



**DEPARTMENT OF ACADEMIC UPGRADING
COURSE OUTLINE**

SCIENCE 0110 5(5.5 – 0 – 1.5) 7hr for 15 weeks (105hr total)

INSTRUCTOR: TANYA KELLER **PHONE:** 539 – 2980
OFFICE: J – 216 **E-MAIL:** TKeller@gprc.ab.ca
OFFICE HOURS: Monday 1:30-2:30pm, Thursday 1:30-2:30pm or by
appointment

Required Text/Resource Materials:

Chemistry 0110 Review by Nancy Fraser
Science 10 Addison Wesley
Lab manual (Can be printed from Moodle)
Lab coat (is loaned to you from the lab)
Lab Safety Glassess
10 quad to 1 cm graph paper (can be printed off of Moodle)
Nonprogrammable calculator
Lab notebook

CALENDAR

DESCRIPTION: This course provides an introduction to major concepts in biology, chemistry and physics. The four areas of study are: Energy and Matter in Chemical Change, Energy Flow in Technological Systems, Cycling of Matter in Living Systems and Energy Flow in Global Systems.

PREREQUISITES : SC0100 or consent of the department; EN0090 or EN0110 placement; MA0091 or MA0093 or MA0110 placement

CREDIT/CONTACT HOURS: SC0110 is 7 hours per week. 5 credit course. (5.5 – 0 – 1.5)

OBJECTIVES:

The following are topics that the students are responsible for on their own time:

- i. state SI units and know how to convert various units.
- ii. define WHMIS and know the related symbols and the appropriate safety measures that need to do taken. There will be a test on this as part of the first chemistry lab.

The following are the topics that I be covering in this course:

- ii. state the number significant figures and how to correctly round numbers.
- iii. write numbers in scientific notation and in standard form.
- iv. define density and solve related problems.

Unit 2: Atomic Structure:

The following are the topics that I be covering in this course:

- i. the definition of atomic number (Z)
- ii. the definition of mass number
- iii. the definition of atomic mass units
- iv. the definition of isotopes
- v. how to draw atomic structure diagrams
- vi. the names and symbols of the first 20 elements in the same position as they appear on the periodic table
- vii. state the octet rule (Rule of eight).
- viii. state the number of valence electrons, and draw the electron dot diagrams for all elements of the "main part" of the periodic table.
- ix. distinguish between groups and periods
- x. distinguish among metals, nonmetals, & metalloids(semi-metals)

Unit 3: Inorganic Nomenclature: (THE MOST IMPORTANT PART OF CHEMISTRY!!!)

The following are the topics that I be covering in this course:

- i. naming of compound containing single valence metals and nonmetals
- ii. naming of compound containing two nonmetals
- iii. naming of compound containing Variable valence metals
- iv. naming of compound containing Polyatomic ions
- v. naming binary acids
- vi. naming ternary or oxyacids
- vii. Arrhenius definition of an acid and a base.

Unit 4: Chemical Equations:

The following are the topics that I be covering in this course:

- i. state law of conservation of mass
- ii. balancing equations by inspection

Unit 1: Kinematics

The following are the topics that I be covering in this course:

- i. Definition and distinction between distance and displacement.
- ii. Definition of scalar and vector quantities.
- iii. Definition and distinction between speed and velocity; average and instantaneous. State their units.
- iv. Definition and explanation of acceleration and state its units.
- v. the explanation of why time appears twice in the acceleration unit.
- vi. distance-time, and velocity-time and acceleration-time graphs. Determine velocity and acceleration from the slopes of the respective graph. Determine displacement from the area under a velocity-time graph.
- vii. how and when to use the following formulae to solve problems.

$$v = \frac{x}{t};$$

$$v = \frac{v + v_0}{2};$$

$$v = v_0 + at;$$

$$x = \left(\frac{v + v_0}{2} \right) t$$

$$x = v_0 t + \frac{1}{2} at^2;$$

$$v^2 = v_0^2 + 2ax$$

- viii. international sign conventions for positive and negative directions
- ix. definition of acceleration due to gravity, "g" and state its value. Also be able to explain the dependency of the value of "g" on different locations.
- x. define and distinguish between mass and weight, and state their units.
- xi. Solve problems involving "g."

