Buckswood School

IB Diploma Programme

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| Subject | IB BIOLOGY |
| HL / SL | SL/HL |
| Text book | IB BIOLOGY OXFORD PRESS |
| Lesson per week | 3 hours SL 5 hours HL |
| Teacher | MRS BRAMLEY |
| Students | TBC |

**Christmas Term**

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| **Week** | **Topics covered** | **TOK Question** | **Connections** | **7 Prescribed Practicals** |
| 1  (11 Sept) | 1.1 Introduction to cells | There is a difference between the living and the non-living environment. How are we able to know the difference? | Environmental science | Use of a light microscope to investigate the structure of cells and tissues, with drawing of cells. Calculation of the magnification of drawings and the actual size of structures and ultrastructures shown in drawings or micrographs.  (Practical 1) |
| 2  (18 Sept) | 1.2 Ultrastructure of cells | • The world that we inhabit is limited by the world that we see. Is there any distinction to be drawn between knowledge claims dependent upon observations made by sense perception and knowledge claims dependent upon observations assisted by technology? How do scientists decide between competing approaches? | Physics  Topic 4.4 Wave behaviour  Topic C.1 Introduction to imaging  Topic C.3 Fibreoptics |  |
| 3  (25 Sep) | 1.3 Membrane structure  1.4 Membrane transport | • The explanation of the structure of the plasma membrane has changed over the years as new evidence and ways of analysis have come to light. Under what circumstances is it important to learn about theories that were later discredited? | Biology  Topic 2.3 Carbohydrates and lipids  Topic 2.6 Structure of DNA and RN | Estimation of osmolarity in tissues by bathing samples in hypotonic and hypertonic solutions.  (Practical 2) |
| 4  (02 Oct) | 1.5 The origin of Cells | • Biology is the study of life, yet life is an emergent property. Under what circumstances is a systems approach productive in biology and under what circumstances is a reductionist approach more appropriate? | Water 2.2 Biology  Topic 4.3 Carbon cycling  Topic 4.4 Climate change  Physics  Topic 3.1 Thermal concepts |  |
| 5  (09 Oct) | 2.1 Molecules to metabolism | Claims about the “memory of water” have been categorized as pseudoscientific. What are the criteria that can be used to distinguish scientific claims from pseudoscientific claims? | Chemistry  Topic 4 Chemical bonding and structure  Option B Biochemistry | Experimental investigation of a factor affecting enzyme activity.  (Practical 3) |
| 6  (16 Oct) | 2.2 Water **Assessment week** | | | |
| 7  (23 Oct) | **Half term** | | | |
| 8  (30 Oct) | 2.3 Carbohydrates Lipids. **HL: metabolism** | There are conflicting views as to the harms and benefits of fats in diets. How do we decide between competing views? | Geography (topic 3)  Biology (topic 4) |  |
| 9  (06 Nov) | 2.4 Proteins. **HL: metabolism** | When is quantitative data superior to qualitative data in giving us knowledge about the world? | Biology (topic 4)  Chemistry (topic 11) |  |
| 10  (20 Nov) | 2.5 Enzymes. **HL: enzymes** | Development of some techniques benefits particular human populations more than others. For example, the development of lactose-free milk available in Europe and North America would have greater benefit in Africa/Asia where lactose intolerance is more prevalent. The development of techniques requires financial investment. Should knowledge be shared when techniques developed in one part of the world are more applicable in another | Biology (topic 4)  Chemistry (topic 11) |  |
| 11  (20 Nov) | 2.6 Structure of DNA/RNA **HL: 7.1 DNA structure and replication** |  | Biology (topic 4)  Biology  Topic 2.2 Water  Topic 3.5 Genetic modification and biotechnology  Topic 7 Nucleic acids  Chemistry (topic 11) |  |
| 12  (27 Nov) | 2.7 DNA replication, transcription and translation. **HL: 7.2 transcription and gene expression** |  |  |  |
| 13  (04 Dec) | 2.8 Cell respiration  Revision. **HL: further cell respiration** | To what degree can looking at component parts give us knowledge of the whole? • The lollipop experiment used to work out the biochemical details of the Calvin cycle shows considerable creativity. To what extent is the creation of an elegant protocol similar to the creation of a work of art? |  | Separation of photosynthetic pigments by chromatograph.  (Practical 4) |
| 14  (11 Dec) | **2**.9 Photosynthesis. **HL: 8.3 Photosynthesis**  **Assessment Week** | | | |

