2017 Winter Biology 2171: Genetics Course Outline **[Sent to the Department on March 14, 2014]**

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Lecture
Location: BB1021
Time: Monday, Wednesday: 11:30-1:00 pm
Duration: 2017/01/09 - 2017/04/07
Credits: 0.50

TA: Hem Kanta Sharma
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Tel: 766-7141 (Lab/Office: CB 3037)

Qin's Office Hours: CB4016, Monday, 1:00 pm to 2:00 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. (Students are strongly encouraged to buy the textbook. Use of other versions of the book is your own choice).

Schedule (January 9: Monday semester starts, April 7, 2014: Friday, semester ends)

January 9: Introduction of the Course, Chapter 1: Genetics: The Study of Biological Information, and Chapter 2: Mendelian Genetics
January 11: Chapter 2: Mendelian Genetics
January 16: Chapter 2: Mendelian Genetics
January 18: Chapter 2: Mendelian Genetics
January 23: Chapter 3: The Chromosome Theory of Inheritance
January 25: Chapter 3: The Chromosome Theory of Inheritance
January 30: Chapter 3: The Chromosome Theory of Inheritance
February 1: Chapter 3: The Chromosome Theory of Inheritance
February 6: 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 13: Chapter 4: Linkage, Recombination, and the Mapping of Genes on Chromosomes
February 15: Chapter 5: The Multifaceted Nature of the DNA Molecule
February 20: Family Day, no class
February 22: February Break (February 21-24), no class
February 27: Chapter 5: The Multifaceted Nature of the DNA Molecule
March 1: Mid-term Exam (Chapters 1-4) [25%] 75 minutes
Chapter 5: The Multifaceted Nature of the DNA Molecule
March 6: Chapter 6: Chromatin to Chromosomes
March 8: Chapter 6: Chromatin to Chromosomes
March 13: Chapter 7: Gene Expression: The Flow of Information from DNA to RNA to Protein
March 15: Chapter 7: Gene Expression: The Flow of Information from DNA to RNA to Protein
March 20: Chapter 7: Gene Expression: The Flow of Information from DNA to RNA to Protein

March 22: Chapter 8: Mutation at the Molecular Level
March 27: Chapter 8: Mutation at the Molecular Level
March 29: Chapter 8: Mutation at the Molecular Level
April 3: Chapter 9: Mutation at the Chromosomal Level
April 5: Chapter 9: Mutation at the Chromosomal Level

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 exam.) (4) Students must understand well enough to solve all the 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. Mid-term exam [25%]: We will have mid-term exam on March 1, 2017, covering chapters 1-4. The midterm exam 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 exam. Duration is 75 minutes, after 75 minutes your exam will not be counted. If you have any concerns about the marking, please contact TA by email first. You are welcome to CC the email to me as well.
2. Final exam (Chapter 5-9) [45%]. 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.
3. Lab components [30%, which will be assigned and evaluated by the lab instructor Michael Moore or other Lab Teaching Assistant. For lab related questions or concerns, please contact Michael Moore at mnmoore@lakeheadu.ca or 343-8909].
4. If you miss your examination, by providing a reasonable written justification and 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. Hem Kanta Sharma at hsharma3@lakeheadu.ca & CC the email to me at wsteaching@gmail.com for arranging a time and place for your alternative exam.

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 the Enrolment Services officer's approval.
(3) This is a big class. The 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 in the class.
(6) Bonus points: Some bonus points may be introduced to the class by two assignments 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.

(7) Two homework assignments [0.5 bonus points each, 5 bonus points in total]: The questions listed below are from the chapters 1-9. The deadline of Assignment One on chapters 1-3 is February 27, 2017 at 23:59 pm. The deadline of Assignment Two on chapters 4-9 is March 30, 2017 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, email submission is not acceptable. The standard answers might be provided after 5 days of the submission deadlines.

(8) Class behaviour: If you whisper too much in the class, the instructor will stop lecturing as warning! If you are complained by two or more than two of your classmates, you may lose some bonus points.

(9) Buying "Online Connect Access" is not required. It's your own choice.

(10) Class attendances will be checked in some classes by the students to initial own names in the attendance sheets.

Biology 2171 (Genetics) 2016 Winter Term Assignments

Two assignments (10 essay questions from chapters 1-9, 0.5 bonus points for each question) [5 bonus points in total]. The deadline of Assignment One on chapters 1-3 is February 27, 2017 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?