

NAVRACHANA INTERNATIONAL SCHOOL VADODARA

IB DP BIOLOGY HL HANDBOOK

***(Information in this document is resourced from IB subject guide
and TSM)***



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Syllabus Outline

Core

Topic 1: Cell biology

- 1.1 Introduction to cells
- 1.2 Ultrastructure of cells
- 1.3 Membrane structure
- 1.4 Membrane transport
- 1.5 The origin of cells
- 1.6 Cell division

Topic 2: Molecular biology

- 2.1 Molecules to metabolism
- 2.2 Water
- 2.3 Carbohydrates and lipids
- 2.4 Proteins
- 2.5 Enzymes
- 2.6 Structure of DNA and RNA
- 2.7 DNA replication, transcription and translation
- 2.8 Cell respiration 2.8 Cell respiration
- 2.9 Photosynthesis

Topic 3: Genetics

- 3.1 Genes
- 3.2 Chromosomes
- 3.3 Meiosis
- 3.4 Inheritance
- 3.5 Genetic modification and biotechnology

Topic 4: Ecology

- 4.1 Species, communities and ecosystems
- 4.2 Energy flow
- 4.3 Carbon cycling
- 4.4 Climate change

Topic 5: Evolution and biodiversity

- 5.1 Evidence for evolution
- 5.2 Natural selection
- 5.3 Classification of biodiversity
- 5.4 Cladistics

Topic 6: Human physiology

- 6.1 Digestion and absorption
- 6.2 The blood system
- 6.3 Defence against infectious disease
- 6.4 Gas exchange
- 6.5 Neurons and synapses
- 6.6 Hormones, homeostasis and reproduction

Additional higher level (AHL)

7. Nucleic acids

7.1 DNA structure and replication

7.2 Transcription and gene expression

7.3 Translation

8. Metabolism, cell respiration and photosynthesis

8.1 Metabolism

8.2 Cell respiration

8.3 Photosynthesis

9. Plant biology

9.1 Transport in the xylem of plants

9.2 Transport in the phloem of plants

9.3 Growth in plants

9.4 Reproduction in plants

10. Genetics and evolution

10.1 Meiosis

10.2 Inheritance

10.3 Gene pools and speciation

11. Animal physiology

11.1 Antibody production and vaccination

11.2 Movement

11.3 The kidney and osmoregulation

11.4 Sexual reproduction

Options

A: Neurobiology and behaviour

Core topics

A.1 Neural development

A.2 The human brain

A.3 Perception of stimuli

A.4 Innate and learned behaviour

A.5 Neuropharmacology

A.6 Ethology

B: Biotechnology and bioinformatics

Core topics

B.1 Microbiology: organisms in industry

B.2 Biotechnology in agriculture

B.3 Environmental protection

B.4 Medicine

B.5 Bioinformatics

C: Ecology and conservation

Core topics

- C.1 Species and communities
- C.2 Communities and ecosystems
- C.3 Impacts of humans on ecosystem
- C.4 Conservation of biodiversity
- C.5 Population ecology
- C.6 Nitrogen and phosphorus cycles

D: Human physiology

Core topics

- D.1 Human nutrition
- D.2 Digestion
- D.3 Functions of the liver
- D.4 The heart
- D.5 Hormones and metabolism
- D.6 Transport of respiratory gases

Higher level assessment specifications

Component	Overall Weight age	Duration	Format & Syllabus Coverage
Paper 1	20	1 hr	40 multiple-choice questions on the core + AHL material.
Paper 2	36	2 ¼ hr	Data-based question ,short-answer questions and extended-response questions on the core and the AHL
Paper 3	24	1 ¼ hr	Questions on core and SL option material. Section A – short answer question on experimental work Section B - answer and extended-response questions from one option.
Externals Internals	80% 20% [Investigations + Group 4 project]		

Practical Work And Internal Assessment **Internal Assessment Specifications 20%**

INTERNAL ASSESSMENT CRITERIA

The new assessment model uses five criteria to assess the final report of the individual investigation with the following raw marks and weightings assigned.

