

SCIENCE GUIDELINES – EXPECTATIONS

BIOLOGY, GRADE 12, UNIVERSITY PREPARATION

METABOLIC PROCESSES

Overall Expectations

By the end of this course, students will:

- Describe the structure and function of the macromolecules necessary for the normal metabolic functions of all living things, and the role of enzymes in maintaining normal metabolic functions;
- Conduct laboratory investigations into the transformation of energy in the cell, including photosynthesis and cellular respiration, and into the chemical and physical properties of biological molecules;
- Explain ways in which knowledge of the metabolic processes of living systems can contribute to technological development and affect community processes and personal choices in everyday life.

Relevant “Over to You” Activities:

Section 6: Research/Interview

Section 7: Research Paper

Section 10: Gather and Summarize Perspectives

Specific Expectations

Understanding Basic Concepts

Developing Skills of Inquiry and Communication

Relating Science to Technology, Society, and the Environment

- Explain the relevance, in their personal lives and the life of the community, of the study of cell biology and related technologies (e.g., explain how their learning about metabolic processes is relevant to their personal choices about exercise, diet, and the use of pharmacological substances).

Relevant “Over to You” Activities:

Section 6: Research/Interview

Section 7: Research Paper

Section 10: Create a Tip Sheet

Section 10: Gather and Summarize Perspectives

MOLECULAR GENETICS

Overall Expectations

By the end of this course, students will:

- Explain the concepts of gene and gene expression and the roles of DNA, RNA, and chromosomes in cellular metabolism, growth, and division, and demonstrate an awareness of the universality of the genetic code;
- Explain, through laboratory activities and conceptual models, processes within the cell nucleus;
- Describe some of the theoretical issues surrounding scientific research into genetic continuity; the general impact and philosophical implications of the knowledge gained; and some of the issues rose by related technological applications.

Relevant “Over to You” Activities:

Section 1: View DVD/Prepare Questions

Section 1: Develop a Survey

Section 10: Gather and Summarize Perspectives

Specific Expectations

Understanding Basic Concepts

Developing Skills of Inquiry and Communication

Relating Science to Technology, Society, and the Environment

- Explain the roles of evidence, theories, and paradigms in the development of scientific knowledge about genetics (e.g., explain the impact of cloning a sheep on the theory of differentiation; explain the impact of the discovery of the structure of DNA as the universal molecule for living organisms)

Relevant “Over to You” Activities:

Section 10: Gather and Summarize Perspectives

HOMEOSTASIS

Overall Expectations

By the end of this course, students will:

- Describe and explain the physiological and biochemical mechanisms involved in the maintenance of homeostasis;
- Analyze, through experiments and the use of models, the feedback mechanisms that maintain chemical and physical homeostasis in animal systems;
- Analyze how environmental factors (physical, chemical, emotional, and microbial) and technological applications affect/contribute to the maintenance of homeostasis, and examine related societal issues.

Relevant “Over to You” Activities:

Section 4: Descriptive Presentation

Section 6: Research/Interview

Specific Expectations

Understanding Basic Concepts

- Describe the anatomy and physiology of the endocrine and nervous systems, and explain their roles in homeostasis;

Relevant “Over to You” Activities:

Section 6: Research/Interview

- Explain the role of the kidney in maintaining water and ion balance

Relevant “Over to You” Activities:

Section 5: Online Research and Key Message Writing

Section 5: Scientific Presentation

- Developing skills of inquiry and communication
- Compile and display, either by hand or computer, data and information about homeostatic phenomena in a variety of formats, including diagrams, flow charts, tables, graphs, and scatter plots

Relevant “Over to You” Activities:

Section 1: Develop a Survey

Section 2: Make a Mini Guinness World Records Display

Section 7: Research

Section 7: Research Paper

Relating Science to Technology, Society, and the Environment

- Synthesize case study information about the effects of taking chemical substances to enhance performance or improve health (e.g., explain the effects of steroids on health; debate the wisdom of taking large quantities of vitamins or amino acids; describe substances people use to cope with stress);

Relevant “Over to You” Activities:

Section 4: Descriptive Presentation

- Present informed opinions about problems related to the health industry, health legislation, and personal health (e.g., describe issues related to transplants or kidney dialysis; discuss the difficulties in treating neurological and infectious diseases);

Relevant “Over to You” Activities:

Section 1: Oral Presentation

Section 3: Research and Presentation

Section 4: Descriptive Presentation

Section 5: Online Research and Key Message Writing

Section 5: Scientific Presentation

Section 6: Research/Interview

Section 7: Research Paper

Section 10: Gather and Summarize Perspectives

- Describe some Canadian contributions to knowledge and technology in the field of homeostasis (e.g., the discovery of a new blood stem cell; the discovery of insulin).

Relevant “Over to You” Activities:

Section 3: Research and Presentation

Section 5: Scientific Presentation

Section 7: Research Paper

EVOLUTION

Overall Expectations

By the end of this course, students will:

- Analyze evolutionary mechanisms, and the processes and products of evolution;
- Evaluate the scientific evidence that supports the theory of evolution;
- Analyze how the science of evolution can be related to current areas of biological study, and technological development has extended or modified knowledge in the field of evolution.

Specific Expectations

Understanding Basic Concepts

Developing Skills of Inquiry and Communication

Relating Science to Technology, Society, and the Environment

POPULATION DYNAMICS

Overall Expectations

By the end of this course, students will:

- Analyze the components of population growth and explain the factors that affect the growth of various populations of species;
- Investigate, analyze, and evaluate populations, their interrelationships with ecosystems and their effect on the sustainability of life on this planet;
- Evaluate the carrying capacity of the Earth and relate the carrying capacity to the growth of populations, their consumption of natural resources and advances in technology.

Specific Expectations

Understanding Basic Concepts

- Explain, using demographic principles, problems related to the rapid growth of human populations and the effects of that growth on future generations (e.g., relate the carrying capacity of the Earth to the growth of populations and their consumption of resources).

Relevant “Over to You” Activities:

Section 2: Make a Mini Guinness World Records Display

Section 10: Gather and Summarize Perspectives

Developing Skills of Inquiry and Communication

- Investigate, individually or collaboratively, the effects of human population growth on the environment and the quality of life

Relevant “Over to You” Activities:

Section 2: Make a Mini Guinness World Records Display

Section 10: Gather and Summarize Perspectives

Relating Science to Technology, Society, and the Environment

- Analyze Canadian investments in human resources and technology in a developing country

Relevant “Over to You” Activities:

Section 10: Gather and Summarize Perspectives

- Outline the advances in medical care and technology that have contributed to an increase in life expectancy, and relate these developments to demographic issues.

Relevant “Over to You” Activities:

Section 1: View DVD/Prepare Questions

Section 1: Read, Discuss and Write a Newspaper Report

Section 2: Make a Mini Guinness World Records Display

Section 5: Scientific Presentation

Section 7: Discover New Term

Section 7: Research Paper