# Sample Unit: Biology – Year 12

***Sample for implementation for Year 12 from Term 4, 2018***

| **Unit title** | Ways to Reproduce | **Duration:** 30 hours including 6 hours for a Depth Study |
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| **Unit description** | Life continues through the processes of reproduction and heredity. Students expand their knowledge by investigating reproductive methods and technologies in both plants and animals. This unit investigates the functions of effective cell division and its role in growth and reproduction. The students examine the consequences of malfunctions in cell division. This unit includes relevant concepts from a number of modules.  Students learn about how contemporary research and the work of scientists in various fields, including agriculture, industry and medicine, can be explored within the context of biotechnology. The impact of biotechnology on biological diversity is also explored.  Students engage with the study of non-infectious disease and disorders, including their causes and effects on human health.  In this unit, students focus on processing and representing data in appropriate formats to analyse and evaluate trends, relationships and patterns. Students derive and justify valid conclusions about the processes involved in heredity. Students should be provided with opportunities to engage with all Working Scientifically skills throughout the course. | |
| **Outcomes**  A student:   * develops and evaluates questions and hypotheses for scientific investigation BIO11/12-1 * designs and evaluates investigations in order to obtain primary and secondary data and information BIO11/12-2 * conducts investigations to collect valid and reliable primary and secondary data and information BIO11/12-3 * selects and processes appropriate qualitative and quantitative data and information using a range of appropriate media BIO11/12-4 * analyses and evaluates primary and secondary data and information BIO11/12-5 * solves scientific problems using primary and secondary data, critical thinking skills and scientific processes BIO11/12-6 * communicates scientific understanding using suitable language and terminology for a specific audience or purpose BIO11/12-7 * explains the structures of DNA and analyses the mechanisms of inheritance and how processes of reproduction ensure continuity of species BIO12-12 * explains natural genetic change and the use of genetic technologies to induce genetic change BIO12-13 * explains non-infectious disease and disorders and a range of technologies and methods used to assist, control, prevent and treat non-infectious disease BIO12-15 | | |
| **Resources**  Microscope work  Internet access  Science journals – *New Scientist*, *Nature, Scientific American*  Field trip to the Pathology Museum | | **Depth Study: 6 hours**  Research task and presentation  Use the learning about the reproduction of vertebrate groups to create a video presentation, with voiceover, describing a representative method of reproduction for each group. |

| **Cell replication** | | |
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| **Inquiry question:** How important is it for genetic material to be replicated exactly? | | |
| **Content** | **Teaching, learning and assessment** | **Resources** |
| **Students:**   * model the processes involved in cell replication, including but not limited to:   + mitosis (ACSBL075) Critical and creative thinking icon  Information and communication technology capability icon   **Students:**   * assess the effect of the cell replication processes on the continuity of species (ACSBL084) | * Students examine prepared slides of animal and plant cells undergoing mitosis. * Students prepare wet mounts of plant cells undergoing mitosis – root tips, buds, internodes. * Students describe the sequence of events in the process of mitosis. * Students work in pairs to produce a model of mitosis, accompanied by a list of human body cells where mitosis replaces cells the quickest through to the slowest. * Students are introduced to the term ‘clones’ * Students explain the significance of mitosis in relation growth and repair. | * Animal cell mitosis <http://www.cellsalive.com/mitosis.htm> * What is mitosis? <http://www.livescience.com/52512-mitosis.html> * Mitosis <http://www.sumanasinc.com/webcontent/animations/content/mitosis.html> |
| **Students:**   * model the processes involved in cell replication, including but not limited to:   + meiosis (ACSBL075) Critical and creative thinking icon  Information and communication technology capability icon | * Students describe the sequence of events in the process of meiosis. * Students create a table, infographic or flowchart to compare and contrast the processes and products of mitosis and meiosis. * Students create a visual glossary describing the terms: * centromere * chromatid * chromosome * crossing over * diploid * fertilisation * gamete * germ cell * haploid * homologous * spindle * zygote. * Students explain the significance of meiosis in relation to the continuity of a species. | * Animal cell meiosis <http://www.cellsalive.com/meiosis_js.htm> * Meiosis made super easy <https://www.youtube.com/watch?v=nMEyeKQClqI> * Meiosis – where sex starts <https://www.youtube.com/watch?v=qCLmR9-YY7o> |

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| **Reproduction** | | | |
| **Inquiry question:** How does reproduction ensure the continuity of a species? | | | |
| **Content** | **Teaching, learning and assessment** | | **Resources** |
| **Students:**   * explain the mechanisms of reproduction that ensure the continuity of a species, by analysing sexual and asexual methods of reproduction in a variety of organisms, including but not limited to:   + animals: advantages of external and internal fertilisation   + plants: asexual and sexual reproduction   + fungi: budding, spores   + bacteria (ACSBL075):binary fission   + protists: binary fission, budding | * Students define the terms ‘sexual reproduction’ and ‘asexual reproduction’. * Students plan and conduct a practical investigation to observe and maintain a photographic record of examples of asexual reproduction, for example: * propagate runners in strawberry or spider plant * propagate potatoes from their ‘eyes’, carrots from their stem or pineapples from their crowns * cultivate yeast and examine yeast budding under a microscope * collect mushroom spores (asexual) by making a mushroom spore print. Produce mushrooms using these spores on compost * collect green pond water samples and examine for budding in hydra and volvox colonies. * Students define parthenogenesis and identify Australian examples of parthenogenesis. * Students discuss whether these processes of asexual reproduction can be considered to be cloning. * Students define the terms ‘internal fertilisation’ and ‘external fertilisation’, providing examples of each. * Students collect samples of monocot and dicot plants, examine the flowers and identify parts of the stamen and pistil. * Students compare and contrast the differences in flower structure between monocots and dicots. * Students examine different pollen grains under the microscope to investigate the growth of pollen tubes. * Students investigate the reproductive methods of at least two hermaphrodite animals. | * The joy of growing pineapples <https://www.youtube.com/watch?v=OpvPGQI1xj8> * Binary fission <http://highered.mheducation.com/olcweb/cgi/pluginpop.cgi?it=swf::500::500::/sites/dl/free/0073375225/594358/BinaryFission.swf::BinaryFission> * Life without males <http://www.abc.net.au/catalyst/stories/4353577.htm> * Virgin birth   <http://www.livescience.com/57536-zebra-shark-has-virgin-births.html>   * We’re facing a future without our favourite banana <http://www.sbs.com.au/food/article/2016/04/07/were-facing-future-without-our-favourite-banana> * Cloning <http://learn.genetics.utah.edu/content/cloning/> * Genetics and cloning <http://www.vtaide.com/png/cloning.htm> * Observing growth of pollen tubes <http://www.nuffieldfoundation.org/practical-biology/observing-growth-pollen-tubes> | |

