

# Biochemistry Major/Minor (Sch of Biomed Sc, LKS Fac of Med)



- ❖ Professors: 16 (plus >7 others from School;  
<http://www.sbms.hku.hk/staff/academic-staff> )
- ❖ Lecturers: 4 (2 Principle Lecturers)
- ❖ Postdoctoral Fellows and Research Associates: ~35
- ❖ Research Assistants: ~20
- ❖ Research postgraduates: ~90
- ❖ Administrative staff: 5
- ❖ Technical staff: 10 technicians & 5 supportive staff

# Introduction to Biochemistry (4-minute video)

[https://youtu.be/tpBAmzQ\\_pUE](https://youtu.be/tpBAmzQ_pUE)

- Study of the **chemistry** of **life processes**!

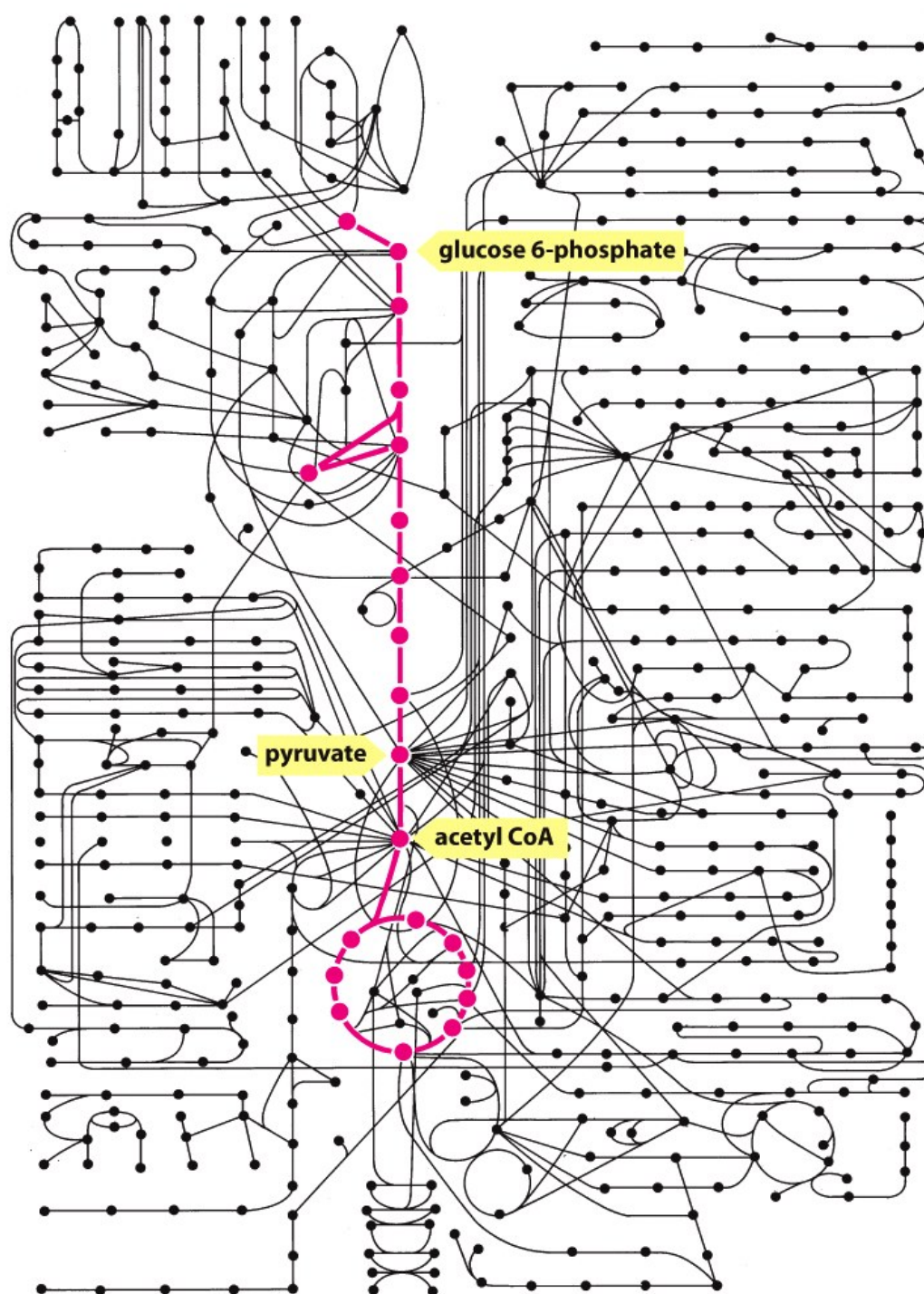
Each second, there are over 500 quadrillion ( $10^{15}$ ) chemical reactions occurring in our body!

