

Summary

Unit 10 - Genetics and Evolution

Subject	Year	Start date	Duration
Biology	IB1	Week 1, May	2 weeks 8 hours

Course Part
Additional

Curriculum

Aims

- Appreciate scientific study and creativity within a global context through stimulating and challenging opportunities
- Acquire a body of knowledge, methods and techniques that characterize science and technology
- Apply and use a body of knowledge, methods and techniques that characterize science and technology
- Develop an ability to analyse, evaluate and synthesize scientific information
- Develop a critical awareness of the need for, and the value of, effective collaboration and communication during scientific activities
- Develop experimental and investigative scientific skills including the use of current technologies
- Develop and apply 21st century communication skills in the study of science
- Become critically aware, as global citizens, of the ethical implications of using science and technology
- Develop an appreciation of the possibilities and limitations of science and technology
- Develop an understanding of the relationships between scientific disciplines and their influence on other areas of knowledge

Objectives

Demonstrate knowledge and understanding of

- facts, concepts, and terminology
- methodologies and techniques
- communicating scientific information

Apply

- facts, concepts, and terminology
- methodologies and techniques
- methods of communicating scientific information

Syllabus Content

Additional higher level

10. Genetics and evolution

10.1 Meiosis

Nature of science:

Making careful observations—careful observation and record keeping turned up anomalous data that Mendel's law of independent assortment could not account for. Thomas Hunt Morgan developed the notion of linked genes to account for the anomalies.

Understandings:

Chromosomes replicate in interphase before meiosis.

Crossing over is the exchange of DNA material between non-sister homologous chromatids.

Crossing over produces new combinations of alleles on the chromosomes of the haploid cells.

Chiasmata formation between non-sister chromatids can result in an exchange of alleles.

Homologous chromosomes separate in meiosis I.

Sister chromatids separate in meiosis II.

Independent assortment of genes is due to the random orientation of pairs of homologous chromosomes in meiosis I.

Applications and skills:

Skill: Drawing diagrams to show chiasmata formed by crossing over.

10.2 Inheritance

Nature of science:

Looking for patterns, trends and discrepancies - Mendel used observations of the natural world to find and explain patterns and trends. Since then, scientists have looked for discrepancies and asked questions based on further observations to show exceptions to the rules. For example, Morgan discovered non-Mendelian ratios in his experiments with *Drosophila*.

Understandings:

Gene loci are said to be linked if on the same chromosome.

Unlinked genes segregate independently as a result of meiosis.

Variation can be discrete or continuous.

The phenotypes of polygenic characteristics tend to show continuous variation.

Chi-squared tests are used to determine whether the difference between an observed and expected frequency distribution is statistically significant.

Applications and skills:

Application: Morgan's discovery of non-Mendelian ratios in *Drosophila*.

Application: Completion and analysis of Punnett squares for dihybrid traits.

Application: Polygenic traits such as human height may also be influenced by environmental factors.

Skill: Calculation of the predicted genotypic and phenotypic ratio of offspring of dihybrid crosses involving unlinked autosomal genes.

Skill: Identification of recombinants in crosses involving two linked genes.

Skill: Use of a chi-squared test on data from dihybrid crosses.

10.3 Gene pools and speciation

Nature of science:

Looking for patterns, trends and discrepancies - patterns of chromosome number in some genera can be explained by speciation due to polyploidy.

Understandings:

A gene pool consists of all the genes and their different alleles, present in an interbreeding population.

Evolution requires that allele frequencies change with time in populations.

Reproductive isolation of populations can be temporal, behavioural or geographic.

Speciation due to divergence of isolated populations can be gradual.

Speciation can occur abruptly.

Applications and skills:

Application: Identifying examples of directional, stabilizing and disruptive selection.

Application: Speciation in the genus *Allium* by polyploidy.

Skill: Comparison of allele frequencies of geographically isolated populations.

ATL Skills

Approaches to Learning



Thinking

- In this unit, we will

ask students to formulate a reasoned argument to support their opinion or conclusion

give students time to think through their answers before asking them for a response

reward a new personal understanding, solution or approach to an issue

ask open questions

set students a task which required higher-order thinking skills (such as analysis or evaluation)

build on a specific prior task

help students to make their thinking more visible (for example, by using a strategy such as a thinking routine)

require students to take an unfamiliar viewpoint into account when formulating arguments

ask questions that required the use of knowledge from a different subject from the one you are teaching

include a reflection activity

make a link to TOK



Social

- In this unit, we will

have students work in small groups

allocate, or ask students to allocate among themselves, different roles in a classroom discussion or activity

have students peer assess their group performance or process

support students in resolving a conflict in a team

give a group assessment task

give students feedback on how they worked as a group

have students discuss their understanding of a text or idea among themselves and come up with a shared understanding

provide an opportunity for students to analyse the impact of their behaviour on the class or on a group performance

encourage students to consider alternative points of view or to take the perspective of others

provide opportunities for students to make decisions

IB DP IB1 Biology SL/HL (IB1)



Developing IB Learners

☆ Learner Profile



Inquirers



Knowledgeable



Thinkers



Balanced



Reflective