

## Lecture 1: Introduction to Cells

17. In the hierarchy of biological organization, which level comes directly below "organism"?
    - a. Ecosystem
    - b. Organ system
    - c. Organ
    - d. Tissue
  18. The theory that all living organisms are made up of cells is known as:
    - a. Evolutionary theory
    - b. Germ theory
    - c. Cell theory
    - d. Molecular theory
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## Lecture 2: Biomolecules and Water

19. Which type of bond holds complementary nitrogenous bases together in DNA?
    - a. Covalent bond
    - b. Hydrogen bond
    - c. Ionic bond
    - d. Peptide bond
  20. Lipids are a key component of:
    - a. Cell walls
    - b. Enzymes
    - c. Cell membranes
    - d. Genetic material
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## Lecture 3: Cellular Membranes

21. What type of movement occurs when water crosses a semi-permeable membrane?
  - a. Diffusion
  - b. Active transport
  - c. Osmosis
  - d. Endocytosis
22. Which of the following is an example of active transport?
  - a. Movement of water through aquaporins
  - b. Diffusion of oxygen into a cell
  - c. Movement of glucose into a cell using transport proteins

d. Pumping sodium ions out of a cell against their concentration gradient

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## Lecture 4: Energy and Metabolism

23. Which of the following describes a metabolic pathway?
- A single chemical reaction occurring in isolation
  - A series of interconnected chemical reactions
  - The breakdown of ATP to ADP
  - A reversible chemical reaction

24. Which factor can affect enzyme activity?
- Substrate concentration
  - Temperature
  - pH
  - All of the above
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## Lecture 5: Photosynthesis

25. The oxygen released during photosynthesis comes from:
- Water molecules
  - Carbon dioxide molecules
  - Glucose
  - Chlorophyll molecules

26. What is the main enzyme responsible for carbon fixation in the Calvin cycle?
- ATP synthase
  - Rubisco
  - Photosystem II
  - NADP<sup>+</sup> reductase
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## Lecture 6: Cellular Respiration

27. What is chemiosmosis?
- The process of splitting glucose into pyruvate
  - The synthesis of ATP using a proton gradient
  - The breakdown of ATP for energy
  - The transport of oxygen into cells

28. Where in the cell does oxidative phosphorylation occur?
- Cytoplasm
  - Mitochondrial matrix

- c. Inner mitochondrial membrane
  - d. Ribosomes
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## Lecture 7: Enzymes and Thermodynamics

- 29. What happens to the rate of an enzyme-catalyzed reaction as the temperature increases to its optimal point?
    - a. It decreases
    - b. It increases
    - c. It remains constant
    - d. It stops completely
  - 30. Which of the following is an example of feedback inhibition?
    - a. A product of a pathway inhibits the enzyme that produced it
    - b. An enzyme becomes active when it binds to a non-substrate molecule
    - c. A substrate binds to an enzyme to increase its activity
    - d. A molecule binds to an enzyme and speeds up its reaction
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## Lecture 8: Genetics and Inheritance

- 31. What is the function of DNA polymerase in DNA replication?
  - a. To synthesize RNA primers
  - b. To unwind the DNA double helix
  - c. To add nucleotides to the growing DNA strand
  - d. To seal gaps between Okazaki fragments
- 32. If an organism's diploid number is 46, how many chromosomes will be in its gametes?
  - a. 46
  - b. 23
  - c. 92
  - d. 12

## Practical-Based Questions

- 33. Why is it important to reset the environmental variable settings in the light curve modelling tool after changing one variable?
  - a. To clear the memory of the program
  - b. To prepare the model for a new set of measurements
  - c. To avoid errors in the graph generation
  - d. To allow multiple variables to change at the same time<sup>12</sup>

34. When running the light curve modelling experiment, what is the step change set to?
- +200
  - 100
  - +100
  - 200<sup>12</sup>
35. What should you do before running the photosynthesis modelling tool?
- Skip the worksheet and directly run the model
  - Run multiple variables at once
  - Follow the "Modelling worksheet" instructions
  - Set all environmental variables to the same value<sup>12</sup>
36. Which environmental variable can be adjusted in the light curve modelling tool?
- Wind speed
  - Light intensity
  - Soil pH
  - Chlorophyll content<sup>12</sup>
37. Why does the model focus on measuring light response under different temperatures?
- To observe how photosynthesis varies with light intensity under specific conditions
  - To monitor oxygen levels in the environment
  - To identify the optimal carbon dioxide concentration
  - To adjust cellular respiration rates<sup>12</sup>
38. What tab should you navigate to in the modelling tool to view the graphical results?
- Main
  - Inputs
  - Graphs
  - Settings<sup>12</sup>
39. What is the main purpose of practicals in BIOL1907?
- To replace lectures
  - To develop hands-on skills and apply theoretical knowledge
  - To prepare for the Masterclass
  - To complete assessments<sup>34</sup>
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## SOURCES

