EDISON STATE COLLEGE

Division of Arts and Sciences

COMMON COURSE SYLLABUS

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OFFICE HOURS: as posted or call for appointment **SEMESTER:** Fall 2010

I. COURSE NUMBER AND TITLE, CATALOG DESCRIPTION, CREDITS:

BSC 1010 BIOLOGICAL SCIENCE I (3 CREDITS)

This introduction to cell biology is designed to meet entrance requirements for upper division majors in biology, psychology or other pre-professional programs. The course addresses and integrates concepts associated with the basic physical and chemical properties of living matter as they relate to the structure and function of the cell, cell reproduction, Mendelian and molecular genetics (DNA replication and gene expression), energy metabolism, metabolic control systems, and cell-to-cell communication systems.

II. PREREQUISITES FOR THIS COURSE:

Minimum score of {(SAT-R 440 quantitative and 440 verbal) or (ACT-E 19 math, 18 reading and 17 English) or (FCELPT 72 math, 83 reading and 83 sentence skills)} and {BSC 1005 or high school biology} with a "C" or better

CO-REQUISITIES FOR THIS COURSE:

BSC 1010L

III. GENERAL COURSE INFORMATION: Topic Outline.

- The chemical basis of life
- Functional organization of prokaryotic and eukaryotic cells
- The cell theory as evidenced in prokaryotic and eukaryotic cell cycles and associated mechanisms of control
- The structural and functional roles of membranes with an emphasis on the functions associated with lipids and proteins
- An introduction to energy and metabolism (role of enzymes in catabolism and anabolism)
- Catabolic energy yielding metabolisms associated with carbohydrates, fatty acids or amino acid skeletons associated with fermentation or respiration and the energy consuming, anabolic process of photosynthesis
- Cell communication mechanisms and their role in control of metabolic pathways and gene expression
- Patterns of Mendelian inheritance and the protein basis of the origin of alleles
- The origin of new genetic variations (mutations) as errors in DNA replication, crossing over or non-disjunction
- The role of chromosomes in heredity, their prokaryotic and eukaryotic structure and replication (DNA biosynthesis)

- The "anatomy" of prokaryotic and eukaryotic genes, their transcription and translation and the regulation of these processes
- Genetic engineering and the Human Genome Project

IV. LEARNING OUTCOMES AND ASSESSMENT:

GENERAL EDUCATION COMPETENCIES:
General education courses must meet at least four out of the five following outcomes. All other courses will meet one or more of these outcomes.

Communication (COM): To communicate effectively using standard English (written or oral).

Critical Thinking (CT): To demonstrate skills necessary for analysis, synthesis, and evaluation.

Technology/Information Management (TIM): To demonstrate the skills and use the technology necessary to collect, verify, document, and organize information from a variety of sources.

Global Socio-cultural Responsibility (GSR): To identify, describe, and apply responsibilities, core civic beliefs, and values present in a diverse society.

Scientific and Quantitative Reasoning (QR): To identify and apply mathematical and scientific principles and methods.

ADDITIONAL COURSE COMPETENCIES:
At the conclusion of this course, students will be able to demonstrate the following additional competencies:

LEARNING OUTCOMES	ASSESSMENTS	GENERAL EDUCATION COMPETENCIES
Construct the atomic structure of simple elements using the periodic table.	Successfully complete one or more of the following: exams; quizzes; collaborative problem solving exercises; or data interpretation and analysis exercises.	
Critically discuss the special properties of water that make it a necessary component of life.	Successfully complete one or more of the following: exams; quizzes; writing assignments; debates; oral, written, or electronic presentations; discussion forums; or data interpretation and analysis exercises.	
Identify molecular bonds and apply bonding concepts to the four major organic molecules of life.	Successfully complete one or more of the following: exams; quizzes; debates; oral, written, or electronic presentations; discussion forums; or data interpretation and analysis exercises.	
Compare and contrast the similarities and differences between prokaryotic and	Successfully complete one or more of the following: exams; quizzes;	