Unit 2: Force and Newton's Laws of Motion

Approximately 2 days

The following are the topics that I be covering in this course:

- i. define and explain force, and state its units
- ii. Newton's First Law of Motion giving examples, explain inertia and its relation to the First Law.
- iii. Newton's Second Law of Motion and derive the expression $F = ma$.
- iv. force of friction, and the solution of related problems.
- v. Newton's Third Law of Motion, and apply it to relevant situations.

Unit 3: Work, Energy, and Power

Approximately 5 days

The following are the topics that I be covering in this course:

- i. energy and state its units.
- ii. different forms of energy, and explain the principle of conservation of energy.
- iii. kinetic and potential energies, and using the principles of conservation of energy, convert kinetic energy into potential energy, and vice-versa.
- iv. work done by a force, and state units of work, and how to solve related problems.
- v. situations in which a force does not do any work.
- vii. relationship between work and energy, and using the relation, convert one into the other and the solution of related problems.
- viii. power, and state its units, and the solution of related problems.
- ix. simple machines; the pulley, the wheel and axle and lever and explain mechanical advantage and efficiency of simple machines, and the solution of related problems.

Unit 4: Heat

Approximately 4 days

The following are the topics that I be covering in this course:

- i. heat as thermal energy, and state its units.
- ii. temperature, and distinguish between heat and temperature.
- iii. the Celsius and Kelvin (Absolute) scales of temperature, and convert one into the other.
- iv. specific heat capacity (or heat capacity) , and state its units.
- v. the implications of the high heat capacity of water, and how it modifies the climate of coastal areas.
- vi. relation between the mass of a substance and its heat capacity, amount of heat and temperature change and the solution of related problems.
- vii. heat of fusion and heat of vaporization, the solution of related problems.

OUTCOMES:**Course Content****CHEMISTRY****Time: 22 days****Unit 1: Introduction:****Approximately 3 days**

On completing this section, you should be able to:

- i. state SI units and know how to convert various units
- ii. state the number significant figures and how to correctly round numbers.
- iii. write numbers in scientific notation and in standard form.
- iv. define density and solve related problems.
- v. define WHMIS and know the related symbols and the appropriate safety measures that need to do taken.

Unit 2: Atomic Structure:**Approximately 3 days**

On completing this section, you should be able to:

- i. define atomic number (Z)
- ii. define atomic mass number
- iii. define atomic mass units
- iv. define isotopes
- v. draw atomic structure diagrams
- vi. write out the names and symbols of the first 20 elements in the same position as they appear on the periodic table from memory
- vii. state the octet rule (Rule of eight).
- viii. state the number of valence electrons, and draw the electron dot diagrams for all elements of the "main part" of the periodic table.
- ix. Groups and periods
- x. Metals, nonmetals, & metalloids(semi-metals)

Unit 3: Inorganic Nomenclature:**Approximately 7 days****(THE MOST IMPORTANT PART OF CHEMISTRY!!!)**

On completing this section, you should be able to name and write formulae in each of the following seven categories:

- i. Single valence metals

- ii. Two nonmetals
- iii. Variable valence metals
- iv. Polyatomic ions
- v. Binary acids
- vi. Ternary or oxyacids
- vii. Bases
- viii. Students should be able to state the Arrhenius definition of an acid and a base.

