



# Course Outline

## **BABS1201**

### Molecules, Cells and Genes

School of Biotechnology and Biomolecular  
Sciences

Faculty of Science

Term 1, 2022

# 1. Staff

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| Position        | Name              | Email  | Contact Details  |
|-----------------|-------------------|--|--|
| Course Convenor | Dr Rebecca LeBard | <a href="mailto:r.lebard@unsw.edu.au">r.lebard@unsw.edu.au</a> | Use <a href="mailto:BABS1201@unsw.edu.au">BABS1201@unsw.edu.au</a> |
| Course Convenor | Dr Teagan Mock    | <a href="mailto:t.gale@unsw.edu.au">t.gale@unsw.edu.au</a>     | Use <a href="mailto:BABS1201@unsw.edu.au">BABS1201@unsw.edu.au</a> |

## **I have a question about the course. Where do I find the answer?**

Check to see if your question is already answered in this Course Outline or on the BABS1201 Moodle site. If not, post your question to the Discussion Forum in the BABS1201 Moodle site.

Email [BABS1201@unsw.edu.au](mailto:BABS1201@unsw.edu.au) if your question is of a personal or sensitive nature. Include your full name and student number and send from your UNSW email account.

You are welcome to contact your lecturers in the course with any questions. If they do not provide their contact details on their lecture slides, please ask your coordinators for them.

## **How do I contact my demonstrator? Can I email them?**

Your demonstrators are generally not available out of class time, as they are contracted only for their teaching hours and preparation. While you can contact them via your Microsoft Teams demonstrator group channel, please know they may not respond until they prepare for your next class.

## **How do I find answers to questions about specific lecture material?**

Read through the corresponding lecture notes whilst listening to the lecture audio recording (lecture notes and recordings can be accessed through the BABS1201 Moodle site). The lecturer may have answered your question during the lecture.

Refer to the corresponding references; there are copies of the recommended text in the library and available from the UNSW Bookshop.

Use the Lightboard revision videos available via Moodle, if applicable.

Attend the Q&A session that corresponds to that lecture.

Post your question on a discussion forum in the BABS1201 Moodle site.

Email your question to the lecturer, letting them know the course and the lecture to which your question refers.

## **Will I have access to past BABS1201 exam papers?**

No, past BABS1201 exams are not available to students.

Sample questions are provided throughout the course and the Lightboard videos cover problematic areas. Live Q&A sessions and formative online quizzes are particularly useful for exam preparation, along with The Reading Game from Week 6.

## 2. Course information

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Units of credit: 6

Pre-requisite(s): No prerequisites.

General course timetable: <http://timetable.unsw.edu.au/2022/BABS1201.html>

### 2.1 Course summary

The course is concerned with the basic characteristics of all life. The chemistry of life is examined, with emphasis on the ways in which living things construct and break down macromolecules. The way in which the genetic code controls these processes depends to a great extent on the structure and function of cell components, and cell biology is a major component of the course. The final topic is genetics - the way in which the genetic code is inherited and the ways in which it can be modified.

### 2.2 Course aims

This course aims to introduce students to the basic concepts of modern biology, with particular emphasis on cell structure, function and genetics. In the process of understanding these concepts, the student will also develop skills in scientific thinking and critical analysis.

### 2.3 Course learning outcomes (CLO)

1. Effectively communicate scientific findings to different audiences using different methods;
2. Identify different types of cells, their structures and functions, and compare and contrast them;
3. Outline the processes for energy generation in cells, including the structure and roles of proteins, carbohydrates and lipids; and,
4. Describe the structures of genetic material, the processes involved in cell division and gene expression, and how these relate to inheritance.

## 3. Strategies and approaches to learning

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### 3.1 Learning and teaching activities

The lectures for the course are pre-recorded and accompanied by live weekly Q&A sessions. This is due to myExperience feedback from students which listed this format as one of the best parts of the course due to its flexibility. A uniform set of lecture notes is provided for students who wish to prepare ahead of time for each lecture. This provides the learning outcomes, covers all assessable material, and the relevant textbook references. Please note that your lecturers will often provide another set in class that extends the information for those interested and gives context and examples from research. At UNSW, the people who teach you biology have made contributions to this area of study.