eukaryotic cell structure and function.	writing assignments; oral, written, or electronic presentations; discussion forums; or data interpretation and analysis exercises.	
Analyze and appraise critical functions played by the lipid and protein components of cell compartmentalization of eukaryotic cells.	Successfully complete one or more of the following: exams; quizzes; writing assignments; debates; oral, written, or electronic presentations; discussion forums; or data interpretation and analysis exercises.	
Defend the current theories of enzyme structure and function and the role of enzymes in metabolism.		
Critically discuss the energy yielding, catabolic pathways of glycolysis and cellular respiration, and evaluate the significance of fermentation, and their significance to living organisms.		
Explain the anabolic pathways associated with photosynthesis and their significance to living organisms.		
Analyze the concepts involved in cell-to-cell communication.	Successfully complete one or more of the following: exams; quizzes; writing assignments; debates; oral, written, or electronic presentations; or discussion forums.	
Compare and contrast cell cycles of prokaryotic and eukaryotic cells and associated controls.		
Analyze Mendelian patterns of inheritance and solve simple genetics problems.	Successfully complete one or more of the following: exams; quizzes; writing assignments; debates; case studies; oral, written, or electronic presentations; discussion forums; collaborative problem solving exercises; or data interpretation and analysis exercises.	QR, CT
Determine relationships between molecular genetics and Mendelian inheritance.		
Describe and explain the processes involved in the replication and repair of DNA.		
Appraise the role of transcription and translation of genes in cellular control.	Successfully complete one or more of the following: exams; quizzes; writing assignments; debates; oral, written, or electronic presentations; discussion forums; or data interpretation and analysis exercises.	
Analyze and appraise methods used to genetically engineer an organism or to map its entire genome.	Successfully complete one or more of the following: exams; quizzes; writing assignments; debates; oral, written, or electronic presentations; discussion forums; collaborative problem solving exercises; or data interpretation and analysis exercises.	COM, GSR

V. DISTRICT-WIDE POLICIES:

PROGRAMS FOR STUDENTS WITH DISABILITIES

Edison State College, in accordance with the Americans with Disabilities Act and the college's guiding principles, offers students with documented disabilities programs to equalize access to the educational process. Students needing to request an accommodation in this class due to a disability, or who suspect that their academic performance is affected by a disability should contact the Office of Adaptive Services at the nearest campus.

Lee Campus	Taeni Hall S-116A	(239) 489-9427
Charlotte Campus	Student Services SS-101	(941) 637-5626
Collier Campus	Admin. Bldg. A-116	(239) 732-3918
Hendry/Glades Ctr.	LaBelle H.S.	(863) 674-0408

VI. REQUIREMENTS FOR THE STUDENTS:

Do well on tests, and be nice.

VII. ATTENDANCE POLICY:

Absences and tardiness are not considered in grading as long as tardy students enter the lab without making disruptive sounds. See disruptive behavior under VIII Grading Policy. However, the number one problem employers tell us they have with Edison graduates, and the number one cause of termination, is their inability to arrive on time and prepared for work. Do not embarrass yourself or Edison with tardiness.

Brief quizzes will be given at the start of class. Class will start at the scheduled time as shown by the clock in the classroom. It is a good idea to arrive 5 minutes early. Students arriving late will not be allowed to take a quiz in progress.

No makeup quizzes or exams are provided unless arrangements are made significantly in advance.

If you encounter an unforeseen problem that will cause you to be late call my cell phone at 941 626-2881 at least 5 MINUTES PRIOR TO THE START OF CLASS and let me know. Failure to call will require that you seek any material you miss from your fellow classmates.

Any student encountering a real problem will have my full support and assistance regardless of the above requirements.