molecule



catalysis  
enzyme

Structure  
structure  
function  
macromolecules  
i.e. proteins  
carbohydrates  
lipids  
etc.



molecule



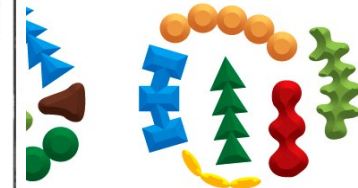
catalysis by  
enzyme 5

molecule



abolism

the many molecules  
that form the cell



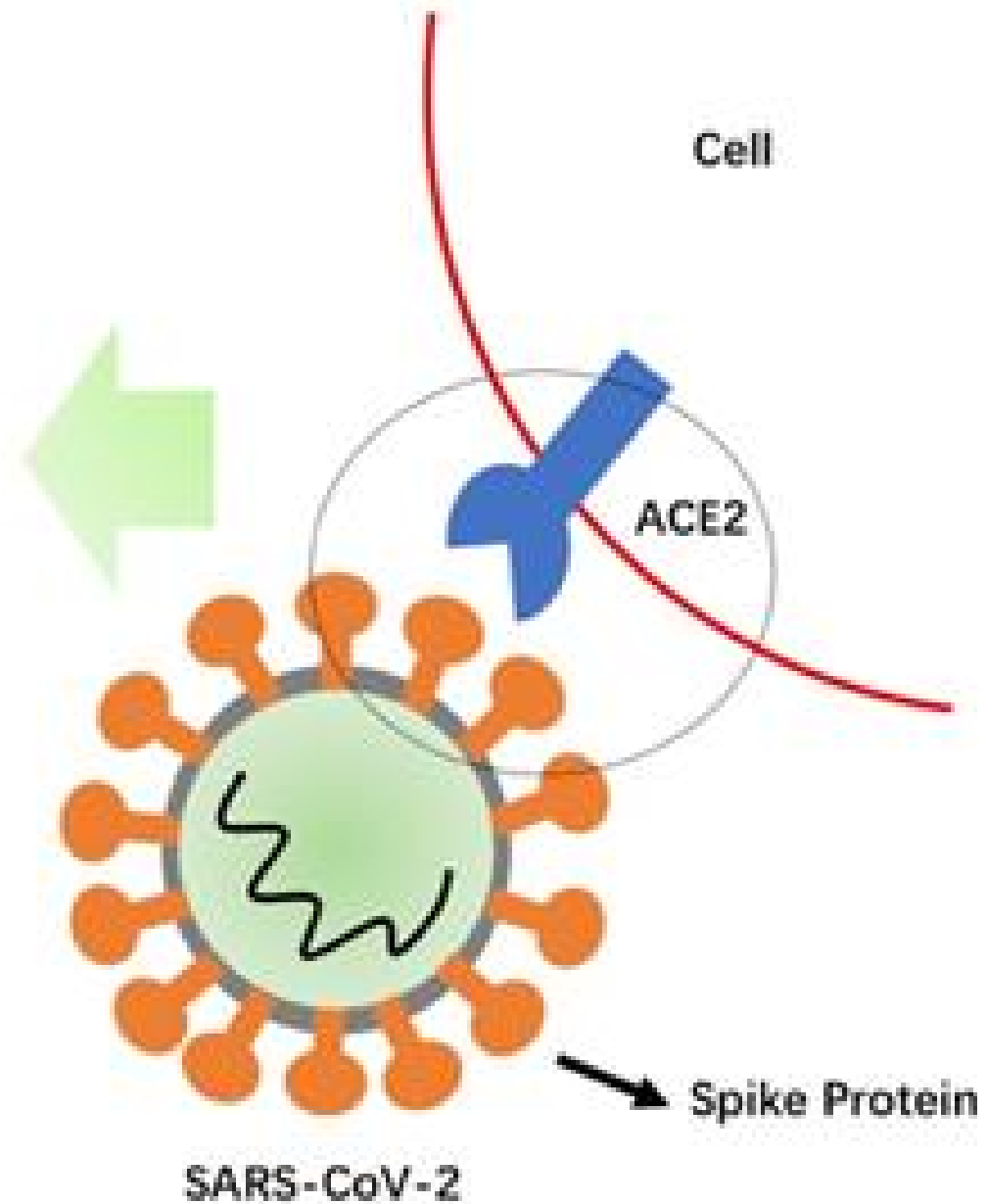
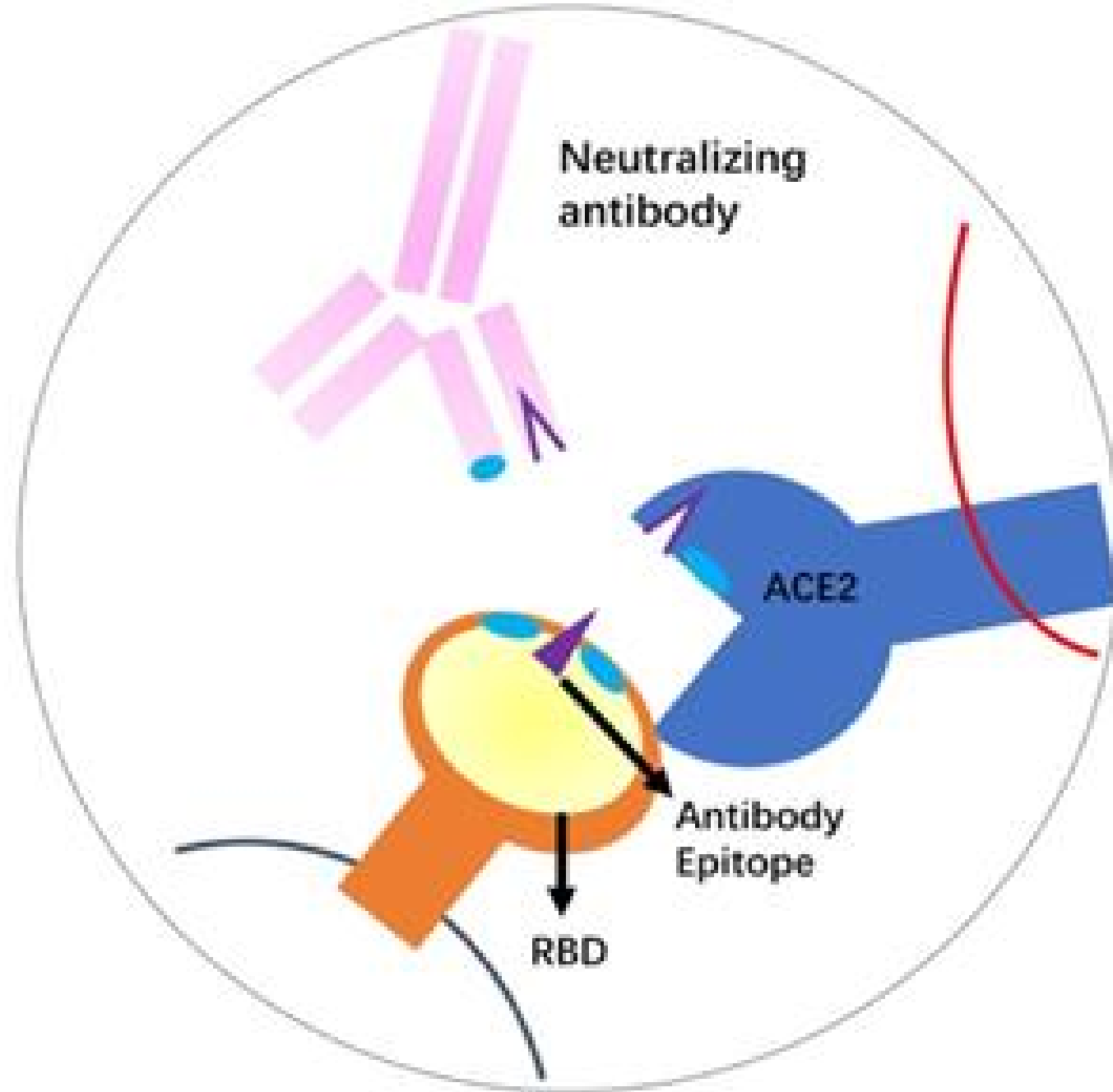
useful  
forms of  
energy

