LOCALLY DEVELOPED COURSE OUTLINE

# Marine Life & Ecosystem Studies (2(

Submitted By:

## Chinook's Edge School Division No. 73

Submitted On:

## May. 7, 2018

# Course Basic Information

| Outline Number | Hours | Start Date | End Date | Development Type | Proposal Type | Grades |
|---|---|---|---|---|---|---|
| 35-5 | 125.00 | 09/01/2018 | 08/31/2022 | Acquired | Reauthorization | G12 |

## Course Description

This course includes a study of the chemical andphysical structure of the marine environment, thevariety and challenges of life in the marine habitat,the structure and function of a variety of marineecosystems, and the impact of humans on themarine environment.
Particular emphasis will be placed on the conditions, ecosystems, and organisms present on the Pacific coast of Canada. The intertidal zone and the myriad of organisms that occupy that zone will receive special attention, as well as the marine mammals that inhabit Pacific coastal waters.
Using nature of science and scientific data, students will develop and demonstrate the skills of scientific research. A lab equipped for dissections, including the requisite safety equipment, is required for this course.
While students may become distressed by the threat of extinction to marine organisms as a result of human activity, positive human impacts as well as potential solutions are also discussed

## Course Prerequisites

Biology 20

# Sequence Introduction (formerly: Philosophy)

The purpose of Marine Life and Ecosystems Studies 35 is to give students an opportunity to learn about the chemical and physical nature of the ocean environment and the variety of organisms that are uniquely adapted to different marine ecosystems. Within the context of a global perspective, the course encompasses nearly all the disciplines of biology including physiology, behavior, and ecology, as well as an understanding of the basics of the very closely related science of oceanography.

In addition, this course is intended to convey to students an understanding of the importance and interconnectedness of the sea to all life on earth and of the need to closely monitor the impact of humans on the global ocean.

By exploring environmental issues, this course will nurture ethical citizenship as students consider their responsibilities with respect to environmental stewardship and responsible management of marine resources.
Through investigations, students will develop habits of mind such as perseverance, self-reliance, motivation, and consideration of multiple perspectives, which are needed to embrace an entrepreneurial spirit.

# Student Need (formerly: Rationale)

Despite the fact that our country is bound by oceans on three sides, many students have never seen an ocean and do not recognize that we are profoundly influenced by an ocean. Understanding the role of the oceans helps students foster an appreciation for biological sciences and a perspective of global stewardship.
While Biology 20 and Biology 30 tend to have a human anatomy focus, this course gives our students a chance to broaden the areas of study into the fields of zoology, taxonomy, and evolutionary biology. Moreover, the diversity of life in the ocean makes it an ideal playground for exploring biological taxonomy. These can inspire an interest in pursuing broader biological fields in postsecondary education.

# Scope and Sequence (formerly: Learner Outcomes)

Study of the physical sciences (geology, chemistry, and physics) is essential in understanding the oceans' physical and chemical properties, as well as the interconnectedness of the global ocean.
Current scientific theories are used to describe, categorize, and compare the many forms of marine life and to analyze how each group meets the unique challenges associated with life in the sea.
Environmental abiotic and biotic factors affect marine life and ecosystems.
The sea is an important as a source of both living and nonliving resources.
Human activity has profound impacts, both positive and negative, on the global ocean.

# Guiding Questions (formerly: General Outcomes

**1 How do geology, chemistry, and physics in oceanography help in the understanding of the physical and chemical properties, as well as interconnectedness of the global ocean?**

**2 How do the defining characteristics of major taxonomic groups of marine life help them survive the unique challenges associated with life in the sea?**

**3 How do abiotic and biotic factors of marine ecosystems affect their ability to thrive?**

**4 To what extent is the sea an important source of both living and nonliving resources?**

**5 To what extent does human activity impact the global ocean?**

## Learning Outcomes (formerly: Specific Outcomes)

| **1 How do geology, chemistry, and physics in oceanography help in the understanding of the physical and chemical properties, as well as interconnectedness of the global ocean?** | **35-5** |
|---|---|
| 1.1 Describe the distribution of oceans and seas. | X |
| 1.2 Analyze and explain the structure of the ocean floor based on the theory of plate tectonics. | X |
| 1.3 Explain the physical and chemical properties of seawater including variation in salinity and, density | X |
| 1.4 Observe and analyze how sea water density produces a three-layered ocean. | X |
| 1.5 Describe the patterns of ocean currents and explain their role in the distribution of nutrients, distribution of heat, and on climate. | X |
| 1.6 Explain the development and movement of ocean waves. | X |
| 1.7 Explain the development and destructive force of tsunamis, and current technologies for detecting them. | X |
| 1.8 Interpret the role of tidal forces in the creation of tides using current models and theories and explain different tidal patterns that occur in different areas. | X |
| 1.9 Analyze and interpret tide tables and graphs to determine differences in patterns of physical characteristics of the ocean temperature, salinity, and tide cycles. | X |