Personal Engagement	Exploration	Analysis	Evaluation	Communication	Total
2(8%)	6(25%)	6(25%)	6(25%)	4(17%)	24(100%)

Students at SL are required to spend 40 hours, and students at HL 60 hours, on practical activities (excluding time spent writing up work). These times include 10 hours for the group 4 project and 10 hours for the internal assessment investigation. (Only 2–3 hours of investigative work can be carried out after the deadline for submitting work to the moderator and still be counted in the total number of hours for the practical scheme of work.)

Resources:

➤ **Books**

- Biology for IB diploma SL &HL- Allan Damon [Pearson Baccalaureate]
- Biology for IB diploma SL&HL- Weem
- Advanced Biology –Kent
- Course companion in Biology by Alliot

Internal Assessment Group 4 Sciences
[Biology, Chemistry & Physics]

Weighting - 20%

Time – 10 hours

The new assessment model uses five criteria to assess the final report of the individual investigation with the following raw marks and weightings assigned:

Personal Engagement:	2
Exploration:	6
Analysis:	6
Evaluation:	6
<u>Communication:</u>	4
TOTAL:	24

Personal engagement – 2 marks

This criterion assesses the extent to which the student engages with the exploration and makes it their own. Personal engagement may be recognized in different attributes and skills. These could include addressing personal interests or showing evidence of independent thinking, creativity or initiative in the designing, implementation or presentation of the investigation.

Mark	Descriptor
0	The student's report does not reach a standard described by the descriptors below.
1	The evidence of personal engagement with the exploration is limited with little independent thinking, initiative or insight. The justification given for choosing the research question and/or the topic under investigation does not demonstrate personal significance, interest or curiosity. There is little evidence of personal input and initiative in the designing, implementation or presentation of the investigation.
2	The evidence of personal engagement with the exploration is clear with significant independent thinking, initiative or insight. The justification given for choosing the research question and/or the topic under investigation demonstrates personal significance, interest or curiosity. There is evidence of personal input and initiative in the designing, implementation or presentation of the investigation.

Exploration – 6 marks

This criterion assesses the extent to which the student establishes the scientific context for the work, states a clear and focused research question and uses concepts and techniques appropriate to the Diploma Programme level. Where appropriate, this criterion also assesses awareness of safety, environmental, and ethical considerations.

Mark	Descriptor
0	The student's report does not reach a standard described by the descriptors below.
1–2	<p>The topic of the investigation is identified and a research question of some relevance is stated but it is not focused.</p> <p>The background information provided for the investigation is superficial or of limited relevance and does not aid the understanding of the context of the investigation.</p> <p>The methodology of the investigation is only appropriate to address the research question to a very limited extent since it takes into consideration few of the significant factors that may influence the relevance, reliability and sufficiency of the collected data.</p> <p>The report shows evidence of limited awareness of the significant safety, ethical or environmental issues that are relevant to the methodology of the investigation*.</p>
3–4	<p>The topic of the investigation is identified and a relevant but not fully focused research question is described.</p> <p>The background information provided for the investigation is mainly appropriate and relevant and aids the understanding of the context of the investigation.</p> <p>The methodology of the investigation is mainly appropriate to address the research question but has limitations since it takes into consideration only some of the significant factors that may influence the relevance, reliability and sufficiency of the collected data.</p> <p>The report shows evidence of some awareness of the significant safety, ethical or environmental issues that are relevant to the methodology of the investigation*.</p>

Mark	Descriptor
5–6	<p>The topic of the investigation is identified and a relevant and fully focused research question is clearly described.</p> <p>The background information provided for the investigation is entirely appropriate and relevant and enhances the understanding of the context of the investigation.</p> <p>The methodology of the investigation is highly appropriate to address the research question because it takes into consideration all, or nearly all, of the significant factors that may influence the relevance, reliability and sufficiency of the collected data.</p> <p>The report shows evidence of full awareness of the significant safety, ethical or environmental issues that are relevant to the methodology of the investigation*.</p>

Analysis – 6 marks

This criterion assesses the extent to which the student's report provides evidence that the student has selected, recorded, processed and **interpreted** the data in ways that are relevant to the research question and can support a conclusion.