- 1: [Practical 4 - 17 Instructions – Photosynthesis Modelling](#)
- 2: [Practical 4 - 16 Instructions – Photosynthesis Modelling](#)

[3: BIOL1x07 Unit Information](#)

[4: General FAQ for Patch](#)

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## Lecture 9: Photosynthesis I

39. Which of the following best describes the primary role of the light-dependent reactions in photosynthesis?
- To fix atmospheric carbon dioxide into glucose
  - To convert sunlight into chemical energy stored in ATP and NADPH
  - To release carbon dioxide into the atmosphere
  - To convert glucose into pyruvate
40. What occurs during photolysis in photosynthesis?
- ATP is converted into ADP and Pi
  - Water molecules are split to release oxygen, protons, and electrons
  - Carbon dioxide is fixed into organic molecules
  - Glucose is broken down into smaller sugars

## Lecture 10: Photosynthesis II

41. Where does the Calvin cycle take place within the chloroplast?
- Thylakoid membrane
  - Stroma
  - Inner membrane
  - Granum
42. Which molecule is regenerated during the Calvin cycle to allow it to continue?
- RuBisCO
  - RuBP (ribulose bisphosphate)
  - NADPH
  - ATP

## Lecture 11: Respiration in Plants

43. What is the role of the stomata in plants?
- Absorption of water

- b. Uptake of carbon dioxide
  - c. Transport of sugars
  - d. Photosynthesis
44. Why do plants perform cellular respiration?
- a. To produce oxygen
  - b. To generate ATP for cellular processes
  - c. To absorb light energy
  - d. To produce glucose

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## Lecture 12: Module 2 Q&A

45. What is the function of NADH and FADH<sub>2</sub> in cellular respiration?
- a. To break down glucose
  - b. To transport electrons to the electron transport chain
  - c. To act as enzymes in the Krebs cycle
  - d. To provide carbon to the Calvin cycle
46. What is the net ATP yield of glycolysis from one molecule of glucose?
- a. 4 ATP
  - b. 2 ATP
  - c. 36 ATP
  - d. 38 ATP

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## Lecture 13: Introduction to Genetics

47. What is the central dogma of molecular biology?
- a. DNA → RNA → Protein
  - b. Protein → RNA → DNA
  - c. RNA → DNA → Protein
  - d. ATP → DNA → RNA
48. Mendel's law of segregation states that:
- a. Alleles for a trait separate during gamete formation
  - b. An organism with two alleles will always express the dominant one
  - c. Genes for different traits assort independently of one another
  - d. Hereditary information is only passed from females

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## Lecture 14: Mendelian Inheritance

49. If a heterozygous organism (Aa) is crossed with a homozygous recessive organism (aa), what percentage of the offspring will be heterozygous?
- 0%
  - 25%
  - 50%
  - 100%
50. In pea plants, yellow seeds (Y) are dominant to green seeds (y). What is the expected phenotype ratio when two heterozygous plants (Yy x Yy) are crossed?
- 1 yellow: 3 green
  - 3 yellow: 1 green
  - 2 yellow: 2 green
  - 4 yellow: 0 green

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## Lecture 15: Evolution

51. Natural selection acts directly on:
- Genotypes
  - Phenotypes
  - Mutations
  - Alleles
52. What is genetic drift?
- A random change in allele frequency in a population over time
  - A process where individuals with advantageous traits survive and reproduce
  - The introduction of new alleles into a population through mutation
  - The movement of individuals between populations

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## Lecture 16: Speciation

53. What is allopatric speciation?
- Speciation due to physical separation of populations
  - Speciation due to polyploidy
  - Speciation within a single population without geographic isolation
  - Speciation caused by genetic drift within a population
54. A population of insects is separated by a river, leading to the formation of two distinct species. What type of speciation has occurred?
- Allopatric speciation
  - Sympatric speciation