Unit 4: Chemical Equations:

Approximately 3 days

On completing this section, you should be able to:

- i. state law of conservation of mass
- ii. balancing equations by inspection

Physics

Time: 22 days

Unit 1: Kinematics

Approximately 5 days

On completing this unit, you should be able to:

- i. Define and distinguish between distance and displacement giving examples.
- ii. Define and identify scalar and vector quantities, giving examples.
- iii. Define and explain speed and velocity; average and instantaneous. State their units.
- iv. Define and explain acceleration and state its units.
- v. Explain why time appears twice in the acceleration unit.
- vi. Draw distance-time, and velocity-time graphs. Determine velocity and acceleration from the slopes of the respective graph. Determine displacement from the area under a velocity-time graph.
- vii. Apply the following formulas in relevant situations to solve problems.

$$v = \frac{x}{t};$$

$$v = \frac{v + v_0}{2};$$

$$v = v_0 + at;$$

$$x = \left(\frac{v + v_0}{2} \right) t$$

$$x = v_0 t + \frac{1}{2} a t^2;$$

$$v^2 = v_0^2 + 2ax$$

- viii. Use the international sign conventions for positive and negative directions
- ix. Define acceleration due to gravity, “g” and state its value. Also be able to explain the dependency of the value of “g” on different locations.
- x. Distinguish between mass and weight, and state their units.
- xi. Solve problems involving “g.”

Unit 2: Force and Newton’s Laws of Motion

Approximately 2 days

On completing this unit, you should be able to:

- i. Define and explain force, and state its units
- ii. State and explain Newton’s First Law of Motion giving examples. Explain inertia and its relation to the First Law.
- iii. State and explain Newton’s Second Law of Motion and derive the expression $F = ma$.
- iv. Explain the force of friction, and incorporate it in problems involving force.
- v. Solve problems based on the Second Law.
- vi. State and explain Newton’s Third Law of Motion, and apply it to relevant situations.

Unit 3: Work, Energy, and Power

Approximately 5 days

On completing this unit, you should be able to:

- i. Define and explain energy and state its units.
- ii. Name different forms of energy, and explain the principle of conservation of energy.
- iii. Explain kinetic and potential energies, and using the principles of conservation of energy, convert kinetic energy into potential energy, and vice-versa.
- iv. Define and explain work done by a force, and state units of work.
- v. Identify situations in which a force does not do any work.
- vi. Calculate work done in different situations.
- vii. Explain the relation between work and energy, and using the relation, convert one into the other. Solve related problems.
- viii. Define and explain power, and state its units. Solve related problems.
- ix. Explain the working of a simple machines; the pulley, the wheel and axle and lever. Explain mechanical advantage and efficiency of simple machines, and how they are calculated.

- x. Solve problems based on the above three simple machines.

Unit 4: Heat

Approximately 4 days

On completing this unit, you should be able to:

- i. Describe heat as thermal energy, and state its units.
- ii. Define temperature, and distinguish between heat and temperature.
- iii. Explain the Celsius and Kelvin (Absolute) scales of temperature, and convert one into the other.
- iv. Define and explain specific heat capacity (or heat capacity) , and state its units.
- v. Discuss the implications of the high heat capacity of water, and how it modifies the climate of coastal areas.
- vi. State the relation between the mass of a substance and its heat capacity, amount of heat and temperature change. Solve related problems.
- vii. Define change of state, define and explain heat of fusion and heat of vaporization. State their units.
- viii. Use the heat of fusion and heat of vaporization to calculate the amount of heat absorbed or released when substances undergo phase changes.

Biology

Unit Objectives:

This unit introduces students to the following Key Concepts:

- Microscopy and the emergence of cell theory
- Cellular structures and functions, and technological applications
- Active and passive transport of matter

- Relationship between cell size and shape, and surface area to volume ratio
- Use of explanatory and visual models in science
- Cell specialization in multicellular organisms; i.e., plants
- Mechanisms of transport, gas exchange, and environmental response in multicellular organisms; i.e., plants

Learning Outcomes:

As a result of taking this unit, students will gain the ability to:

BIOLOGY: MICROSCOPY & CELLS

Part 1 - Microscopy

5 DAYS

- State the contributions of Hans and Zacharias Janssen, Robert Hooke, and Anthony van Leeuwenhoek to the development of early microscopes.
- Identify and name different parts of a compound microscope.
- Outline the procedures of using a microscope.
- List the safety procedures one must follow when using a microscope.
- Differentiate between different types of biological slides such as wet mount slides and prepared slides.
- Describe staining and image enhancing (contrast).
- Determine the magnification of a compound microscope when using the different objectives.
- Define field of view and state what happens to the field of view as different objectives are used.
- Differentiate between drawing magnification and microscopic magnification.
- Calculate drawing magnification and estimate sizes of biological specimens including both macroscopic and microscopic specimens.
- Draw and label lab drawings using biological standards. Define resolving power (or resolution) and relate to the clarity of magnification.
- Summarize the functions of each of the following different types of microscopes: electron microscope, transmission electron microscope (TEM) and scanning electron microscope (SEM). Compare these microscopes to the compound microscope.

Learning Activities:

- *Lab #1 – Introduction to Microscopes and Drawings*
- *Assignment #1 – Microscopy*

Internet Resources:

How to Use a Compound Microscope

<http://www.udel.edu/biology/ketcham/microscope/scope.html>

PowerPoint Presentations

Unit 1 PowerPoint

Compound Microscope PowerPoint

In Class Worksheets

Diagram of Compound microscope (label)

Matching Exercise

Drawing Magnification Exercise

Part 2 – Cell Theory and Cells

5 DAYS

- List the 5 general characteristics of living things.
- Define spontaneous generation.
- Summarize the experiments of Redi, Needham, Spallanzani, and Pasteur in terms of spontaneous generation.
- Define controlled variable, manipulated variable, and responding variable, experimental control and discuss in terms of Pasteur's experiment.
- Summarize the contributions of Hooke, Schleiden, Schwann, and Virchow to the development of the cell theory.
- State the modern cell theory.
- Recognize the existence of sub-cellular particles such as viruses and prions, which have only some of the characteristics of living things.
- Describe the structure and function of each of the following organelles: nucleus (nuclear envelope, pores, nucleoplasm, nucleolus, chromatin); cell membrane, vacuole, lysosomes, rough and smooth endoplasmic reticulum, Golgi apparatus, vesicles, ribosomes, chloroplasts, mitochondria, centrioles, cell wall, cytoskeleton, cilia, and flagella.
- Relate a cell's structure to its function.
- Differentiate between prokaryotic and eukaryotic cells.
- Differentiate between animal and plant cells in terms of structure and function.
- Label diagrams of plant and animal cells.

Learning Activities:

- Quiz (to be counted as an assignment mark)
- Unit 1 Test

Internet Resources:

Tour of the Cell (14 minutes includes a microscope discussion)

<https://www.youtube.com/watch?v=1Z9pqST72is&list=TL5kmKsjkw103nc1jdDEi85HH1LVUCdSUZ>

Cell Rap Song:

<http://www.bing.com/videos/search?q=You+tube+and+Organelle+song&docid=4576280309795566&mid=5031B830BAFCA41C2A365031B830BAFCA41C2A36&view=detail&FORM=VIRE1#view=detail&mid=EEA648DCDF16FEE10F4CEEA648DCDF16FEE10F4C>

Cells Alive

Interactive Labelling Exercise

http://cellsalive.com/cells/cell_model.htm

Cell Quiz: Test Yourself

http://www.wisc-online.com/objects/typical_animal_cell/

PowerPoint Presentations

Animal Cell PowerPoint

Plant Cell PowerPoint

In Class Worksheets

Diagrams of Plant and Animal Cells to label

Cellular Organelle Matching Exercise

BIOLOGY: MEMBRANE, PLANTS AND BIOMOLECULES

Part 3 – The Cell As An Open System (membrane) –

3 DAYS

- Define open system and identify the cell as an open system.
- State three functions of the cell membrane.
- Label a diagram of the fluid mosaic model of the cell membrane.
- State the function of phospholipid bilayer (hydrophilic heads and hydrophobic tails) and proteins (embedded, carrier, recognition, receptor and channel)
- Relate the structure of the cell membrane to its function.
- Differentiate between passive and active transport in terms of energy requirements and concentration gradient.