VIII. GRADING POLICY:

Percent scores will be converted to grades based on the following, unless otherwise modified as discussed below:

90 – 100	=	A
80 – 89	=	B
79 – 70	=	C
60 – 69	=	D
< 60	=	F

Grades will be computed based on quizzes, exams and a Learning Outcome portfolio:

- Quizzes 33.33%
- Exams 33.33%
- Portfolio 33.33%.

For a discussion of the portfolio requirements see XIII.

Quizzes will be given during most classes.

Exam grades will be computed by adding up the exam scores and the comprehensive final exam score and dividing by the total number of exams. I reserve the right to overweight the final exam when students perform exceptionally well on the final.

Make up exams are not be provided unless arrangements are made significantly in advance.

Disruptive behavior, especially tardy students making noise upon entering, will result in 3 points per disruptive event being deducted from your final lab average. Behavior will be judged disruptive if in the professor's opinion it interferes with fellow student's ability to hear or focus on class activities.

(Note: The "incomplete" grade ["I"] will be given only when unusual circumstances warrant. An "incomplete" is not a substitute for a "D," "F," or "W."

IX. REQUIRED COURSE MATERIALS:

Biology by Campbell, Reece, et. al, 8th Edition. Some find CD and collateral materials helpful, but they are not required.

X. RESERVED MATERIALS FOR THE COURSE:

Other special learning resources may be announced from time to time.

XI. CLAST COMPETENCIES INVOLVED IN THIS COURSE.

Successful students need to be able to read and comprehend technical information, take good notes, arrive on time and be nice.

XII. CLASS SCHEDULE:

Date	Lecture Topics: Fall 2010	Quiz Due	Draft Portfolio Due
8-23 M	Overview Quiz		
25 W	Overview Quiz		
27 F	Overview Quiz (Drop)		
30 M	**Exam 1**		
9-1 W	Review Exam & Ch. 2 Chemical...		
3 F	Ch. 2 & Ch. 3 Water	Ch. 2	1.1 – 1.3 chemistry
6 M	CLOSED		
8 W	Ch. 3 & Ch. 4	Ch. 3	2.1 – 2.6 water
10 F	Ch. 4 & Ch. 5	Ch. 4	
13 M	Ch. 5	Ch. 5	
15 W	Ch. 5		3.1 – 3.6 organic molecules
17 F	Review		
20 M	**Exam 2**		
22 W	Review Exam & Ch. 6 Cells		
24 F	Ch. 6 and Ch. 7 Membranes	Ch. 6	4.3 only pro/euk
27 M	Ch. 7 (Withdraw)	Ch. 7	5.1 – 5.4 membranes
29 W	Ch. 8 Metabolism	Ch. 8	6.1 -6.4 enzymes
10-1 F	Ch. 9 Cell Respiration		
4 M	Ch. 9	Ch. 9	
6 W	Ch. 9 & Ch. 10 Photosynthesis		7.1 -7.7 cell respiration
8 F	Ch. 10	Ch. 10	8.1 – 8.3 photosynthesis
11 M	**Exam 3**		
13 W	Review & Ch. 11 Cell Communication	Ch. 11	9.1 – 9.3
15 F	Ch. 12 Asexual cycle and mitosis		
18 M	Ch. 13 Sexual cycle and meiosis	Ch. 12	10.1 -10.2
20 W	Ch. 13		
22 F	Ch. 14 Mendelian Genetics	Ch. 13	
25 M	Ch. 14 & Ch. 15 Chromosomes	Ch. 14	11.1- 11.3 Mendelian genetics
27 W	Ch. 15 & 16 DNA	Ch. 15	12 Mendelian vs molecular
29 F	Ch. 16 & Review	Ch. 16	13.1 -13.2 DNA replication
11-1 M	**Exam 4**		
3 W	Review Exam & Ch. 17 Gene to Pro..		
5 F	Ch. 17	Ch. 17	14 transcription/translation
8 M	Ch. 17 & Ch. 18 Regulation of Gene..		
10 W	Ch. 18 & Ch. 19 Viruses	Ch. 18	
12 F	Ch. 19	Ch. 19	
15 M	Ch. 20 Biotechnology		4.1 -4.2 pro/euk
17 W	Ch. 20	Ch.20	
19 F	Ch. 20 Review		15 genetic engineer
22 M	**Exam 5**		
24 W	Review exam & Ch. 21 Genomes		