Lecture notes and recordings are accessible via the BABS1201 Moodle site and it is highly recommended you keep the schedule as it aligns with your online laboratory classes and assessments.

Every Monday, 12-1 pm, there will be an optional live Q&A session on general course aspects, such as assessment. This will be recorded for students in the Monday 5-6 pm stream.

Every Friday, 10-11 am, there will be an optional live Q&A and revision session on the lecture content. This will be recorded for students in the other lecture stream, who can submit any questions prior.

## 3.2 Expectations of students

Your attendance is expected for all laboratory classes. If you are unable to attend a laboratory class, please email [BABS1201@unsw.edu.au](mailto:BABS1201@unsw.edu.au).

For laboratory classes students are required to:

- Attend and actively participate in the laboratory classes as timetabled.
- Arrive on time and prepared for the class and complete your online Class Notebook each week.
- **On campus:** Arrive with PPE (laboratory coat, safety glasses and closed shoes) and bring your own device. We will have some additional devices available on request.
- **Online:** Be prepared to have your camera and microphone on to participate. If for some reason you are unable to have your camera on, you may communicate this to your demonstrator at the start of the class.

### **I missed a laboratory class. What should I do? Can I attend a makeup class?**

Attendance at your laboratory classes is compulsory. If you miss a lab class due to illness or some other unavoidable circumstance that can be explained using professional documentation (e.g., a medical certificate), please contact your demonstrator on Teams or email [BABS1201@unsw.edu.au](mailto:BABS1201@unsw.edu.au). We do not offer make up classes.

## 4. Course schedule and structure

| Wk | Starting                | Lectures   | Lecturer  | Laboratory  |
|----|-------------------------|--|---|---|
| 1  | 14 Feb                  | Welcome to Molecules, cells & genes<br><i>LIVE Monday 14 Feb 1-2 pm on Teams</i><br>Lecture 1: Life<br>Lecture 2: Cells I<br>Lecture 3: Cells II                 | Rebecca LeBard &<br>Teagan Mock                             | Self-directed   |
| 2  | 21 Feb                  | Lecture 4: Scientific Literature<br>Lecture 5: Science communication<br><i>LIVE Friday 25 Feb 10-11am on Teams</i>   | Rebecca LeBard<br>Teagan Mock                               | Health and safety   |
| 3  | 28 Feb                  | Lecture 6: Macromolecules I<br>Lecture 7: Macromolecules II<br>Lecture 8: Macromolecules III   | Rebecca LeBard<br>Rebecca LeBard<br>Rebecca LeBard          | Cell structure  |
| 4  | 7 Mar                   | Lecture 9: Cell integrity<br>Lecture 10: Nutrient & ion transport<br>Lecture 11: Metabolism I  | Vladimir Sytnyk<br>Vladimir Sytnyk<br>Rebecca LeBard        | Macromolecules  |
| 5  | 14 Mar                  | Lecture 12: Metabolism II<br>Lecture 13: Photosynthesis  | Rebecca LeBard<br>Rebecca LeBard                            | Osmosis & diffusion   |
| 6  | <i>Flexibility Week</i> |  |   |   |
| 7  | 28 Mar                  | Lecture 14: DNA Replication<br>Lecture 15: Cell division & reproduction<br>Lecture 16: Gene expression I   | Louise Lutze-Mann<br>Louise Lutze-Mann<br>Louise Lutze-Mann | Photosynthesis  |
| 8  | 4 Apr                   | Lecture 17: Gene expression II<br>Lecture 18: Polymerase Chain Reaction<br>Lecture 19: Mutation  | Louise Lutze-Mann<br>Louise Lutze-Mann<br>Anne Galea        | Mitosis & cell division                                       |
| 9  | 11 Apr                  | Lecture 20: Mendel's Laws of Heredity<br>Lecture 21: Mechanisms of Inheritance<br>Lecture 22: Population genetics<br><i>Friday - Public holiday</i>              | Paul Waters<br>Paul Waters<br>Paul Waters                   | Genetic inheritance   |
| 10 | 18 Apr                  | <i>Monday - Public holiday</i><br>Genetics revision<br><i>LIVE Wednesday 20 Apr 2-3 pm Teams</i><br>Exam revision<br><i>LIVE Friday 22 Apr 10-11 am on Teams</i> | -<br>Rebecca LeBard &<br>Teagan Mock                        | Presentations<br>(Genetic Inheritance<br>for Friday students) |