- Define diffusion.
- Define osmosis
- Define isotonic, hypertonic and hypotonic in terms of concentrations of solutions (solute/solvent)
- Predict the consequences on plant and animal cells when they are placed in isotonic, hypertonic and hypotonic solutions. Define each of the following: turgor pressure, plasmolysis, crenation and lysis.
- Define facilitated diffusion.
- Define different methods of active transport such as, endocytosis and exocytosis.
- Identify some disorders that are linked to membrane failures.

Learning Activities:

- **Assignment #3 – Membranes**
- *Lab 2 - Diffusion Through Membranes*

Internet Resources

How lysosomes work

http://highered.mcgraw-hill.com/sites/0072437316/student_view0/chapter5/animations.html#

Endo/exocytosis

http://highered.mcgraw-hill.com/sites/0072437316/student_view0/chapter6/animations.html#

Diffusion and Facilitated Diffusion

<http://bcs.whfreeman.com/thelifewire/content/chp05/0502001.html>

Cell Membrane Transport (Bozeman Biology)

https://www.youtube.com/watch?feature=player_detailpage&v=RPAZvs4hvGA

How Diffusion Works

http://highered.mcgraw-hill.com/sites/0072495855/student_view0/chapter2/animation_how_diffusion_works.html

How Osmosis Works

http://highered.mcgraw-hill.com/sites/0072495855/student_view0/chapter2/animation_how_osmosis_works.html

How Phagocytosis Works

http://highered.mcgraw-hill.com/sites/0072495855/student_view0/chapter2/animation_phagocytosis.html

How Facilitated Diffusion Works

http://highered.mcgraw-hill.com/sites/0072495855/student_view0/chapter2/animation_how_facilitated_diffusion_works.html

Part 4 – Plants and Biomes – This part will focus on 1) the organization of plants as a multicellular organism with specialized structures at the cellular, tissues and systems levels, and 2) distribution of world's complex biomes.

7 DAYS

- Using the concept of the hierarchy of life, define the terms cell, tissue, organ and system.
- Define division of labour.
- Outline the simple classification of plants: vascular, non-vascular; seeded, seedless; angiosperms (flowering), gymnosperms (cone-bearing)
- Identify the two main organ systems in plants and their key components.
- Discuss the importance of meristems to the growth of a plant and identify regions where meristems may be located.
- Identify specialized cells in plants and state the location and function of each.
- List the three main types of plant tissues and state the location and function of each.
- Given a diagram of a cross-section of a herbaceous plant stem, label the epidermis, ground tissue, xylem, phloem, and vascular tissue. Describe each of these structures and state their functions.
- Identify the blade and petiole as parts of a leaf.
- Given a diagram of a cross-section of a typical dicot leaf, label the upper and lower epidermis, palisade and spongy mesophyll, cuticle, guard cells, and stomata. Describe each of these structures and state their functions.
- Identify where lenticels are located, describe their structure, and state their main function.
- Discuss gas exchange in the dermal tissue of plant, including the role of the guard cells, stomata, spongy mesophyll, and lenticels.
- State, using both words and formulas, the balanced chemical equation for photosynthesis. Identify where photosynthesis mainly occurs.
- State the purpose, location and balanced chemical equation (words and formulas) of cellular respiration in plant cells.
- Discuss/compare the relationship between cellular respiration and photosynthesis.
- Discuss the transport of water in plants including the concepts of cohesion/adhesion, root pressure, osmosis, and transpiration pull.
- Indicate why it is best for plants to live in a hypotonic environment.
- Discuss the transport of sugars in the phloem, from the site of production to the site of storage using the pressure flow theory.
- Define the term stimulus.
- Describe each of the following plant responses to stimuli: phototropism, gravitropism, and photoperiodism

- Define the terms biosphere, atmosphere, lithosphere, and hydrosphere and troposphere.
- Differentiate between climate and weather.
- Summarize the importance of climate to organisms and identify how organisms adapt to change.
- Define and give examples of biotic and abiotic factors. Use these terms to define ecosystem and biome.
- Give the approximate locations and general characteristics including temperature and precipitation for the following biomes in the world: tundra, taiga, deciduous forest, grassland, desert, and tropical rainforest. Locate these regions on a map of the world.
- List six Alberta Provincial Ecosystems (or Natural Regions): Foothill, Boreal Forest, Parkland, Canadian Shield, Rocky Mountain, and Grassland. Locate these on a map of Alberta

