



Bear Essentials – Year Eleven + Twelve

Program Overview & Schedule

Program Duration: 45 minutes

Minimum Participants: 10 students

Maximum Participants: 35 students

Location: Polar Bear Shores

Relevant Subjects: Biology

Program Overview:

During this program, students will attend Sea World's Polar Bear Shores exhibit to investigate the specialised body processes and mechanisms that Polar bears use to cope with and ultimately dominate wild Arctic ecosystems. In doing so, students will be able to relate the concept of homeostasis to the maintenance of the Polar bear's internal environment in response to a changing and challenging external environment. In alignment with the Queensland Syllabus and Australian Curriculum for Biology, students will make connections between how Polar bears' structural, physiological and behavioural adaptations relate to their ability to maintain homeostasis. Specifically, students will explore the thermoregulatory and osmoregulatory mechanisms utilised by Polar bears to sustain internal conditions within tolerance limits. This program will incite discussion about human impacts, such as climate change and pollution, that are altering the Arctic environment and students will be guided to consider how these changes interrupt the nervous and hormonal pathways and metabolic activity necessary for homeostasis in Polar bears. Finally, students will be encouraged to reflect on personal habits and use critical thinking skills to design action for sustainability at an individual level and on a global scale to help conserve the Polar bear species.

Program Schedule:

Time

9:15am Arrival

The school will arrive promptly at 9:15am and will be met by a Marine Education Officer on the lawn next to the flagpoles out the front of Sea World.

9:20am Park Entry

The Marine Education Officer will lead the school group through the admissions gate to Polar Bear Shores for the education program.

9:30am Education Program

This program is approximately 45 minutes and will finish by 10:30am at the latest. Please note: selection of this program will prevent the school group from seeing the morning *Seal Guardians Presentation*.

10:30am Program Conclusion

At the conclusion of this session, students will be free to enjoy the park for the rest of the day, at the discretion of school staff.

Bear Essentials – Year Eleven + Twelve Program Mapping

Alignment with Queensland Senior Syllabus:

BIOLOGY (2019)

Science as a Human Endeavour - General

Development of complex models and/or theories often requires a wide range of evidence from multiple individuals and across disciplines.

The use and acceptance of scientific knowledge is influenced by social, economic, cultural and ethical contexts.

The use of scientific knowledge may have beneficial and/or harmful and/or unintended consequences.

Scientific knowledge can enable scientists to offer valid explanations and make reliable predictions.

Scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts and to design action for sustainability.

Scientific knowledge can be used to inform the monitoring, assessment and evaluation of risk.

Science can be limited in its ability to provide definitive answers to public debate; there may be insufficient reliable data available, or interpretation of the data may be open to question.

Unit 2: Maintaining the internal environment

Unit objectives	1. Describe and explain homeostasis and infectious disease
	2. Apply understanding of homeostasis and infectious disease
	7. Communicate understandings, findings, arguments and conclusions about homeostasis and infectious disease.

Topic 1: Homeostasis

Homeostasis	Recall that homeostasis involves a stimulus-response model in which change in the condition of the external or internal environment is detected and appropriate responses occur via negative feedback
Hormonal homeostatic control pathways	Recall that hormones are chemical messengers (produced mostly in endocrine glands) that relay messages to cells displaying specific receptors for each hormone via the circulatory or lymphatic system
Thermoregulation	Identify and explain the varying thermoregulatory mechanisms of endotherms and how they control heat exchange and metabolic activity in terms of structural features (brown adipose tissue, increased number of mitochondria per cell, insulation) behavioural responses (kleptothermy, hibernation, aestivation and torpor) physiological mechanisms (vasomotor control, evaporative heat loss, countercurrent heat exchange, thermogenesis/metabolic activity from organs and tissues) homeostatic mechanisms (thyroid hormones, insulin).
Osmoregulation	Identify and explain the various homeostatic mechanisms that maintain water balance in animals (osmoregulators and osmoconformers) in terms of structural features (excretory system) behavioural responses physiological mechanisms homeostatic mechanisms (antidiuretic hormone [ADH] and the kidney)

Bear Essentials – Year Eleven + Twelve Program Mapping

Alignment with Australian Curriculum:

BIOLOGY

Science as a Human Endeavour

The acceptance of scientific knowledge can be influenced by the social, economic and cultural context in which it is considered (ACSBL105)

People can use scientific knowledge to inform the monitoring, assessment and evaluation of risk (ACSBL106)

Science can be limited in its ability to provide definitive answers to public debate; there may be insufficient reliable data available, or interpretation of the data may be open to question (ACSBL107)

Unit 4: Maintaining the internal environment

Homeostasis	Homeostasis involves a stimulus-response model in which change in external or internal environmental conditions is detected and appropriate responses occur via negative feedback; in vertebrates, receptors and effectors are linked via a control centre by nervous and/or hormonal pathways (ACSBL110)
	Changes in an organism's metabolic activity, in addition to structural features and changes in physiological processes and behaviour, enable the organism to maintain its internal environment within tolerance limits (ACSBL111)
	Hormones alter the metabolism of target cells, tissues or organs by increasing or decreasing their activity; in animals, most hormones are produced in endocrine glands as a result of nervous or chemical stimulation, and travel via the circulatory or lymph system to the target cells, tissues or organs (ACSBL113)
	Endothermic animals have varying thermoregulatory mechanisms that involve structural features, behavioural responses and physiological and homeostatic mechanisms to control heat exchange and metabolic activity (ACSBL114)
	Animals, whether osmoregulators or osmoconformers, and plants, have various mechanisms to maintain water balance that involve structural features, and behavioural, physiological and homeostatic responses (ACSBL115)