2016 Winter   Biology 2171: Genetics Course Outline   [Version of December 23, 2015]

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Lecture
Location: ATAC 1001 (115 seats)
Time: Monday & Wednesday: 1:00-2:30 pm
Duration: 2015/01/04 - 2015/04/05
Credits: 0.50

Qin's Office Hours: CB4016, Monday, 2:30 pm to 3:30 pm, or by appointment

Textbook: "Genetics: From Genes to Genomes" (2014 First Canadian Edition) by Leland H. Hartwell, Leroy Hood, Michael L. Goldberg, Anne E. Reynolds, Lee M. Silver, Jim Karagiannis (University of Western Ontario), Maria Papaconstantinou (University of Toronto). Publisher: McGraw-Hill Ryerson. (Textbook is required).

Schedule (January 4: Monday semester starts, April 5, 2014: Tuesday, semester ends)

January 4: Introduction of the Course & Chapter 1 Genetics: The Study of Biological
          Information
January 6: Chapter 2: Mendelian Genetics
January 11: Chapter 2: Mendelian Genetics
January 13: Chapter 2: Mendelian Genetics
January 18: Chapter 2: Mendelian Genetics
January 20: Chapter 3: The Chromosome Theory of Inheritance
January 25: Chapter 3: The Chromosome Theory of Inheritance
January 27: Chapter 3: The Chromosome Theory of Inheritance
February 1: Chapter 4: Linkage, Recombination, and the Mapping of Genes on Chromosomes
February 3: Chapter 4: Linkage, Recombination, and the Mapping of Genes on Chromosomes
February 8: Chapter 4: Linkage, Recombination, and the Mapping of Genes on Chromosomes
February 10: Mid-term Exam One (Chapters 1-3) [20%] 75 minutes
February 15: Family Day, no class
February 17: February Break (February 16-19), no class
February 22: Chapter 5: The Multifaceted Nature of the DNA Molecule
February 24: Chapter 5: The Multifaceted Nature of the DNA Molecule
February 29: Chapter 6: Chromatin to Chromosomes
March 2: Chapter 6: Chromatin to Chromosomes
March 7: Chapter 7: Gene Expression: The Flow of Information from DNA to RNA to Protein
March 9: Chapter 7: Gene Expression: The Flow of Information from DNA to RNA to Protein
March 14: Chapter 8: Mutation at the Molecular Level
March 16: Chapter 8: Mutation at the Molecular Level
March 21: Chapter 9: Mutation at the Chromosomal Level

March 23: Mid-term Exam Two (Chapters 4-5) [20%] 75 minutes
March 28: Easter Monday, University Closed
March 30: Chapter 9: Mutation at the Chromosomal Level
April 5: Tuesday, last day of class, make up for Good Friday of March 25, 2015. We do not have class on Good Friday.

Additional Requirements: (1) Preview the textbook and think about the questions in the related chapter(s) before the applicable class. (2) Review the textbook and try to answer the questions in the chapter(s) after the class. (3) Read the entire lectured chapters 1-9 for exams. (The PPT slides do not contain all the information needed for the exams). (4) Students must understand well enough to all the solved problem questions in chapters 2-9.

Grading Scheme (The PowerPoint slides do not cover all the information for exams, so intensive reading and understanding of the whole lectured chapters are necessary).

1. Two homework assignments [5% each, 10% in total]: The questions listed below are from the chapters 1-9. The deadline of Assignment One on chapters 1-3 is February 22, 2015 at 23:59 pm. The deadline of Assignment Two on chapters 4-9 is March 30, 2015 at 23:59 pm. A 20% deduction is applied to any late submission of per day. The assignments should be placed in the lockable black mailbox outside Room CB 3037 (on the top of a white desk). The assignments must be printed and placed in the above mentioned black mailbox, handwriting and email submissions will not be accepted. The standard answers might be provided 5 days after the submission deadlines.

2. Two Mid-term exams [20% each, 40% in total]: We will have two mid-term exams (one will be before the February Break covering chapters 1-3 and the other will be after the February Break but before the Easter Monday, covering chapters 4-5. If you miss both the exams, you will not be allowed to write final exam unless you have approval from the department chair and/or registrar. Both midterm exams may include (1) Fill in the blank questions, (2) Multiple choice questions, (3) True/False questions, (4) Essay questions, etc. TA will help administer and mark the exams. Duration is 75 minutes, after 75 minutes your exam will not be counted. If you have any concerns about the marking, please contact TA first. You are welcome to CC the email to me as well.

3. Final exam (Chapter 6-9) [35%]. Exam may include (1) Fill in the blank questions, (2) Multiple choice questions, (3) True/False questions, (4) Essay questions, etc. Duration is 3 hours.

4. Lab components [15%, which will be assigned and evaluated by the lab instructor Michael Moore or the Lab Teaching Assistant].

5. If you miss your examination, by providing a written justification with strong reason and a Doctor's note, an alternative test paper (Test B) may be made. Test B will be different in questions and/or format from the test paper for the class (Test A). You should contact our TA Mr. Ayyappa Kumar Sista Kameshwar at asistak@lakeheadu.ca and CC the email to me at wsteaching@gmail.com for arranging your alternative exam. The

alternative Mid-term Exam One will be on February 24, 2016 Evening starting at 7 pm in Room CB 3037 with TA Mr. Ayyappa Kumar Sista Kameshwar. The alternative Mid-term Exam Two will be on April 6, 2016 in Room CB 3037 starting at 1 pm with TA Mr. Ayyappa Kumar Sista Kameshwar.