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| **Reproduction** | | |
| **Inquiry question:** How does reproduction ensure the continuity of a species? | | |
| **Content** | **Teaching, learning and assessment** | **Resources** |
| **Students:**   * evaluate the impact of scientific knowledge on the manipulation of plant and animal reproduction in agriculture (ACSBL074) Ethical understanding icon Literacy icon | * Students research and describe the methods used to manipulate plant and animal reproduction in agriculture. * Students describe the scientific knowledge that has been applied to develop these methods. * Students evaluate the effect that this manipulation of plant and animal reproduction has on the reproduction and continuity of the species. |  |
|  | **Depth Study: 6 hours**  Students use their learning about the reproduction of vertebrate groups to create a video presentation, with voiceover, describing a representative method of reproduction for each group. |  |

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| **Genetic technologies** | | |
| **Inquiry question:** Does artificial manipulation of DNA have the potential to change populations forever? | | |
| **Content** | **Teaching, learning and assessment** | **Resources** |
| **Students:**   * compare the processes and outcomes of reproductive technologies, including but not limited to: Sustainability icon   + artificial insemination   + artificial pollination | * Students describe and compare the processes of artificial insemination and artificial pollination. * Students discuss the advantages and disadvantages of artificial insemination in agricultural animals. * Students explain the purpose and procedure of artificial pollination in horticulture. * Students research other areas where artificial means are employed to increase the chances of fertilisation. | * Animal husbandry <http://agritech.tnau.ac.in/animal_husbandry/animhus_cattle_AI.html> * Avocados <http://beeaware.org.au/pollination/pollinator-reliant-crops/avocados/> |
| **Students:**   * investigate and assess, the effectiveness of cloning, including but not limited to: Ethical understanding icon  Information and communication technology capability icon * whole organism cloning | * Students research the production of the clone, ‘Dolly’ the sheep * Students describe the process of cloning. * Students using Australian agricultural examples, describe the advantages and disadvantages of monocultures that reproduce asexually (cloning), including bananas, sugar cane and pineapples. * Students discuss responses to the inquiry question in the light of information gathered to this point. | * Life of Dolly <http://dolly.roslin.ed.ac.uk/facts/the-life-of-dolly/> * Click and clone <http://learn.genetics.utah.edu/content/cloning/clickandclone/> |

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| **Non-infectious disease and disorders: Cause and responses** | | |
| **Inquiry question:** Do non-infectious diseases cause more deaths than infectious diseases? | | |
| **Content** | **Teaching, learning and assessment** | **Resources** |
| **Students:**   * investigate the causes and host responses of non-infectious diseases in humans, including but not limited to:  Information and communication technology capability icon * cancer | * Students discuss cancer as a non-infectious disease and its possible causes. * Students recall the process and consequences of mitosis. * Students define tumour as being benign or malignant and distinguish between the different types of tumours. * Students investigate scientific articles on the different cancer-causing agents – biological, physical and chemical. * Students examine Australian cancer statistics, state by state – identify any patterns or trends that emerge. * Students investigate the success of government anti-cancer campaigns within Australia - anti-smoking (QUIT), ‘Slip, Slop, Slap’. * Students view and discuss the techniques used in commercials that promoted smoking and tanning.   Possible field trip to: University of Sydney Ainsworth Interactive Collection of Medical Pathology (Pathology Museum) OR UNSW Museum of Human Disease – students to research three different types of cancer related to three different organs and prepare a case study for each. | * Cancer and the cell cycle <https://science.education.nih.gov/supplements/nih1/cancer/activities/activity2_animations.html> * Cancer overview <http://www.cancercenter.com/video/what-is-cancer/cancer-overview/> * Cancer statistics <https://canceraustralia.gov.au/affected-cancer/cancer-statistics> * All cancers in Australia <https://canceraustralia.gov.au/affected-cancer/what-cancer/cancer-australia-statistics> * Cancer statistics in Australia <https://acrf.com.au/on-cancer/cancer-statistics-australia/> * Cancer Council <https://www.cancercouncil.com.au/cancer-information/> |

**Reflection and Evaluation**

**TEACHER: CLASS:**

**DATE UNIT COMMENCED: DATE UNIT CONCLUDED:**

* **Variations to program:** (List additional resources and outline alternative strategies used)
* **The most effective teaching/learning strategies and resources in this unit were:** (Please nominate 3 at least)
* **Less effective teaching strategies and resources for this unit were:** (Please nominate 2 at least)

**TEACHER’S SIGNATURE\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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