**Spring Term**

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| **Week** | **Topics covered** | **TOK Question** | **Connections** | **Recommended Extra Reading** |
| 1  (08 Jan) | 3.1 Genes. **HL: sexual reproduction** | The story of the elucidation of the structure of DNA illustrates that cooperation and collaboration among scientists exists alongside competition between research groups. To what extent is research in secret ‘anti-scientific’? | Biology (topics 5 and 10) |  |
| 2  (15 Jan) | 3.2 Chromosomes. **HL: reproduction** | To what extent might some of these scientific discoveries be the result of intuition rather than luck? • Highly repetitive sequences were once classified as “junk DNA” showing a degree of confidence that it had no role |  |  |
| 3  (22 Jan) | 3.3 Meiosis. **HL: 10.1 meiosis -** | There is a link between sickle cell anaemia and prevalence of malaria. How can we know whether there is a causal link in such cases or simply a correlation? | Biology  Topic 1.6 Cell division  Topic 10.1 Meiosis  Topic 11.4 Sexual reproduction |  |
| 4  (29 Jan) | 3.4 Inheritance. **HL: 10.2 inheritance** | The nature versus nurture debate concerning the relative importance of an individual’s innate qualities versus those acquired through experiences is still under discussion. Is it important for science to attempt to answer this question? |  |  |
| 5  (05 Feb) | Assessment Week | | | |
| 6  (12 Feb) | **Half Term** | | | |
| 7  (19 Feb) | 3.5 Genetic modification and biotechnology. **HL: 10.2 inheritance** | Mendel’s theories were not accepted by the scientific community for a long time. What factors would encourage the acceptance of new ideas by the scientific community? • The law of independent assortment was soon found to have exceptions when looking at linked genes. What is the difference between a law and a theory in science? • The use of DNA for securing convictions in legal cases is well established, yet even universally accepted theories are overturned in the light of new evidence in science. What criteria are necessary for assessing the reliability of evidence? | Geography (options A and  D) |  |
| 8  (26 Feb) | 4.1 Species, communities and ecosystems | The precautionary principle is meant to guide decision-making in conditions where a lack of certainty exists. Is certainty ever possible in the natural sciences? | Geography  Part 2A: Fresh water-issues and conflicts  Environmental systems and societies  Topic 2.1 Species and populations |  |
| 9  (05 Mar) | 4.2 Energy flow | To what extent does our culture determine or shape our ethical judgments? | Biology  Topic 2.8 Cell respiration  Topic 2.9 Photosynthesis  Physics  Topic 2.3 Work, energy and power  Topic B.2 Thermodynamics  Environmental systems and societies  Topic 2.3 Flows of energy and matter |  |
| 10  (12 Mar) | 4.3 Carbon cycling  Revision | A wide range of parameters are used to test the quality of water and judgments are made about causes and effects of water quality—how can we effectively identify cause–effect relationships, given that we can only ever observe correlation? | Physics  Topic 8.1 Energy sources  Chemistry  Topic C.2 Fossil fuels  Topic C.5 Environmental impact—global warming |  |
| 11  (19 Mar) | **Assessment Week** | | | |

**Summer Term**

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| **Week** | **Topics covered** | **TOK Question** | **Connections** | **Recommended Extra Reading** |
| 1  (16 April) | 4.4 Climate Change | The soil system may be represented by a soil profile—since a model is, strictly speaking, not real, how can it lead to knowledge? | Physics  Topic 8.2 Thermal energy transfer  Geography  Part 1.3 Patterns in environmental quality and sustainability/Atmosphere and  change  Environmental systems and societies  Topic 7.2 Climate change—causes and impacts |  |
| 2  (23 Apr) | 5.1 Evidence for Evolution. **HL: 10.3 gene pools and speciation** | The theory of evolution by natural selection tells us that change in populations is achieved through the process of natural selection—is there a difference between a convincing theory and a correct one? | Physics  Topic 7.1 Discrete energy and radioactivity  Geography  Part 1.3 Patterns in environmental quality and sustainability/Biodiversity and  change  Environmental systems and societies  Topic 4 Biodiversity in ecosystem |  |
| 3  (30 Apr) | 5.2 Natural selection. **HL: 10.3 gene pools and speciation** | Evolutionary history is an especially challenging area of science because experiments cannot be performed to establish past events or their causes. |  | Setting up sealed mesocosms to try to establish sustainability.  (Practical 5) |
| 4  (07 May) | 5.3 Classification of biodiversity. **HL: 10.3 gene pools and speciation** | The term “biodiversity” has replaced the term “nature” in much literature on conservation issues—does this represent a paradigm shift | Chemistry  (options A and C)  Geography  (topic 3) |  |
| 5  (14 May) | 5.4 Cladistics. **HL: 10.3 gene pools and speciation** | There are nonetheless scientific methods of establishing beyond reasonable doubt what happened in some cases. How do these methods compare to those used by historians to reconstruct the past? | Geography (topic 3)  Physics (sub-topic 8.2) |  |
| 6  (21 May) | **Assessment week** | | | |
| 7  (28 May) | **Half term** | | | |
| 8  (04 Jun) | 6.1 Digestion and absorption | Our current understanding is that emotions are the product of activity in the brain rather than the heart. Is knowledge based on science more valid than knowledge based on intuition?  Paradigm shift—the chemiosmotic theory led to a paradigm shift in the field of bioenergetics. | Biology  Topic 2.1 Molecules to metabolism  Topic 2.5 Enzymes | Monitoring of ventilation in humans at rest and after mild and vigorous exercise.  (Practical 6)  Group 4 project |
| 9  (11 Jun) | I.A.: Group 4 project |  |  |  |
| 10  (18 Jun) | Revision | | | |
| 11  (25 Jun) | School Exam week | | | |