

## Course outline

The course LIFS 2240 Cell Biology Laboratory comprises altogether six laboratory exercises and their associated tutorial sessions.

The aims of laboratory exercises are three-fold: 1) to enhance the comprehension of the students in the practical sense of what they have learnt in lectures; 2) to provide the students some hands-on experience in the fields of Cell Biology; and 3) to equip the students with knowledge that will be practically useful in advanced studies.

Every experimental exercise is associated with one tutorial, where background principles and practical protocols related to the particular experiment will be presented. There will also have some discussion on the experimental results obtained from the laboratory exercise.

Taken together, this course is aimed to help students to acquire various basic laboratory techniques in cell biology, and to develop skills in laboratory write-up by presenting experimental data in a formal laboratory report format or worksheet. Students will also learn how to collaborate effectively to perform the experimental tasks in group.

### **Learning Outcomes**

Upon completion of this course, students will be able to:

1. Demonstrate basic laboratory techniques in cell biology:
  - Describe and differentiate cellular structures of various cell types, including mammalian cells, plant cells and protozoans, in light microscopy
  - Mammalian cell culture techniques and quantification of cell density by hemocytometer
  - Cell Fractionation by centrifugation, and protein assay and enzymatic assay of cell fractions
  - Study of membrane permeability by plant cells
  - Study of cell motility by protozoans
  - Bacterial cell culture techniques and transformation
2. Qualitatively and quantitatively analyze experimental data and apply cell biology knowledge to interpret the results
3. Write formal laboratory reports
4. Work and coordinate effectively in a group to accomplish laboratory-based tasks

## **Teaching Team**

**Instructor and Course Coordinator:** Dr. Philip Y Lam

**Senior Technician:** Mr. Ming YM Wong

**Technician:** Ms Frances SL Chan  
Mr. Wilson SH Chan

**Laboratory and Tutorial Schedule**  
**<Spring Semester 2018-19>**

	<b>Laboratory</b>	<b>Tutorial</b>
<b>Schedule</b>	Thursday, 13:00 - 16:50	Tuesday, 18:00 – 18:50
<b>Venue</b>	Room 4160, Lift 33	Lecture Theater F

**Course Introduction and Laboratory Check-in**

14 February            Laboratory

**Exercise 1**            **Microscopy**  
 19 February            Tutorial  
 21 February            Laboratory

**Exercise 2**            **Cell Culture**  
 26 February            Tutorial  
 28 February            Laboratory  
 5 March                Tutorial  
 7 March                Laboratory

**Exercise 3**            **Activation of  $\beta$ -galactosidase gene in the Transformed *E. coli***  
 12 March                Tutorial  
 14 March                Laboratory

**Exercise 4**            **Membrane Permeability**  
 19 March                Tutorial  
 21 March                Laboratory

**Exercise 5**                      **Cell Fractionation by Differential Centrifugation**  
26 March                      Tutorial  
28 March                      Laboratory

**Exercise 6**                      **Identification of Mitochondrial Fraction**  
2 April                      Tutorial  
4 April                      Laboratory

**Final Examination**

\*\*\*\*Schedule and Venue is to be determined\*\*\*\*

**Note:**

- Students are required to attend ALL concerned tutorial and laboratory session.
- Exercise 2 and 3 will have *follow-up laboratory sessions*.

### **Follow-up Laboratory Session**

In addition to the regular lab section as listed in page iii-iv, Exercise 2 and 3 will have follow-up laboratory sessions. Details of these sessions are listed as below.

	<b>Follow-up lab sessions</b>
Exercise 2	1/3/2019 Friday, 10:00 am – 11:00 am 4/3/2019 Monday, 10:00 am – 11:00 am 6/3/2019 Wednesday, 10:00 am – 11:00 am
Exercise 3	15/3/2019 Friday, 10:00 am – 10:30 am

Note:

- Only two students from each group are required for each of the follow-up sessions.
- Schedule of this follow-up session is subjected to changes. You will be notified for the finalized schedule in the involved laboratory session.

## Distribution of Marks

The grades for this course will be determined as follows:

Method of Assessment	Contribution to Final Grade (%)	Learning Outcomes* to be Assessed
Tutorial Quizzes	12%	(1)
Laboratory Performance	12%	(1), (2) & (4)
Laboratory Write-up	24%	(2) & (3)
Final Examination	52%	(1) & (2)

\*Listed on page ii

### **Tutorial Quizzes**

A good practice always is to study the laboratory manual before you come into the laboratory. Good preparation is encouraged and is assessed by laboratory quizzes, which are held in the tutorial. *The quiz is on sudden and random basis*, and will consist of multiple-choice questions to access on the experimental details and theory of that laboratory session.