## 5. Assessment

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### 5.1 Assessment tasks

| Assessment         | Description   | Due date  |
|--------------------|---|---|
| Written assignment | Literature review (a minimum of three primary articles and one secondary article) (20%) | Friday 5 pm, Week 5                                     |
| Mid-term test      | Mid-term test (15%)   | Monday enrolled lecture time (1-2 pm OR 4-5 pm), Week 7 |
| Project            | Group presentation proposal (5%)  | Friday 5 pm, Week 7                                     |
|                    | Group presentation (15%)  | Upload prior to laboratory class, Week 10               |
|                    | Group presentation portfolio (5%)   | Friday 5 pm, Week 10                                    |
| Exam               | Final exam (40%)  | Exam period   |

Further details in the “Assessments” section of Moodle and in the Class Notebook.

UNSW assessment policy: [student.unsw.edu.au/assessment](http://student.unsw.edu.au/assessment)

### 5.2 Special Consideration

Students who believe that their performance, either during the session or in the end of session exams, may have been affected by illness or other circumstances may apply for special consideration. Applications can be made for compulsory class absences such as (laboratories and tutorials), in-session assessments tasks, and final examinations.

You must submit the application prior to the start of the relevant exam, or before a piece of assessment is due, except where illness or misadventure prevent you from doing so. If you become unwell on the day of the exam or fall sick during an exam, you must provide evidence dated within 24 hours of the exam, with your application.

UNSW has a fit to sit/submit rule which means that if you sit an exam or submit a piece of assessment, you are declaring yourself fit to do so.

You must obtain and attach Third Party documentation before submitting the application. Failure to do so may result in the application being rejected. Further information on special consideration: <https://student.unsw.edu.au/specialconsideration>.

The application must be made through Online Services in myUNSW (My Student Profile tab > My Student Services > Online Services > Special Consideration).

Students will be contacted via their university email address as to the outcome of their application.

The University does not give deferred examinations. However, further assessment exams may be given to those students who were absent from the final exams through illness or misadventure and received Special Consideration approval. Mid-term supplementary exam will be held during the term at the convenient period determined by the course convenor. Final supplementary exam will be run by The Exam Office and in supplementary exam period.

**For Term 1 2022, Supplementary Exams will be scheduled between: 23 May – 27 May 2022.**

It is the responsibility of all students to regularly consult their official student email accounts and myUNSW in order to ascertain whether or not they have been granted further assessment. Failure to sit for the appropriate exam may result in an overall failure for the course. Further assessment will NOT be offered on any alternative dates.

### **5.3 Submission of assessment tasks**

The literature review is submitted via Turnitin in the 'Assessments' section of Moodle. You are only able to submit an assessment to Turnitin once, so please make sure you finalise your assessment prior to submission.

The Mid-term test will be accessible through the 'Assessments' section of Moodle.

Group project:

- The proposal and portfolio is submitted via Turnitin in the 'Assessments' section of Moodle, note only ONE group member needs to submit this. You are only able to submit an assessment to Turnitin once, so please make sure you finalise your assessment prior to submission.
- Details on submission of the presentation video will be provided closer to Week 10 (via the course Announcements and the 'Assessments' section of Moodle, and your laboratory demonstrator).

The Final exam will be in a separate section of Moodle.

### **5.4. Late penalty for assessment tasks**

In line with the UNSW assessment policy, assessments submitted after the due date will be penalised at the rate of 5% per day (unless a student has received an extension due to their ELS status or an approved Special Consideration application). This is capped at five days (120 hours), after which a student cannot submit the assessment.