Mark	Descriptor
0	The student's report does not reach a standard described by the descriptors below.
1-2	<p>The report includes insufficient relevant raw data to support a valid conclusion to the research question.</p> <p>Some basic data processing is carried out but is either too inaccurate or too insufficient to lead to a valid conclusion.</p> <p>The report shows evidence of little consideration of the impact of measurement uncertainty on the analysis.</p> <p>The processed data is incorrectly or insufficiently interpreted so that the conclusion is invalid or very incomplete.</p>
3-4	<p>The report includes relevant but incomplete quantitative and qualitative raw data that could support a simple or partially valid conclusion to the research question.</p> <p>Appropriate and sufficient data processing is carried out that could lead to a broadly valid conclusion but there are significant inaccuracies and inconsistencies in the processing.</p> <p>The report shows evidence of some consideration of the impact of measurement uncertainty on the analysis.</p> <p>The processed data is interpreted so that a broadly valid but incomplete or limited conclusion to the research question can be deduced.</p>

Mark	Descriptor
5-6	<p>The report includes sufficient relevant quantitative and qualitative raw data that could support a detailed and valid conclusion to the research question.</p> <p>Appropriate and sufficient data processing is carried out with the accuracy required to enable a conclusion to the research question to be drawn that is fully consistent with the experimental data.</p> <p>The report shows evidence of full and appropriate consideration of the impact of measurement uncertainty on the analysis.</p> <p>The processed data is correctly interpreted so that a completely valid and detailed conclusion to the research question can be deduced.</p>

Evaluation – 6 marks

This criterion assesses the extent to which the student's report provides evidence of evaluation of the investigation and the results with regard to the research question and the accepted scientific context.

Mark	Descriptor
0	The student's report does not reach a standard described by the descriptors below.
1-2	<p>A conclusion is outlined which is not relevant to the research question or is not supported by the data presented.</p> <p>The conclusion makes superficial comparison to the accepted scientific context.</p> <p>Strengths and weaknesses of the investigation, such as limitations of the data and sources of error, are outlined but are restricted to an account of the practical or procedural issues faced.</p> <p>The student has outlined very few realistic and relevant suggestions for the improvement and extension of the investigation.</p>
3-4	<p>A conclusion is described which is relevant to the research question and supported by the data presented.</p> <p>A conclusion is described which makes some relevant comparison to the accepted scientific context.</p> <p>Strengths and weaknesses of the investigation, such as limitations of the data and sources of error, are described and provide evidence of some awareness of the methodological issues* involved in establishing the conclusion.</p> <p>The student has described some realistic and relevant suggestions for the improvement and extension of the investigation.</p>

Mark	Descriptor
5-6	<p>A detailed conclusion is described and justified which is entirely relevant to the research question and fully supported by the data presented.</p> <p>A conclusion is correctly described and justified through relevant comparison to the accepted scientific context.</p> <p>Strengths and weaknesses of the investigation, such as limitations of the data and sources of error, are discussed and provide evidence of a clear understanding of the methodological issues* involved in establishing the conclusion.</p> <p>The student has discussed realistic and relevant suggestions for the improvement and extension of the investigation.</p>

Communication– 4 marks

This criterion assesses whether the investigation is presented and reported in a way that supports effective communication of the focus, process and outcomes.

Mark	Descriptor
0	The student's report does not reach a standard described by the descriptors below.
1–2	<p>The presentation of the investigation is unclear, making it difficult to understand the focus, process and outcomes.</p> <p>The report is not well structured and is unclear: the necessary information on focus, process and outcomes is missing or is presented in an incoherent or disorganized way.</p> <p>The understanding of the focus, process and outcomes of the investigation is obscured by the presence of inappropriate or irrelevant information.</p> <p>There are many errors in the use of subject-specific terminology and conventions*.</p>
3–4	<p>The presentation of the investigation is clear. Any errors do not hamper understanding of the focus, process and outcomes.</p> <p>The report is well structured and clear: the necessary information on focus, process and outcomes is present and presented in a coherent way.</p> <p>The report is relevant and concise thereby facilitating a ready understanding of the focus, process and outcomes of the investigation.</p> <p>The use of subject-specific terminology and conventions is appropriate and correct. Any errors do not hamper understanding.</p>