will be given upon successful completion of a challenge exam or portfolio.

VIII. DIRECT CREDIT TRANSFERS:

Students who wish to apply for direct credit transfer (advanced standing) should obtain a direct credit transfer form from the Dean's secretary. Students will be required to provide a transcript and course outline related to the course in question.