

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY
SAULT STE MARIE, ON



COURSE OUTLINE

Course Title: FUNDAMENTALS OF BIOLOGY & CHEMISTRY

Code No.: SCI110 0

Semester: I AND II

Program: GENERAL ARTS & SCIENCE

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Date: JUNE 2002 Previous Outline Date: JUNE 2001

Approved: _____
Dean Date

Total Credits: 5

Prerequisite(s): NONE

Length of Course: 16 WEEKS

Total Credit Hours: 80

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For additional information, please contact Brian Punch, Dean, School of Natural Resources (705) 759-2554, Ext. 688.

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, ecology 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. List basic ecological concepts and describe the distribution of life on earth.
5. State and describe the properties and atomic structure of matter.
6. 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.

COURSE NAME

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**II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE
(Continued):**

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.

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;

**II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE
(Continued):**

- 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;
- explain the function of breathing;
- 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. List basic ecological concepts and describe the distribution of life on earth.

Potential Elements of the Performance

- identify the parts of an ecosystem;
- define and give examples of food chains and food webs;
- identify the roles of producers, consumers and decomposers in food chains;
- trace the transfer of energy in a food pyramid;
- describe four processes that cause a population to change in size;
- identify limiting factors in an ecosystem;
- describe the process of succession in an ecosystem;
- identify the factors that can harm a habitat;
- identify factors that lead a species to become endangered or extinct.
- define the theory of evolution;
- explain Darwin's theory of natural selection;
- identify some plant and animal adaptations;
- explain how climate affects biomes;
- describe the features of tundra and tropical rain forest biomes;
- describe the characteristics of deciduous and evergreen forest biomes;
- identify some adaptations of forest organisms;
- describe the features of the desert biome;
- identify some adaptations of desert plants and animals;
- identify the features of the grassland biome;
- describe life zones in the ocean;
- identify adaptations that help organisms survive in the ocean.

**II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE
(Continued):**

5. 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.

**II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE
(Continued):**

6. 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;

**II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE
(Continued):**

7. 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
- 4 Ecology
- 5 Distribution of Life

CHEMISTRY

- 6 Properties of Matter
- 7 Atoms and Molecules
- 8 Chemical Elements
- 9 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

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

| | |
|------------------------------------------|-------|
| Lab assignments and projects | 40% |
| Term tests (four tests of equal value) | 50% |
| Final exam | 10% |
| | ----- |
| Total | 100% |

METHOD OF ASSESSMENT

| | | |
|----|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| A+ | Consistently outstanding | (90% - 100%) |
| A | Outstanding achievement | (80% - 89%) |
| B | Consistently above average achievement | (70% - 79%) |
| C | Satisfactory or acceptable achievement in all areas subject to assessment | (60% - 69%) |
| R | Repeat - The student has not achieved the objectives of the course, and the course must be repeated | (less than 60%) |
| CR | Credit exemption | |
| X | A temporary grade, limited to situations with extenuating circumstances, giving a student additional time to complete course requirements | |

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

The minimum passing grade is 60% based on the weighting described above. Grades from 50% to 60% may allow the student the right to an overall supplemental provided that the attendance requirement has been met, and all projects and assignments are completed and submitted. All lower grades or failure to meet other requirements as listed above will require the student to repeat the course in order to gain credit.

The instructor retains the right to modify the course content during the duration of the course provided that these modifications are explained to those taking the course.

VI. SPECIAL NOTES:Special Needs

Students with special needs (e.g. physical limitations, visual impairments, hearing impairments, learning disabilities) are encouraged to discuss required accommodations with the professor and/or contact the Special Needs Office.

Complementary Activities

To meet course objectives, students should expect to match each scheduled class hour with independent study.

Plagiarism

Students should refer to the definition of “academic dishonesty” in the “Statement of Student Rights and Responsibilities.”

Students who engage in “academic dishonesty” will receive an automatic failure for that submission and/or other such penalty, up to and including expulsion from the course.

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.

Retention of Course Outlines

Students are responsible for retaining all course outlines for possible future use in gaining advanced standing at other post-secondary institutions.

Substitute course information is available at the Registrar’s office.

VII. PRIOR LEARNING ASSESSMENT

Students who have related employment-centered experience should see the Prior Learning Assessment (PLA) Coordinator.