+  
lost  
heat

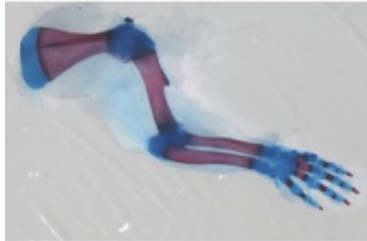
ANABOLIC  
PATHWAYS

building blocks  
synthesis

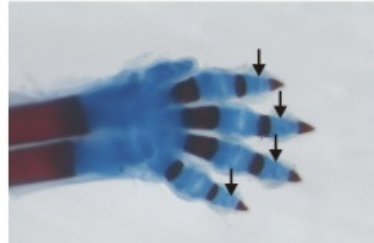
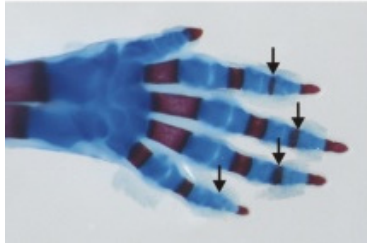
(and Science 2010)



Wt



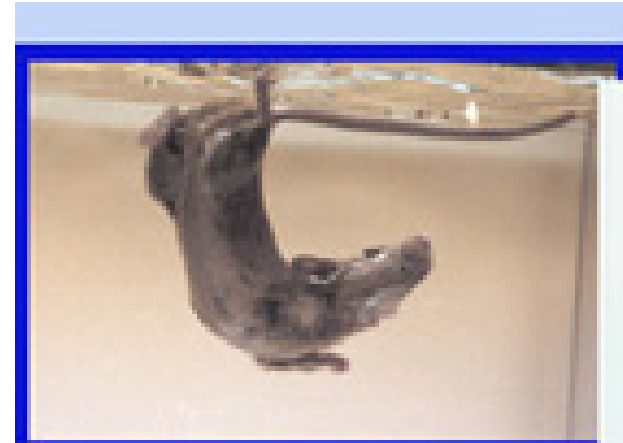
Ror2-W749X



Skeletal



Aging



Deaf and balance



# Study of Biochemistry:

- Evolving discipline - take on new meanings with time!
  - E.g. Proteins (enzymes) in 60s-70s
  - Genes in 80s
  - Whole genomes in ~2000
  - System biology in ~2010 (transcriptome, proteome, metabolome)
  - Noncoding RNAs, epitranscriptome, single cell analysis, CRISPR/Cas9 genome editing more recently
- Broad
  - studied at different levels of complexity using various model systems (3D modeling, bioinformatics, cancer cells, chick neural tube, Planaria, mutant mice, etc.)
- Relevance to **health and diseases**

# BIOCHEMISTRY MAJOR

Please access <https://www.scifac.hku.hk/current/ug/academic/syllabuses> to see the latest Biochemistry program structure.