26 F	CLOSED		
29 M	Ch. 21	Ch. 21	**Final Portfolio:** printed copy
12-1 W	Ch. 21 and Review		And email attachment
2 R			
TBA	**FINAL EXAM**		

XIII. ANY OTHER INFORMATION OR CLASS PROCEDURES OR POLICIES:

Learning Outcome Portfolio Instructions

You will write technical reports on various Learning Outcome topics (IV) and assemble these reports into a portfolio. Your reports will be graded 50% on format and 50% on content and understanding. Half of your content grade will be based on your ability to correctly answer questions in exams and quizzes prepared to test if you learned the material you submitted.

Only random portions of your reports will be read and graded.

Do not cut and paste or quote from other sources. Form your answers yourself.

Reports should be in Arial font, 11 point; drafts should be double spaced, the final portfolio single spaced.

These reports are not essays, and your opinion or personal perspective should not intrude unless otherwise indicated. Write in a direct explicit fashion, i.e. precisely and clearly. You will lose content points for extraneous information, repetitive statements, rhetorical flourishes, vague-unclear-incorrect statements and flights of fancy. Focus tightly on topic.

***1. Format**.*

You will assemble your reports into a portfolio with a title page, a table of contents and page numbers to aid the reader in navigating your portfolio. Some topics ask that you format your response in a table.The Learning Outcomes are numbered. Use the Outcome numbers and subsection numbers in your portfolio responses. REPEAT THE QUESTION JUST ABOVE YOUR ANSWER OR RESPONSE.

2. ***Content.***

2.1 ***Text.*** *The material should be organized chronologically or sequentially (step by step) to aid the reader in understanding. Cover the Who, What, When, Where, Why and How of each topic as appropriate.*

2.2 Images. *Insert images into each of your reports. Part of your content grade will be based on how well the images support your comments. Part of you format grade will be based on the clarity of the image and its labeling. Use the Paint program, or other, to re-label and modify images.*

You may use simple tables to organize images and text so it is obvious what image the text refers to. *You are required to illustrate your reports with images that help you convey your information.*	

The learning outcomes from the syllabus are numbered, reproduced below and subdivided into several report topics for each outcome. Each report should contain 30-60 words unless otherwise specified.

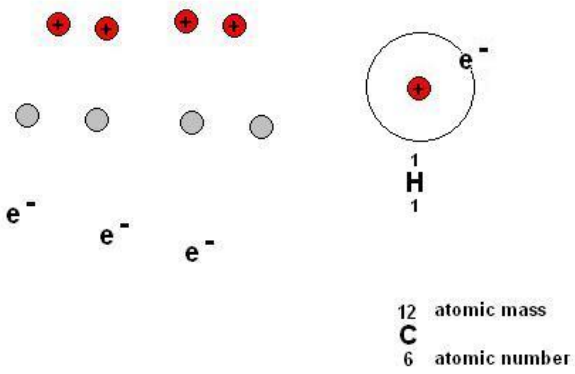
Learning Outcome Portfolio Topics

1. Construct the atomic structure of simple elements using the periodic table.

    1.1 Explain the sequence of elements in the periodic table. One sentence.

    1.2 What determines the different rows and columns? ditto

    1.3 Illustrate the atomic structure of H, C, N, and O using a graphics program such as Paint. Insert these graphics into a two column table with 4 rows. Put the graphic on the right and a one sentence explanation of the graphic in the left column. Include the chemical symbol, atomic mass and atomic number. Use the format shown below.