Learning Activities

- Assignment #4 –Biomes
Biology Test

Internet Resources:

Plants: (Start about ½ way

through)https://www.youtube.com/watch?feature=player_embedded&v=X4L3r_XJW0I

Plant Structure:<http://www.bozemanscience.com/plant-structure>

Plant Nutrition and Transport<http://www.bozemanscience.com/plant-nutrition-transport>

Nova<https://www.youtube.com/watch?v=38peWm76l-U>

In Class Worksheet

Diagram of cross section of leaf

Diagram of cross section of stem

In Class Question and Answer Worksheet

TRANSFERABILITY: ** Grade of D or D+ may not be acceptable for transfer to other post-secondary institutions. Students are cautioned that it is their responsibility to contact the receiving institutions to ensure transferability.

GRADING CRITERIA: Regular attendance is expected of all students, and is crucial to passing this course. Students who miss classes will soon find themselves falling behind and failing. Lateness will **not** be tolerated as it interrupts the instructor and fellow classmates.
As per Department Policy, if you miss more than 10 per semester of classes in any course, you may be debarred from the final exam for that course.

A certificate (a doctor's or a note from the funeral home) will be required to make up the midterm or final exam. **You will receive a grade of F if you miss the final.** Call if you are going to miss a test. There may be a deduction of 10% for test rewrites.

There are **NO** 'make up' labs in this course. Being absent from an experiment will result in a grade of **ZERO** for that experiment.

Lab reports must be submitted on the required date and by the required time.

Assignments may not be accepted after the assignment has been returned to the class. I am usually a speedy marker and usually return papers the next day.

Penalties for late **assignments** are as follows: (Assuming that I have not returned the marked assignments)

1 day late -20%, 2 days late -50%, 3 days late -100%

Penalties for late **lab reports** are as follows:

5 minutes after due time -10 %, 24 hours after due time -100%

The Final exam is set by the Student Services. It will be composed of material from the course.

EVALUATION:	Lab Reports	10%
	Assignments	15%
	Unit Tests	45%
	Final Exam	<u>30%</u>
	Total	100%

GRADING CRITERIA:

GRANDE PRAIRIE REGIONAL COLLEGE			
GRADING CONVERSION CHART			
Alpha Grade	4-point Equivalent	Percentage Guidelines	Designation
A ⁺	4	90 – 100	EXCELLENT
A	4	85 – 89	
A ⁻	3.7	80 – 84	FIRST CLASS STANDING
B ⁺	3.3	77 – 79	
B	3	73 – 76	GOOD
B ⁻	2.7	70 – 72	
C ⁺	2.3	67 – 69	SATISFACTORY
C	2	63 – 66	
C ⁻	1.7	60 – 62	
D ⁺	1.3	55 – 59	MINIMAL PASS
D	1	50 – 54	
F	0	0 – 49	FAIL
WF	0	0	FAIL, withdrawal after the deadline

STUDENT RESPONSIBILITIES:

Students will:

- be at class regularly and on time. (If you miss more than 10 per semester of classes in any course, you may be debarred from the final exam for that course.)
- complete all pre class and pre-lab assignments before arriving in class.
- keep up with course material.
- if experiencing difficulties with course get help immediately.
- catch up on missed material before the next class.
- provide documentation for missed midterms or finals.
- be aware of penalty for failing the lab component and not writing the final.

STATEMENT ON PLAGIARISM AND CHEATING:

Refer to the College Policy on Student Misconduct: Plagiarism and Cheating at https://www.gprc.ab.ca/files/forms_documents/Student_Misconduct.pdf

**Note: all Academic and Administrative policies are available at <https://www.gprc.ab.ca/about/administration/policies/>