Throughout the curriculum there is an emphasis on experiential learning through laboratory practicals, problem-solving exercises, group-based learning, industrial experience, overseas exchange and research-based projects.

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## Learning Outcomes:

By the end of this programme, students should be able to:

- (1) describe the principles of biomolecular structure, metabolism, molecular interactions, molecular processes and their regulation, genetics and systems biology critical to contemporary biochemistry and molecular biology  
(by means of coursework and experiential learning)
- (2) apply biochemical, bioinformatics and molecular genetics technologies for new observations, measurements and analyses; and to design experiments that bring discovery and insight into the unknown  
(by means of laboratory-based and research project-based learning)
- (3) interpret and communicate scientific data and literature using appropriate scientific language  
(by means of literature-based coursework and debate)
- (4) work effectively as a team and synergize with their colleagues in a supportive manner  
(by means of group-based learning and by group-based problem solving)
- (5) recognize the interconnections of biochemistry with other disciplines in science, medicine and engineering, humanities and ethics, which are relevant to diverse working environment in the society  
(by means of multidisciplinary-based research projects, internship and debate)

# Required courses (96 credits) (16 courses)

|   |  |  |
|---|--|--|
| <b>1. Introductory level courses (42 credits) (7 courses)</b>             |  |  |
| <b>Disciplinary Core Courses: Science Foundation Courses (12 credits)</b> |  | <b>(semester)</b>  |
| SCNC1111  | Scientific method and reasoning (6)                        | (1,2)  |
| SCNC1112  | Fundamentals of modern science (6)                         | (1,2)  |
| <b>Disciplinary Core Courses (30 credits)</b>                             |  |  |
| CHEM1042  | General chemistry I (6)                                    | (1,2)  |
| CHEM1043  | General chemistry II (6)                                   | (2)  |
| BIOC2600 (or BIOL2220)  | Basic biochemistry (6) [or Principles of biochemistry (6)] | (1)  |
| CHEM2441  | Organic chemistry I (6)                                    | (1,2)  |
| <b>Disciplinary Electives (6 credits)</b>                                 |  |  |
| BIOC1600  | Perspectives in biochemistry (6)                           | Take either BIOC1600 or BIOL1110, but not both.<br>(1)   |
| BIOL1110  | From molecules to cells (6)                                | Take either BIOC1600 or BIOL1110, but not both.<br>(1,2) |



|   |  |                   |
|---|--|-------------------|
| <b>2. Advanced level courses (48 credits) (8 courses)</b>     |  |                   |
| <b>Disciplinary Core Courses (30 credits)</b>                 |  | <b>(semester)</b> |
| BIOC3601  | Basic Metabolism (6)   | (1)               |
| BIOC3604  | Essential techniques in biochemistry and molecular biology (6) | (2)               |
| BIOL3401  | Molecular biology (6)  | (1)               |
| BIOC4610  | Advanced biochemistry (6)                                      | (1)               |
| BIOC4613  | Advanced techniques in biochemistry & molecular biology (6)    | (1)               |
| <b>Disciplinary Electives (18 credits)</b>                    |  |                   |
| Plus at least 18 credits selected from the following courses: |  |                   |
| BIOC3605  | Sequence bioinformatics (6)                                    | (2)               |
| BIOC3606  | Molecular medicine (6)   | (2)               |
| BIOL3202  | Nutritional biochemistry (6)                                   | (1)               |
| BIOL3402  | Cell biology and cell technology (6)                           | (1)               |
| BIOL3403  | Immunology (6)   | (2)               |
| BIOL3404  | Protein structure and function (6)                             | (2)               |
| BIOL3408  | Genetics (6)   | (1)               |
| CHEM3441  | Organic chemistry II (6)                                       | (1,2)             |
| BIOC4612  | Molecular biology of the gene (6)                              | (2)               |
| BIOL4417  | 'Omics' and systems biology (6)                                | (2)               |
| CHEM4145  | Medicinal chemistry (6)  | (2)               |
| CHEM4444  | Chemical biology (6)   | (2)               |
| <b>3. Capstone requirement (6 credits) (1 course)</b>         |  |                   |
| At least 6 credits selected from the following courses:       |  |                   |
| BIOC3999  | Directed studies in biochemistry (6)                           | (1,2,summer)      |
| BIOC4966  | Biochemistry internship (6)                                    | (1,2,summer)      |
| BIOC4999  | Biochemistry project (12)                                      | (1+2)             |