### **Laboratory Performance**

In each experimental exercise, laboratory performance of students, including *practical performance, discipline and laboratory safety* will be assessed by Teaching Assistant. In addition to the rules and criteria as listed on page viii-ix, the following is the general focus of such assessment.

- To prepare a **simple flow-chart** of the experiment as preparation
- **Understanding and motivation** to accomplish the experimental tasks
- **Communication** with group members and Teaching Assistant
- To submit **group-based data** by the end of experiment, if necessary
- **Timing** of experiment
- **Clean-up** the bench after experiment

### **Laboratory Report and Worksheet**

Refer to Page x-xii for details

### **Final Examination**

This is a written examination to test your understanding of the principles and techniques studied in the experimental exercises. It will be very important for you to be able apply those principles you learnt through doing the experiments. The date and venue of the written examination will be announced later.

## Rules and Safety

Working in a laboratory may expose one to potentially dangerous tools and equipment, and hazardous chemicals. Therefore, you need to exercise discipline and cautiousness in your work. The following rules are mandatorily enforced in the LIFS 2240 laboratory in order to ensure that experiments are conducted under the best and safest conditions.

*Students who break the following regulations will be penalized by deducting 1-4% from the total score of the lab course.*

### **Attendance**

- a) **Full attendance** for all experimental exercise in the semester and for the entire duration of each one, except under circumstances where permission is granted. 4%
- b) Attendance on the follow-up laboratory session, whenever necessary. 3%
- c) Students are NOT allowed to swap the assigned session, except with permission granted from laboratory instructor. 3%

### **Punctuality**

You should be on time (**no more than 5 minutes late**) for any laboratory session. 2%

### **Practical Performance**

- a) Pay attention to instructions from teaching staff and lab manual. 1%
- b) Execute the experimental procedures carefully and accurately. 1%
- c) Preparation of flow chart of experimental procedure 1%
- d) Submission of Group-based data, whenever required 1%

### **Dress Code**

- a) Lab coat must be **worn at all times** as protection. 1%
- b) **Cover lower body with clothing** i.e. no shorts, short skirts, stockings, sandals, slippers, to minimize injuries against spills 1%
- c) Long loose hair must be **tied up** securely to minimize contact with Bunsen flame, chemicals, etc. 1%

### **General Safety Precautions and Procedures**

*Any offences to the below regulations will be penalized by deducting scores accordingly.*

1. Read the experimental details in this manual BEFORE you come to the laboratory to be sure that you understand all the procedures and safety precautions. Ask if you do not understand exactly what has to be done. Do not improvise any procedure.
2. Do not perform any unauthorized experiments.
3. Do not bring any unnecessary items into the laboratory, and do not place any personal items (pocketbooks, bags, coats, umbrellas etc.) on the laboratory bench, or somewhere where someone might trip over them.

4. Make sure all apparatus and equipment is adequately supported and is positioned squarely on the bench.
5. Never remove equipment, chemicals, biological materials, or any other material from the laboratory.
6. Do not operate any equipment until you are instructed in its proper use. If you are unsure of the procedures, ask your TA or the Instructor.
7. Dispose of chemicals, biological materials, used apparatus, and waste materials according to the directions of your instructor.
8. Do not put anything in your mouth while in the laboratory. Never eat, drink, taste chemicals, lick labels, smoke, or store food in the laboratory.
9. Wash your hands before leaving the laboratory and remove protective clothing.

**Laboratory Write-up**  
**(Laboratory Report and Worksheet)**

Students are required to submit Laboratory Write up, which is either in format of Laboratory Report or Experimental Worksheet, for all Exercises. Therefore, a total of six write-up will be submitted by each student, as follows,

<b>Format of write-up</b>	<b>Involved Exercise</b>
Laboratory Report	Exercise 1 and 2
Worksheet	Exercise 3, 4, 5 and 6

**Requirement of Laboratory Report**

It is essential in science to keep a good record of your experimental results and you will learn the required skills of writing a proper laboratory report throughout this course. All the essential components of a full laboratory report are expected, these include:

*Title and Author* – Give the Name, Student Number, Group Number / Session, Experimental Date, and the Number and Title of the Exercise concerned.