### **5.5. Feedback on assessment**

The written assessments will be submitted via Turnitin in the 'Assessments' section of Moodle There are two types of feedback for you: the marking rubric and comments from the marker. For information on how to access the rubric: <https://student.unsw.edu.au/view-rubric-or-marking-guide-moodle> and for a video on how to access feedback and comments click on the "Accessing your mark and feedback" toggle on this page: <https://student.unsw.edu.au/turnitin>. Any questions on this should be directed to your demonstrator as the first point of contact. Feedback is available in the online quizzes immediately.

## 6. Academic integrity, referencing and plagiarism

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**Referencing** is a way of acknowledging the sources of information that you use to research your assignments. You need to provide a reference whenever you draw on someone else's words, ideas or research. Not referencing other people's work can constitute plagiarism. Note that when you reference you must still use your own words.

Further information about referencing styles can be located at [student.unsw.edu.au/referencing](http://student.unsw.edu.au/referencing)

**Academic integrity** is fundamental to success at university. Academic integrity can be defined as a commitment to six fundamental values in academic pursuits: honesty, trust, fairness, respect, responsibility and courage.<sup>1</sup> At UNSW, this means that your work must be your own, and others' ideas should be appropriately acknowledged or plagiarism may be detected in your work.

Further information about academic integrity and **plagiarism** can be located at:

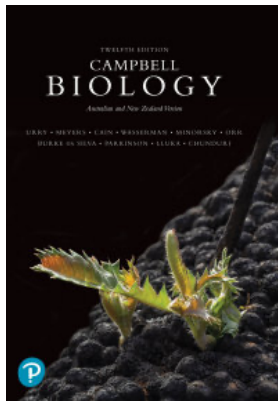
- The *Current Students* site [student.unsw.edu.au/plagiarism](http://student.unsw.edu.au/plagiarism)
- The *ELISE* training site [subjectguides.library.unsw.edu.au/elise](http://subjectguides.library.unsw.edu.au/elise)
- The *Conduct and Integrity Unit* provides further resources to assist you to understand your conduct obligations as a student: [student.unsw.edu.au/conduct](http://student.unsw.edu.au/conduct). It is important to know that plagiarism does not simply mean you are not referencing the original source. Your submitted work needs to be in your own

## 7. Readings and resources

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### Laboratory manual:

The laboratory manual, referred to as the Class Notebook. This is introduced in the first lecture and accessible via both the course Teams and Moodle sites.



### Recommended textbook:

#### Campbell Biology, 12th edition, Australian and New Zealand version

By: Lisa A. Urry, Noel Meyers, Michael L. Cain, Steven A. Wasserman, Peter V. Minorsky

Published: 18th October 2021

## 8. Administrative matters

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For general questions not specific to the course: [UNSW.to/webforms](http://UNSW.to/webforms)

### Student Complaint Procedure

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<sup>1</sup> International Center for Academic Integrity, 'The Fundamental Values of Academic Integrity', T. Fishman (ed), Clemson University, 2013.



- Contact the Course Convenor for any concerns as the first point of contact.
- School contact is Megan Lenardon: [m.lenardon@unsw.edu.au](mailto:m.lenardon@unsw.edu.au).
- University contact is Student Conduct and Appeals Officer (SCAO) within the Office of the PVCE: [studentcomplaints@unsw.edu.au](mailto:studentcomplaints@unsw.edu.au)

## 9. Additional support for students

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- Student Gateway: [student.unsw.edu.au](http://student.unsw.edu.au)
- Academic Skills and Support: [student.unsw.edu.au/skills](http://student.unsw.edu.au/skills)
- Student Wellbeing, Health and Safety: [student.unsw.edu.au/wellbeing](http://student.unsw.edu.au/wellbeing)
- Equitable Learning Services: [student.unsw.edu.au/disability](http://student.unsw.edu.au/disability)
- UNSW IT Service Centre: [www.it.unsw.edu.au/students](http://www.it.unsw.edu.au/students)

## 10. Course themes and lecture learning outcomes

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### 10.1 Course Themes

The course encompasses four major themes. These are not presented in turn, but integrated throughout the course.