2. Critically discuss the special properties of water that make it a necessary component of life.

    2.1 Explain what causes the water molecule to be a polar molecule. One paragraph of 50-100 words

    2.2 Explain why water is called the solvent of life. One sentence

    2.3 Illustrate how water forms a hydration shell around small hydrophilic molecules causing them to dissolve.

    2.4 Explain the hydrophobic nature of lipids.

    2.5 Using the Pauling scale, indicate the electronegativity of O, Cl, N, C and H, and indicate

which two elements would form the most polar covalent bond and the least.

2.6 Explain the relationship between electronegativity and polar covalent bonds.

3. Identify molecular bonds and apply bonding concepts to the four major organic molecules of life. (Ch. 4 & 5)

3.1 Describe the four major organic molecules of life, their functional groups, chemical properties and metabolic role in living cells. One paragraph of 50-100 words per major organic molecule.

3.2 Describe the polymerization process for these four major organic molecules.

3.3 Describe the bonds associated with holding monomers together as polymers in carbohydrate.

3.4 Describe the bonds associated with holding monomers together as polymers in protein.

3.5 Describe the bonds associated with holding monomers together as polymers in nucleic acids.

3.6 Describe the bonds associated with holding fatty acids to glycerol.

4. Compare and contrast the similarities and differences between prokaryotic and eukaryotic cell structure and function. (Ch. 1, 6, 12, 17, 18)

4.1 What critical difference in cellular structure leads to prokaryotes staying unicellular while eukaryotes progressed to complex multicellular creatures? (Ch. 17) One sentence.

4.2 From this one difference in cellular structure discuss the differences in transcription/translation, gene structure (introns and exons), regulation of gene expression (operons versus complex transcription factors and enhancers). 3 paragraphs of 50-75 words each.

4.3 Prepare a table listing all the differences and similarities between prokaryotic and eukaryotic cells.

5. Analyze and appraise critical functions played by the lipid and protein components of cell compartmentalization of eukaryotic cells. (Ch. & 11)

5.1 Describe the *fluid mosaic* model of membrane structure.

5.2 Describe the unique chemical properties of phospholipid molecules.

5.3 Describe the various functions of membrane proteins. One table with figures in the right column and brief discussion of each image in the left column. One sentence per membrane function.

5.4 Discuss the role of cholesterol in membranes.

6. Defend the current theories of enzyme structure and function and the role of enzymes in metabolism. (Ch. 8)

6.1 What is an enzyme? 50-100 words

6.2 What is an enzymatic pathway? 50-100 words

6.3 What do enzymes do? one sentence

6.4 How do enzymes work? 100-150 words

7. Critically discuss the energy yielding, catabolic pathways of glycolysis and cellular respiration, and evaluate the significance of fermentation, and their significance to living organisms. (Ch. 9)

7.1 What is cellular respiration? 1 sentence

7.2 What is oxidation? 1 sentence

7.3 What is reduction, and how is it related to oxidation? one sentence

7.4 Contrast cellular respiration with combustion; how are they similar, and how are they different? Arrange your answer in a table. You choose the length

7.5 Organize the following in a proper sequence assuming one molecule of glucose is oxidized to carbon dioxide and water. Next, organize the processes and molecules into at least 4 paragraphs of 40-80 words each. Show the proper sequence above your response. Organize the proper sequence in outline form reflecting your paragraphs.

ingestion
glycolysis
ATP synthase
digestion
citric acid cycle
absorption
electron transport chain
transport in blood stream
carbon dioxide (CO_2)
NADH
oxidative phosphorylation
gaseous oxygen (O_2)
mitochondria
water (H_2O)

7.6 Discuss fermentation? 50-100 words

7.7 Discuss the role of lactic acid fermentation in muscle physiology. 100-200 words

8. Explain the anabolic pathways associated with photosynthesis and their significance to living organisms.

8.1 What is photosynthesis? 50-100 words

8.2 Discuss the anabolic pathways associated with photosynthesis. Illustrate your answer with a box and arrow diagram showing inputs and outputs to each pathway. 50-100 words