- c. Parapatric speciation
  - d. Convergent speciation
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## Lecture 17: Ecosystems I

- 55. Which of the following describes a primary producer?
  - a. An organism that consumes autotrophs
  - b. An organism that decomposes organic material
  - c. An organism that converts sunlight into chemical energy
  - d. An organism that eats both plants and animals
- 56. In the food chain, which group typically has the most energy available?
  - a. Tertiary consumers
  - b. Secondary consumers
  - c. Primary consumers
  - d. Primary producers

## Lecture 18: Ecosystems II

- 57. What is the ecological role of decomposers in an ecosystem?
  - a. To produce oxygen for the environment
  - b. To recycle nutrients by breaking down dead organisms
  - c. To compete with primary producers for sunlight
  - d. To regulate the population of predators
- 58. What is the term for the maximum population size that an environment can sustainably support?
  - a. Trophic level
  - b. Carrying capacity
  - c. Limiting factor
  - d. Biotic potential

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## Lecture 19: Human Impact on the Environment

- 59. Which of the following is a major contributor to global warming?
  - a. Burning fossil fuels
  - b. Deforestation
  - c. Industrial emissions
  - d. All of the above

60. Which of the following is an example of sustainable resource management?
- Clear-cutting large forests for agriculture
  - Harvesting fish populations faster than they can reproduce
  - Implementing renewable energy sources such as wind power
  - Using nitrogen-based fertilizers excessively

## Short Answer Questions

Answer all 4 questions. Each question is worth 10 marks.

- Module 1: Cells and Biomolecules
  - Compare and contrast DNA replication and transcription. Include at least three key differences in your answer.
- Module 2: Photosynthesis and Cellular Respiration
  - Describe how the light-dependent and light-independent reactions (Calvin cycle) of photosynthesis are related.
- Module 3: Genetics and Evolution
  - Explain the importance of mutations in evolution. Provide an example of how a genetic mutation can lead to a new trait in a population.
- Module 4: Ecosystems and Human Impact
  - Identify two human activities that negatively affect ecosystems and suggest solutions to mitigate their impact.

## Additional SAQs: Set 1

### Module 1: Information Transfer

- Explain the relationship between DNA, RNA, and proteins in the central dogma of molecular biology.
  - Your answer should describe how genetic information is transferred from DNA to RNA (transcription) and then translated into proteins (translation). Include an example of why this is important for cellular function.

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### Module 2: Photosynthesis and Cellular Respiration

- Compare and contrast the processes of aerobic and anaerobic respiration.

- Describe the similarities and differences between these two processes, including their ATP output and the conditions in which they occur. Provide specific examples of organisms that perform each type of respiration.

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### Module 3: Genetics and Evolution

3. What is genetic drift, and how can it influence allele frequencies in a population?
  - Explain the concept of genetic drift and provide an example, such as the bottleneck effect or founder effect, to illustrate its impact on a population over generations.

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### Module 4: Ecosystems and Human Impact

4. Describe the concept of carrying capacity in an ecosystem. How can human activities impact the carrying capacity of a specific environment?
  - Define carrying capacity, discuss examples of factors that affect it (e.g., resource availability), and explain how human actions like deforestation or pollution can alter an ecosystem's ability to support its populations.

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## Additional SAQs: Set 2

### Module 1: Information Transfer

1. How do prokaryotic and eukaryotic cells differ in terms of their structure and function?
  - Compare and contrast the two cell types, focusing on the presence of organelles, genetic material, and size differences.

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### Module 2: Photosynthesis and Cellular Respiration

2. Why are photosynthesis and cellular respiration considered complementary processes within the biosphere?
  - Explain how the products of one process serve as the reactants of the other, and how this relationship supports life on Earth. Include a specific example of this cycle in a natural ecosystem.

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## Module 3: Genetics and Evolution

### 3. What is the role of natural selection in driving evolution?

- Describe how natural selection works, using the example of a population developing a beneficial trait (e.g., antibiotic resistance in bacteria or coloration in moths).
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## Module 4: Ecosystems and Human Impact

### 4. What are the main differences between primary and secondary succession?

- Compare the processes of primary and secondary ecological succession, including examples of ecosystems where these processes occur.
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## SOURCES

1: [Module 1: Unit Information](#)

2: [BIOL1x07 Assessment Overview](#)