#### **Theme 1: Thinking like a scientist**

This theme introduces the skills of scientific thinking, including how to decide what is true or plausible, and how scientists communicate. It also exposes you to cutting edge research being conducted at UNSW. Lectures and practical classes on this theme are interspersed through the term, enabling you:

- To comprehend that science is a never-ending exploration, and that knowledge is provisional.
- To identify the principal characteristics of scientific evidence.
- To understand how scientists approach the investigation of a topic.
- To communicate the principles of scientific findings to other scientists.

#### **Theme 2: Cell biology and cell architecture**

This theme describes the principal types of living cells, the key components of cell structure, their functions, and how they relate to each other. Lectures and practical classes on this theme should enable you:

- To understand the evolutionary origins of life, and of the diversity of life.
- To identify the different types of living cells, and the main similarities and differences between them.
- To explain how different cell types are identified.
- To describe important cell structures and relate these to function.
- To compare and contrast cell structures in eukaryotes and bacteria.

#### **Theme 3: Metabolism**

This theme outlines the key concepts of metabolism, the consumption and generation of energy by living cells. Lectures and practical classes on this theme should enable you:

- To describe the essential differences between proteins, carbohydrates and lipids.
- To describe the processes by which these molecules enter cells.
- To comprehend the processes of generating energy for cellular function.
- To compare and contrast energy generation in animals and plants.

#### **Theme 4: Genetics**

This theme introduces the key concepts of modern genetics, including what genes are, how they are regulated, how genetic information is transmitted and how modern molecular biology can use genetics to understand biology. Lectures and practical classes on this theme should enable you:

- To describe the essential structures of genetic material (nucleic acids, genes, chromosomes).
- To explain the processes by which cells divide.
- To describe the principal steps in the control of gene expression and the production of functional proteins.
- To relate these structures and processes to the inheritance of genetic characteristics.
- To explain the uses of recombinant DNA technology in at least one situation relating to investigation of gene function.

## 10.2 Course Outcomes

Please note that changes to learning outcomes may be communicated via your lecturers.

|   |   |
|---|---|
| <b>Molecules, cells and genes</b>   | In this lecture you will meet your coordinators, receive information on the course structure, expectations, assessments and procedures.   |
| <b>Scientific Literature</b>  | LO1 Explain the purpose of a scientific journal<br>LO2 Identify a primary article and list its features<br>LO3 Explain the differences between primary and secondary sources of scientific literature<br>LO4 Describe the term 'peer review' as it applies to scientific literature   |
| <b>Scientific Communication</b>   | Introduces the Biology Threshold Learning outcomes ( <a href="http://www.acds-tlcc.edu.au/science-threshold-learning-outcomes-tlos/science-tlos/">http://www.acds-tlcc.edu.au/science-threshold-learning-outcomes-tlos/science-tlos/</a> ).   |
| <b>Life</b>   | LO1 List the major elements of life.<br>LO2 Describe some properties of water that make it essential for life as we know it.<br>LO3 Changes in pH affect living organisms   |
| <b>Cells I</b>  | LO1 List the major elements of life<br>LO2 Explain how the diversity of life is classified<br>LO3 Define what a cell is<br>LO4 List some characteristics of life<br>LO5 Explain the fundamental differences between prokaryotes and eukaryotes<br>LO6 Describe the concept of endosymbiosis   |
| <b>Cells II</b>   | LO1 Identify characteristic structures of eukaryotic and bacterial cells, and describe their basic functions<br>LO2 Describe the endomembrane system<br>LO3 List the main components of the cytoskeleton and briefly describe their roles in the cell   |
| <b>Macromolecules I (CHO &amp; lipids), II (proteins) and III (nucleic acids)</b> | LO1 Provide a broad definition of the term "macromolecule".<br>LO2 Explain the way in which macromolecules are generally synthesised and broken down by organisms.<br>LO3 Briefly describe the general structural features of each of the four major classes of macromolecules.<br>LO4 List some examples of members belonging to each of the four major classes of macromolecules.<br>LO5 Describe some of the key functions of members belonging to each of the four major classes of macromolecules. |
| <b>Cell Integrity</b>   | LO1 To describe the structure of cell membranes and their function in cell integrity.<br>LO2 To describe the different components of the cell membrane that are important in maintaining cell integrity.<br>LO3 To explain the non-selective diffusion of some small molecules across cell membranes and osmosis.   |
| <b>Cellular transport</b>   | LO1 To explain the mechanisms by which small molecules may be selectively transported in and out of cells.<br>LO2 To describe the concept of a membrane potential arising from ionic imbalances across cell membranes.<br>LO3 To describe the different types of endocytosis.   |

