

2018 Winter            Biology 2171: Genetics Course Outline

Instructor: Dr. Wensheng Qin

Email: wsteaching@gmail.com  
wqin@lakeheadu.ca

Office: CB 4016 (Tel: 343 8467)

Homepage: <http://flash.lakeheadu.ca/~wqin/>

Lecture Location: ATAC 1001

Time: Tuesdays, Thursdays: 10:00-11:300 am

Duration: 2018/01/08 - 2018/04/06

Credits: 0.50

TA: Hem Kanta Sharma

Email: hsharma3@lakeheadu.ca

TA's Tel: 766 7141, Office: CB 3037

Qin's Office Hours: CB4016, Tuesdays, 1:00 pm to 2:00 pm, or by appointment

Textbook: "Genetics: From Genes to Genomes" (2017 Second Canadian Edition) by Leland H. Hartwell, Michael L. Goldberg, Janice A. Fischer, Leroy Hood, Charles Aquadro, Jim Karagiannis (University of Western Ontario), Maria Papaconstantinou (University of Toronto). Publisher: McGraw-Hill Ryerson. (Students are strongly encouraged to buy the textbook of 2017 Second Canadian Edition, but not required. Use of other versions of the textbook is **TOTALLY** your own choice).

**Schedule (January 8, 2018: Monday, semester starts, April 6, 2018: Friday, semester ends)**

First Day of Classes	Monday January 8, 2018
Final Day of Classes	Friday April 6, 2018 (April 9, 10 will be make up days for Easter)
Final Date to Register	Friday January 19, 2018
Final Date for Withdrawal	Friday March 9, 2018
Examination Period	April 13 - 24 (includes 1 Sunday exam day)
Exam Contingency Date	Sunday April 15, 2018 & Wednesday April 25, 2018
Marks Due	Tuesday May 2, 2018

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 19: Family Day, no class

February 20: Winter Reading Week (February 20-23), no class  
February 22: Winter Reading Week (February 20-23), 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 (Last class)

**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, 2018, 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. For any lab components related questions or concerns, please directly contact Michael Moore at [mnmoore@lakeheadu.ca](mailto:mnmoore@lakeheadu.ca) or 343-8909, I am not in charge of scheduling the labs and giving lab components marks].
4. Bonus marks: Some bonus marks may be offered when necessary (see the notes below).

Notes: If you miss any examination (mid-term exam or final exam), we strictly follow the university regulations below of “Missed Examinations Due to Illness or Other Extenuating Circumstances”. If you are permitted to write your missed exam, an alternative test paper (Test B) may be made. Test B will be different in questions and/or format from the test questions for

the class (Test A). You should email TA and copy the email to me at wsteaching@gmail.com for arranging your alternative exam.

### Missed Examinations Due to Illness or Other Extenuating Circumstances

Occasionally, students encounter circumstances beyond their control where they may not be able to write an examination for reasons such as serious illness or death of an immediate family member.

In cases where a student misses an examination (including mid-term exam and/or final exam) due to an incapacitating illness, the student must have the “Certificate of Illness or Incapacitation” completed by a Medical Professional and submit the completed form to Enrolment Services no later than three (3) working days after the date of the original final examination. The “Certificate of Illness or Incapacitation” must be dated as seen by the Medical Professional no later than one (1) working day after the examination.

In other exceptional circumstances, official supporting documentation must be provided (e.g. copy of a death certificate or letter from the funeral home).

Accommodation shall be granted only when the documentation indicates that the onset, duration and severity of the illness or other circumstances are such that the student could not have reasonably been expected to complete the examination on the scheduled date.

Upon receipt of the “Certificate of Illness or Incapacitation” or other supporting documentation, Enrolment Services will notify the Instructor who will arrange for the student to write the missed examination. The final grade will be submitted to Enrolment Services as soon as possible after the rescheduled examination has been written.

Students will not be given another opportunity to write the examination if it is missed a second time. In some cases, when extraordinary circumstances beyond a student’s control prevent him/her from completing the rescheduled examination, a student may be eligible to petition Enrolment Services to explain the circumstances.

### **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 department chair and/or registrar’s approvals.
- (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 short 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: Students may be randomly offered to sign class attendance sheet for some

classes. Each signature will be counted as 1 bonus point, each bonus point can value more or less than 1% adding to the final grade. It depends on the class average marks from the exams and class participation.

- (7) Two homework assignments [Not for marks, just for your own practice]: The questions listed below are from the chapters 1-9. Standard answers are provided for your reference at the bottom of this file.
- (8) Class behaviour: If two or more students around you who whisper or talk too much in the class and affect your listening and learning, if you stand up and stop them as long as you have at least one witness supports you, you and your witnesses will receive 5 bonus points and the whisperers will lose 5 bonus points.
- (9) Please read and learn how to use scantron sheet before the exam. I attach a warning note example for the reasons the scantron machine reading could possibly be rejected. If you do not receive any warning note for scantron reading, you will be automatically awarded one bonus point in each exam. Please do not lose this bonus point. Please mark "A" in your exam scantron sheet (see the label below).
- (10) Get yourself familiar with the course outline and find answers there to automatically receive one bonus point. Please do not lose this bonus point.
- (11) Buying "Online Connect Access" is not required. It's totally your own choice.

### **Biology 2171 (Genetics) 2018 Winter Term Assignments**

Two assignments (10 essay questions from chapters 1-9) [Not for marks, just for your own practice]:

#### **Assignment #1 from chapters 1-3**

[1] Short hair in rabbits is produced by a dominant gene ( $I^+$ ) and long hair by its recessive allele ( $i$ ). 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*<sup>+</sup> and *y*<sup>+</sup>, 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 (<sup>15</sup>N and <sup>14</sup>N). 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?