

Grande Prairie Regional College

Dept. of Science & Technology

SEP 06 2000

BI 1070  
CELLULAR BIOLOGY

COURSE OUTLINE  
Winter 1999-2000

Instructors

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Course description: All life functions are based on cells, and this course will provide an introduction to cell structure and function. Major topics will include the origin of life, the development of procaryotic and eucaryotic cell lineages, energy conversions, the compartmentation of biochemical functions within a cell, and communication from cell to cell. The genetic control of cell activities is examined through methods in molecular genetic analysis and their application in genetic engineering and biotechnology.

Text-books: "Biology" (6<sup>th</sup> edition, 2002)  
Campbell, Reese and Mitchell  
Benjamin Cummings Pub.  
*(Older editions of the text can be used if available)*

Student Study Guide for "Biology" (optional, but useful) (6<sup>th</sup> ed, 2002)  
Martha R. Taylor  
Benjamin Cummings Pub.

Biology 1070 Lab Manual (required)

Requirements: Since participation in lectures/laboratories and completion of assignments are important components of this course, students will serve their best interests by regular attendance at both class and laboratory sessions. Those who chose not to attend must assume whatever risks are involved. In this regard, your attention is directed to the Academic Guidelines of Grande Prairie Regional College. All assignments must be completed and handed to the Instructor by the date specified. Late assignments will not be marked. Students must attend the laboratory session and complete the exercise in order to receive credit for the lab reports.

Evaluation:

|                      |          |
|----------------------|----------|
| Lab. Quizzes.....    | 10%      |
| Lab. Reports.....    | 10%      |
| Mid-term Exam.....   | 20%      |
| Final Lab. Exam..... | 20%      |
| Final Exam.....      | 40%      |
| <br>TOTAL.....       | <br>100% |

## BI 1070 - Topic Outline

| TOPIC                                        | Chapter |
|----------------------------------------------|---------|
| Macromolecules and inorganic constituents    | 5       |
| Membrane structure and function:             |         |
| - fluid mosaic model                         | 8       |
| - permeability and transport                 |         |
| - procaryotic/eucaryotic differences         |         |
| Procaryotes:                                 |         |
| - morphology                                 | 27      |
| - cell walls (Gram positive & Gram negative) |         |
| - Archaeobacteria & Eubacteria               |         |
| - cell surface structures                    |         |
| - motility                                   |         |
| - internal structures                        |         |
| - genome and genetic exchange                |         |
| - growth and binary fission                  |         |
| - growth curves                              |         |
| - endospores                                 |         |
| Viruses:                                     |         |
| - structure and replication                  | 18      |
| - viral infection                            |         |
| - bacteriophage (lytic/lysogenic cycles)     |         |
| - animal viruses - reproductive cycles       |         |
| - viral diseases                             |         |
| - viruses and oncogenes                      |         |
| - viroids and prions                         |         |
| Eucaryotic cell structure:                   |         |
| - nucleus, ribosomes, endoplasmic reticulum  | 7       |
| - lysosomes and vacuoles                     |         |
| - cell wall synthesis                        |         |
| - cytoskeleton and contractility             |         |
| - mitochondria and chloroplasts              |         |
| - extracellular matrix                       |         |
| Introduction to metabolism:                  |         |
| - metabolic maps                             | 6       |
| - enzymes and metabolism                     |         |
| - control of metabolism                      |         |

| TOPIC                                                                                                                      | Chapter |
|----------------------------------------------------------------------------------------------------------------------------|---------|
| Cellular respiration:<br>- ATP, Redox reactions, respiration                                                               | 9       |
| Prokaryotic anaerobic metabolism:<br>- fermentation<br>- anaerobic respiration<br>- facultative anaerobes                  | 9       |
| Aerobic respiration:<br>- Glycolysis<br>- Krebs's Cycle<br>- Electron Transport Chain<br>- Oxidative phosphorylation       | 9       |
| Eucaryotic anaerobic respiration:<br>- energy utilization<br>- anaerobiosis<br>- carbohydrate metabolism                   | 9       |
| Photosynthesis:<br>- Photophosphorylation<br>- Calvin Cycle                                                                | 10      |
| <b>MID-TERM EXAM</b>                                                                                                       |         |
| Mitosis and the Cell Cycle                                                                                                 | 12      |
| Meiosis and sexual life cycles                                                                                             | 13      |
| Nucleic acids:<br>- composition<br>- complementary base pairing                                                            | 16      |
| Eucaryotic chromosome organization                                                                                         | 19      |
| DNA replication                                                                                                            | 16      |
| Genes, proteins and the genetic code                                                                                       | 17      |
| Transcription:<br>- RNA-polymerase<br>- processing of mRNA                                                                 | 17      |
| Translation:<br>- tRNA and codon recognition<br>- translation at the ribosomal level<br>- post-translational modifications | 17      |

| TOPIC                                                                                                                                                                                                                                                                          | Chapter |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Protein trafficking and targeting: <ul style="list-style-type: none"> <li>- peptide signal sequences</li> <li>- protein sorting</li> <li>- protein secretion</li> </ul>                                                                                                        | 17      |
| Mutations                                                                                                                                                                                                                                                                      | 17      |
| Transcriptional control: <ul style="list-style-type: none"> <li>- negative control by repression</li> <li>- negative control by induction</li> <li>- positive control</li> </ul>                                                                                               | 19      |
| Recombinant DNA: <ul style="list-style-type: none"> <li>- restriction endonucleases</li> <li>- chromosome mapping</li> <li>- splicing genes into vectors</li> <li>- expression of cloned genes (cDNA)</li> <li>- PCR, RFLP's</li> <li>- uses of genetic engineering</li> </ul> | 20      |
| Signal Transduction                                                                                                                                                                                                                                                            | 11      |