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|--|---|
| <b>Metabolism I:<br/>Metabolic concepts</b>                  | <p>LO1 Explain the terms metabolism, catabolism and anabolism.</p> <p>LO2 Explain the basic model for enzyme catalysis</p> <p>LO3 Describe the structure and function of ATP</p> <p>LO4 Describe the terms respiration and fermentation.</p> <p>LO5 Describe the importance of redox reactions in metabolism, including the common cofactors.</p>   |
| <b>Metabolism II:<br/>Extracting energy<br/>from food</b>    | <p>LO1 Describe the catabolism of different macromolecules.</p> <p>LO2 Describe the central features of glycolysis, the TCA cycle and oxidative phosphorylation.</p> <p>LO3 Explain the process of chemiosmosis.</p> <p>LO4 Compare the advantages and disadvantages of fermentation and aerobic respiration.</p> <p>LO5 Explain the control of cellular respiration via feedback.</p>  |
| <b>Photosynthesis:<br/>Synthesising food<br/>from energy</b> | <p>LO1 To explain the functions of the different stages in photosynthesis; light harvesting, the conversion of light energy into chemical energy, and carbon dioxide fixation.</p> <p>LO2 To explain the overall organisation of the light reactions in photosystems I and II.</p> <p>LO3 To describe, in overview, the fixation of carbon dioxide and synthesis of glucose in the Calvin cycle.</p> <p>LO4 To compare and contrast the generation of energy from photosynthesis and oxidative phosphorylation.</p> |
| <b>DNA replication</b>                                       | <p>LO1 Explain the semi-conservative model of DNA replication.</p> <p>LO2 Describe the basic steps involved in the process of DNA replication.</p> <p>LO3 Describe the function of the major enzymes involved in DNA replication.</p>   |
| <b>Cell division and<br/>reproduction</b>                    | <p>LO1 To explain the difference between a gene and a chromosome and describe the way in which DNA is packaged within a cell.</p> <p>LO2 To explain the processes of mitosis and meiosis and the differences between them.</p>  |
| <b>Gene expression I:<br/>Transcription</b>                  | <p>LO1 Describe the genetic code.</p> <p>LO2 Explain how the instructions contained within DNA are transcribed into RNA.</p> <p>LO3 Define the three stages of transcription.</p> <p>LO4 State the main differences in gene expression between bacteria and eukaryotes.</p>   |
| <b>Gene expression II:<br/>Translation</b>                   | <p>LO1 Explain the process of translation, and relate it to cell function and the role of ribosomes.</p> <p>LO2 Describe the basic structure and function of tRNA.</p> <p>LO3 Describe the three main stages of translation.</p> <p>LO4 Explain the main differences between control of gene expression in bacteria and eukaryotes.</p>   |
| <b>The polymerase<br/>chain reaction</b>                     | <p>LO1. To describe the PCR including the steps involved.</p> <p>LO2. To list several applications of PCR.</p>  |
| <b>Mutation</b>  | <p>LO1 To explain at mechanisms by which mutations can arise.</p> <p>LO2 To elate the occurrence of mutations to the outcomes for cells and whole organisms.</p> <p>LO3 To appreciate the importance of the rate of mutation for the evolution of species.</p>  |

|                                  |  |
|----------------------------------|--|
| <b>Mendel's laws of heredity</b> | LO1 To describe Mendel's laws.<br>LO2 To explain the basis of inherited characteristics.<br>LO3 To explain why genotype does not always equal phenotype.   |
| <b>Mechanisms of inheritance</b> | LO1 To explain the varied modes of inheritance in different organisms. This includes the concepts of dominant and recessive traits, sex-linked and autosomal inheritance, linkage and recombination, complex traits eg codominance |
| <b>Population genetics</b>       | LO1 To explain the evolutionary forces that influence population genetics using the Hardy-Weinberg model.  |