8.3 Discuss the electromagnetic spectrum and which wavelengths of light best drive photosynthesis. Use an "action spectrum" to illustrate you response. 50-100 words

9. Analyze the concepts involved in cell-to-cell communication. (Ch. 11 & 7)

9.1 Explain the role of receptors in cell-to-cell communication.

9.2 Compare and contrast the functioning of a receptor to the functioning of an enzyme.

9.3 What happens at the cellular level when we taste something? Illustrate your answer with figures explaining signal transduction and electrical transmission across a synapse. Format your answer like a slide show but with images in the right column and text in the left column of a two column table with as many rows as images. 30-60 words per figure

10. Compare and contrast cell cycles of prokaryotic and eukaryotic cells and associated controls. (Ch. 12)

10.1 Compare binary fission with the eukaryotic cell cycle. 50-100 words

10.2 Describe the role of MPF in the eukaryotic cell cycle. 50-100 words

11. Analyze Mendelian patterns of inheritance and solve simple genetics problems. (Ch. 14)

11.1 Explain the pattern of inheritance seen with recessive genes. Use a pedigree to illustrate your answer. Use a pedigree to illustrate your answer . 50-100 words

11.2 Explain the pattern of inheritance seen with dominant genes. 50-100 words

11.3 Explain what goes wrong when a person has cystic fibrosis. Use the terminology associated with osmosis in your response. 100-150 words

12. Determine relationships between molecular genetics and Mendelian inheritance. (Ch. 12, 13, 14, 16 and 17)

12. In three paragraphs compare and contrast the following terms based on how Gregor Mendel used the terms and how we understand these terms today based on our study of molecular genetics. You pick the response length.

gene
segregation
independent assortment

13. Describe and explain the processes involved in the replication and repair of DNA.

13.1 Organize the following terms into a meaningful sequence that reflects the step by step process of DNA replication. Show the proper sequence above your response. Organize the proper sequence in outline form reflecting your paragraphs. you select the length as

appropriate
- anti-parallel
- lagging strand
- ligase
- replication bubble
- helicase
- cell cycle
- replication fork
- tissue growth
- single strand binding proteins
- wound repair
- primer
- growth of zygote into embryo
- primase
- S-Phase of Interphase
- DNA polymerase
- *semiconservative* replication
- Okazaki fragments
- leading strand
- nucleotides
- base pairing
- hydrogen bonds

13.2. Describe the process of DNA repair. Relate the process to spontaneous mutation of genes. 25-50 words (Ch. 16)

14. Appraise the role of transcription and translation of genes in cellular control. (Ch. 17 & 18)

14.1 Compare transcription in prokaryotic and eukaryotic cell. 30-60 words

14.2 Discuss eukaryotic processing of mRNA. 30-60 words

14.3 Discuss translation. Start by organizing the molecules and processes involved in translation into an outline that reflects how and when you would introduce each in a computer animation of translation. Place your discussion below your outline. You select the length as appropriate.

14.4 Discuss polyribosomes and how the lack of a cell membrane has restricted prokaryotic cells to a unicellular life style. one sentence

14.5 Discuss how bio engineers use reverse transcriptase to engineer eukaryotic genes with introns and exons so they can be intron free and then expressed by prokaryotic cells. You select the length as appropriate.

14.6 Discuss the benefits of such bioengineering to patients with insulin dependent diabetes or hemophilia. one sentence

14.7 Discuss the stages in gene expression that off opportunities for regulation of gene expression in eukaryotic cells. Consider using a table or bullet points. You select the length as appropriate.

14.8 Why are operons (structural genes) common in prokaryotic cells but very rate in eukaryotic cells? one sentence

15. Analyze and appraise methods used to genetically engineer an organism.

15. Discuss the steps necessary to genetically engineer bacteria to produce human growth hormone. Organize the processes and molecules in an outline that reflects the paragraphs you intend on using. Place your response below the outline. You select the length as appropriate.

END