| Black: Core (11 courses)<br>Purple: Elective (4 courses)<br>Green: Capstone requirement (1 course) | <b>Science Foundation and Chemistry</b>   | <b>Fundamental Biochemistry/ Molecular Biology</b>                                   | <b>Advanced and Integrative Biochemistry/ Molecular Biology</b>  | <b>Techniques/ Undergrad Research (Capstone)</b>  |
|--|---|--|--|---|
| Year 1   | SCNC 1111 Scientific method and reasoning (6)<br>SCNC1112 Fundamentals of modern science (6)<br>CHEM1042 General Chemistry I<br>CHEM1043 General Chemistry II | BIOC1600 Perspectives in biochemistry (6) or<br>BIOL1110 From molecules to cells (6) |  |   |
| Year 2   | CHEM2441 Organic Chemistry I (6)  | BIOC2600 Basic Biochemistry (6)  | BIOC3605 Sequence bioinformatics (6)<br>BIOC3606 Molecular medicine (6)<br>BIOL3404 Protein structure and function (6)                                     | BIOC3604 Essential techniques in biochemistry and molecular biology (6)   |
| Year 3   | CHEM3441 Organic Chemistry II (6)   | BIOC3601 Basic Metabolism (6)<br>BIOL3401 Molecular Biology (6)                      | BIOL3202 Nutritional biochem (6)<br>BIOL3402 Cell biol & cell tech (6)<br>BIOL3403 Immunology (6)<br>BIOL3408 Genetics (6)                                 | BIOC4613 Advanced Techniques in biochemistry and molecular biology (6)  |
| Year 4   | CHEM4145 Medicinal chem (6)   |  | BIOC4610 Advanced Biochemistry (6)<br>BIOC4612 Molecular biology of the gene (6)<br>BIOL4417 "Omics" and systems biol (6)<br>CHEM4444 Chemical biology (6) | BIOC3999 Directed studies in biochemistry (6)<br>BIOC4966 Biochemistry internship (6)<br>BIOC4999 Biochemistry project (12) |

## Suggested Electives at the Advanced Level

|                              |   |
|------------------------------|---|
|                              | <p><b>Advanced and Integrative Biochemistry/<br/>Molecular Biology</b></p>  |
| Premed/Graduate school track | <p>           BIO3605 Sequence bioinformatics (6)<br/>           BIO3606 Molecular medicine (6)<br/>           BIOL3403 Immunology (6)<br/>           BIOL3404 Protein structure and function (6)<br/>           BIOL3408 Genetics (6)<br/>           BIO4612 Molecular Biology of the gene (6)         </p>  |
| Biotech/Pre-business track   | <p>           BIO3606 Molecular medicine (6)<br/>           BIOL3402 Cell biol &amp; cell tech (6)<br/>           CHEM3441 Organic Chemistry II (6)<br/>           BIOL4417 "Omics" and systems biol (6)<br/>           CHEM4145 Medicinal chem (6)<br/>           CHEM4444 Chemical biology (6)         </p> |
| Teaching track               | <p>           BIO3606 Molecular medicine<br/>           BIOL3402 Cell biol &amp; cell tech<br/>           BIOL3404 Protein structure and function<br/>           BIOL3408 Genetics<br/>           CHEM3441 Organic Chemistry II<br/>           BIO4612 Molecular Biology of the gene         </p>             |

Read more about Career Prospects and Student Sharing at  
<https://www.scifac.hku.hk/prospective/ug/6901-bsc/majors/biochemistry>  
 Talk to your Academic Advisor!!!!!!!