Extra notes:

(1) We strictly follow the course outline as rules for the course.
(2) Request of doing extra assignments for raising your marks is not allowed unless you have departmental chair and/or registrar's approvals.
(3) This is a big class, students are strongly encouraged to sit in the front seats. In the middle of 1.5 hours class, we will have 5 minutes break.
(4) The important contents and information for examination will be emphasized often in class.
(5) Slides in D2L and slides for lecturing may be slightly different. The lectured version of slides will not be posted in D2L and will not be sent to the students by email as well. This is to encourage students to attend the classes and take your own notes.
(6) Bonus points: When necessary (only when it is very necessary), for example, the class average marks from two mid-term exams are too low, some bonus points may be introduced to the class by having an extra take-home exam and/or using other ways. The bonus points are for adjusting class average marks. Each bonus point value may be higher or lower than 1% for adding to your final grade. If we do have take-home exam for bonus points, you will be informed by email. For take-home exam(s): students are not allowed to directly ask the TA and/or instructor for correct answers of the questions before you hand in your test (no bonus points will be awarded after the deadline for take-home exam).
(7) Please read and learn how to use scantron sheet before the exam. A TSC made note listing the reasons why the scantron machine reading could possibly be rejected is provided to you in D2L website.
(8) Get yourself familiar with the course outline information.
(9) Buying "Online Connect Access" is not required. It's your own choice.
(10) If your course registration is after the January 4th 2016's class, please email me thus I know whether I should email you some messed information.

Biology 2171 (Genetics) 2016 Winter Term Assignments

Two assignments (10 essay questions from chapters 1-9, 1.0% for each question) [10% in total]. The deadline of Assignment One on chapters 1-3 is February 11, 2015 at 23:59 pm. The deadline of Assignment Two on chapters 4-9 is March 30, 2015 at 23:59 pm. A 20% deduction is applied to any late submission of per day. The assignments should be placed in the lockable black mailbox outside Room CB 3037 (on the top of the white desk). Assignments must be submitted by printed copies.

Assignment #1 from chapters 1-3

[1] Short hair in rabbits is produced by a dominant gene (l^+) and long hair by its recessive allele (l). Black hair results from the action of a dominant gene (b^+) and brown hair from its allele (b). Determine the genotypic and the corresponding phenotypic ratios of the F_2 offspring, beginning with a parental cross of a female rabbit with brown hair and a male rabbit with long hair. Assume that the P female is homozygous for short hair and the P male is homozygous for black hair.

[2] In rats, the gene for the pigment (P) is dominant to no pigment (p). The gene for black (B) is dominant to the gene for cream (b). If a pigment gene (P) is absent, genes B and b are inoperative. Predict the genotypes and phenotypes of the F_2 of a parental cross between a homozygous black rat and an albino homozygous for cream.

[3] You have obtained an interesting flower for your garden from your neighbor. The neighbor has given you two pure lines of the plant, one with red flowers and one with yellow flowers. You decide to cross them and find that you obtain all orange flowers. The curious molecular geneticist in you decides to test two independent hypotheses: Hypothesis 1: Incomplete Dominance; Hypothesis 2: Recessive Epistasis. The first step in your test is to self the F_1 orange plants, which you complete only to find that the results do not statistically distinguish the two hypotheses. a) What ratio of yellow, orange, and red would you expect in the F_2 population for each hypothesis and b) what crosses would you complete next to definitively test your two hypotheses?

[4] In Drosophila, white eyes (w) and yellow body (y) are both recessive X-linked mutations. The wild type alleles, w+ and y+, control red eyes and dark body color, respectively. If a homozygous yellow body, red-eyed female is crossed with a dark body, white-eyed male, and F1 progeny are interbred, what will the phenotypes and ratios of the F1 and F2 be?

[5] In crosses of white-eyed *Drosophila* females with red-eyed males, Bridges recovered white-eyed daughters and red-eyed sons at a rate of around one per 2,000 offspring. (Most of the offspring were white-eyed males and red-eyed females.) He hypothesized that these exceptional progeny resulted from nondisjunction of the X chromosomes in meiosis in the female. Why did he suspect that nondisjunction was occurring in the female parent? What types of progeny would result from nondisjunction in the male parent?

Assignment #2 from chapters 4-9

[6] The Holliday model of recombination has been modified. The current model, termed the consensus model, is now consistent with current research. What are the five properties of recombination, as they are now understood?

[7] When Meselson and Stahl performed the experiment that showed that replication is a semiconservative process, they utilized E. coli, and various isotopes of nitrogen (15N and 14N). Explain briefly what their results would have been if DNA replicated conservatively.

[8] How is DNA altered by hydrolysis, radiation, UV light, and oxidation respectively?

[9] Chemical X has just been screened using the Ames test. A total of 5,000 bacteria were tested against 0.001 M, 1 M, 0.1M, and 1M concentrations for which 4, 1, 0, and 200 colonies grew respectively. Control plate of minimal media supplemented with histidine had 5,000 colonies while minimal media alone had only two. Interpret these data.

[10] The local pet store received several shipments of albino ferrets. You choose two males and two females as pets one breeding pair from the same litter, one from two different litters. When your ferrets' litters are born, one litter has normally pigmented offspring. State which offspring are albino and which are pigmented and explain why?