Below is an example for you as reference:

**Course code: LIFS 2240**  
**Student name: Chan Siu Ming**  
**Session/ Group no.: 1A**  
**Exercise 1: Microscopy**

**Course name: Cell Biology Laboratory**  
**Student ID: 10888888**  
**Date of experiment: 21 Feb 2019**

*Introduction* – A concise paragraph stating the objectives of the experiment.

*Procedure* – Do not copy the entire procedure from lab manual but only record the alteration in the procedure made during the practical session must be noted.

*Results* – A clear record of the data you collected from the practical sessions, in format of table, chart and figure, if applicable. Proper title and labels should be provided.

*Discussion* – Explain and interpret your results. Attempt to explain any negative result or experimental error that you might have.

## Requirement of Worksheet

The worksheet is in **question-answer format**. *The question sets would be distributed in the involved laboratory or tutorial session.*

Similar to laboratory report, in each worksheet, you are also required to put down your Name, Student Number, Group Number / Session, Experimental Date, and the Number and Title of the Exercise concerned. After you have provided all the above information, proceed directly to provide answers to the questions and problems of the worksheet. For worksheet, you are NOT required to rewrite the introduction and procedure. So do not waste your time in doing that.

## Report and Worksheet Marking

One assigned teaching assistants will be responsible for collecting and marking all the laboratory write-up on an exercise.

## Plagiarism

All write-up work **MUST BE** your own work. It is essential that you write the reports **IN YOUR OWN WORDS**. **YOU MUST NOT COPY** from your friends, from the manual, from the lecture notes, from a previously submitted report, from the text book or from the internet.

Academic integrity and honesty are key values at HKUST (for details, please visit <http://www.ust.hk/vpao/ug-guide/integrity/index.html>). Student who is found cheating (i.e. making up or adjusting data); or to have committed plagiarism (i.e. presenting work which is not their own and originates from other sources as if it is their own) will receive **ZERO MARK** for that lab report.

**If you are found to have committed plagiarism in more than one report, you will receive a “fail” in the course with an X recorded in your transcript.**

Plagiarism includes but is not limited to:

- reporting data that is not from your own or your group unless you have specific permission from your instructor to do so;
- using a graph or figure prepared by another student in your lab report;
- asking another student to let you read his or her lab report and then using what he or she has written as the basis for your own report writing;
- working together with a partner on writing the reports, resulting in two identical or very similar reports;
- failing to give credit (a properly formatted citation and reference) for any facts or ideas which are actually not originated from your own.

## Laboratory Report and Worksheet Submission Schedule

You should submit “laboratory write up” (report or worksheet) on the following date and to specific location, accordingly:

<b>Exercise</b>	<b>Format of Lab Write-up</b>	<b>Submission Date / Location</b>
1	Laboratory Report	28 Feb / Laboratory
2	Laboratory Report	14 Mar / Laboratory
3	Worksheet	21 Mar / Laboratory
4	Worksheet	28 Mar / Laboratory
5&6	Worksheet	11 Apr / Mailbox outside LIFS general office

Note:

For the submission location that is indicated as “laboratory”, you should submit the lab write-up to the assigned collection tray as arranged by the instructor, on your arrival of laboratory session on the required submission date.

For the submission location that is indicated as “mailbox outside LIFS general office”, you should submit your worksheet to a dedicated mailbox outside LIFS general office (5<sup>th</sup> floor, 25/26 lift) by 5 pm.

### *Format*

All laboratory reports or worksheet must be submitted in MS-Word format and must conform to the format described above with *a font size of 12 point* and a *spacing of 1.5 lines*. Double-page printing is encouraged to reduce paper use.

### *Late Submission Penalty*

Marks will be deducted for late submissions: 10% of the final mark per day after the final deadline.

### **Purpose of Experimental Datasheet**

In the last part of each experimental protocol, is the “Experimental Datasheet” for each corresponding exercise. Its purpose is for you to record all relevant experimental raw data, such as drawings, observation or numerical data, collected during the experimental exercise.

**All these raw data should be then formally reported AGAIN on the laboratory write-up** (laboratory report or worksheet), in format of table, chart or figure, accordingly. Note proper title and/or label should be provided for the drawings, table, chart or figure, and calculation step should be demonstrated, if necessary, in the formal write-up.

For some exercises, the experimental task is collaborated among group members and the experimental data obtained is also group-based. Then each group of students should submit one copy of experimental datasheet to laboratory instructor for records, and students of the same group are expected to report the *identical set of raw data* in the laboratory write-up.