| **2 How do the defining characteristics of major taxonomic groups of marine life help them survive the unique challenges associated with life in the sea?** | **35-5** |
|---|---|
| 2.1 Analyze the effect of salinity and salinity changes on life in the ocean | X |
| 2.2 Analyze the effect of temperature on life in the ocean | X |

| | |
|---|---|
| 2.3 Describe and analyze the role of different prokaryotes. | X |
| 2.4 Describe, categorize, and compare different unicellular algae, including diatoms dinoflagellates, and symbiotic algae, and analyze their role in the ocean. | X |
| 2.5 Describe, categorize, and compare different protozoans, including foraminiferans, radiolarians, and ciliates, and analyze their role in the ocean. | X |
| 2.6 Describe, categorize, and classify seaweeds and analyze their role in marine environments and their and economic importance. | X |
| 2.7 Describe flowering plants, including sea grasses, salt-marsh grasses, and mangroves, and analyze their role in the ocean. | X |
| 2.8 Use the scientific method and collaborate to design and perform an investigation that tests the effects of physical characteristics of ocean on primary production. | X |
| 2.9 Describe, classify, and compare marine representatives of major invertebrate phyla, including porifera, cnidarians, ctenophores, annelids, mollusks, arthropods, lophophorates, echinoderms and hemichordates. | X |
| 2.10 Describe, classify, and compare marine representatives of major classes making up the mollusk and echinoderm phyla. | X |
| 2.11 Perform dissections to identify, and compare anatomy of, representative invertebrate organisms that are locally available | X |
| 2.12 Describe, classify, and compare representatives of classes of marine fish, including agnatha, chondrichthyes, and osteichthyes, and analyze their special adaptations for swimming and for life in different marine habitats. | X |
| 2.13 Describe, categorize, and compare representatives of marine reptiles and analyze their special adaptations for life in different marine habitats. | X |
| 2.14 Describe, categorize, and compare representatives of sea birds and analyze their special adaptations for life in different marine habitats. | X |

| | |
|---|---|
| 2.15 Describe, classify, and compare representatives of different orders of marine mammals, including baleen and and toothed whales, sirenians, seals and sea lions, sea otters, and polar bears. | X |
| 2.16 Explain and analyze the special adaptations that are required for mammals living in the marine environment, including adaptations for maintenance of body temperature, water balance, gas exchange and very prolonged, very deep dives, reproduction and rearing of young. | X |
| 2.17 Describe the long migrations made by different marine reptiles, birds, and mammals to defend the concept of a world ocean. | X |
| 2.18 Communicate the description and classification of major phyla in a persuasive and an engaging manner, using appropriate multimedia forms. | X |

| **3 How do abiotic and biotic factors of marine ecosystems affect their ability to thrive?** | **35-5** |
|---|---|
| 3.1 Explain how each of the following abiotic factors affects the distribution of organisms in the rocky intertidal: exposure at low tide, wave action, space as a limiting factor. | X |
| 3.2 Analyze patterns of vertical zonation in the rocky intertidal based on biotic and abiotic factors. | X |
| 3.3 Analyze the distribution of organisms in soft-bottom intertidal communities based on abiotic factors. | X |
| 3.4 Explain the physical characteristics of estuaries including salinity and substrate. | X |
| 3.5 Analyze how the variety of mechanisms that organisms have developed help them cope with the unique environment of estuaries. | X |
| 3.6 Compare the types of communities present in open water, mudflats, salt marshes and mangrove swamps. | X |
| 3.7 Explain the physical characteristics of the subtidal environment. | X |
| 3.8 Compare soft-bottom and hard-bottom subtidal communities. | X |

| | |
|---|---|
| 3.9 Analyze the role of physical factors in determining the differential distribution of kelp communities. | X |
| 3.10 Describe and compare a variety of reef-building organisms including corals and coralline algae. | X |
| 3.11 Analyze the role of abiotic factors for development and continued health of coral reefs. | X |
| 3.12 Explain the abiotic factors required for development and continued health of coral reefs. | X |
| 3.13 Compare the typical structure of the three main types of coral reefs: fringing reefs, barrier reefs, and atolls. | X |
| 3.14 Examine the unique trophic structure of coral reefs, often allowing a highly productive ecosystem to develop in the midst of a marine desert. | X |
| 3.15 Describe characteristics of different types of organisms inhabiting the epipelagic. | X |
| 3.16 Explain the variety of adaptations among epipelagic organisms to stay afloat, to obtain food, and to avoid predation. | X |
| 3.17 Describe and interpret the complexity of epipelagic food webs. | X |
| 3.18 Explain the importance of dissolved organic matter and the microbial loop. | X |
| 3.19 Explain the factors determining patterns of productivity including the importance of upwelling. | X |
| 3.20 Describe the division into zones of waters below the epipelagic. | X |
| 3.21 Describe and compare abiotic factors in the different zones including light, pressure, temperature, and dissolved oxygen concentration. | X |
| 3.22 Describe and compare the adaptations of representative organisms for life at different depths. | X |
| 3.23 Explain the importance of hot springs, cold seeps and dead bodies to life on the deep ocean floor. | X |

| | |
|---|---|
| **4 To what extent is the sea an important source of both living and nonliving resources?** | **35-5** |

| | |
|---|---|
| 4.1 Evaluate the importance of and explain the reasons for the decline in world fisheries. | X |
| 4.2 Explain ongoing practices and evaluate the significance of the future of mariculture. | X |
| 4.3 Describe examples of non-living marine resource development, including offshore oil and gas, mining, and the development of tidal and other forms of energy form the sea, and evaluate their impact on the ocean. | X |

| **5 To what extent does human activity impact the global ocean?** | **35-5** |
|---|---|
| 5.1 Evaluate the impact of coastal development and the impact of the associated pollution on marine ecosystems | X |
| 5.2 Evaluate the effects of oil spills on marine organisms | X |
| 5.3 Evaluate the effects of persistent substances on marine organisms. | X |
| 5.4 Identify examples of threatened and endangered marine organisms. | X |

# Facilities or Equipment

## Facility

Use of a lab for dissections.

Facilities:

## Equipment

Safety Equipment:

- Aprons
- Gloves
- Goggles
- Dissection kits

# Learning and Teaching Resources

No required resources for this course.

## Sensitive or Controversial Content

It is expected that all issues and texts that may be controversial or sensitive will be discussed with school administration prior to coverage in class.
Guiding principles for dealing with sensitive and controversial issues are outlined in Chinook's Edge *Policy 2-09 Teaching About Controversial Issues.*

## Issue Management Strategy

## Health and Safety

All Chinook's Edge health and safety procedures will be followed as per regular classroom instruction, in accordance with Chinook's Edge *Administrative Procedure 4-19 Health & Safety.*
If students are taken off campus, all Chinook's Edge procedures pertaining to planning, parental consent, risk assessment, etc., will be followed in accordance with Chinook's Edge *Administrative Procedure 2-09 Field Trips - Planning & Requirements.*

## Risk Management Strategy

## Statement of Overlap with Existing Programs

**Provincial Courses with Overlap and/or Similar**
Science 20
**Identified Overlap/Similarity**

- ●20-C2.6k - list and describe the evidence that supports the theory of plate tectonics; i.e., location of volcanoes and earthquakes, ocean floor spreading, mountain ranges, age of sediments, paleomagnetism

**Reasoning as to Why LDC is Necessary**
To understand the nature of the seafloor, an understanding of plate tectonics is necessary. The theory of plate tectonics is included as part of Marine Life and Ecosystem Studies because few, if any, students would have taken Science 20, considering that Biology 20 is a pre/co-requisite for Marine Life and Ecosystems Studies.
**Provincial Courses with Overlap and/or Similar**
Biology 20
**Identified Overlap/Similarity**

- ●20-A1.1k – photosynthesis and chemosynthesis

- ●20-A1.3k – structure of ecosystem trophic levels, using models such as food chains and food webs

- ●20-A2.1k – biogeochemical cycling and general reuse of matter

- ●20-A3.1k –the interrelationship of energy, matter and ecosystem productivity

- ●20-B1.1k – the definition of species, population, community, and ecosystem and the interrelationships among them

- ●20-B1.2k – a variety of habitats can support a diversity of organisms

- ●20-B1.3k – identify biotic and abiotic factors and explain their influence in (succession)

- ●20-B1.4k – limiting factors

- ●20-B1.5k – principles of taxonomy

- ●20-D1.5k – the exchange of matter and transfer of thermal energy between the body and the environment, using the mechanism of breathing in gas exchange…and heat loss

- ●20-D3.1k – identify the major and associated structures of the nephron…and explain their function in maintaining plasma compositions (i.e. water, pH, ions)

- ●20-D3.4k – describe the function of the kidney in excreting metabolic wastes.

**Reasoning as to Why LDC is Necessary**
None of the knowledge concepts taught in the Biology 20 curriculum will be taught in Marine Life and Ecosystem Studies. In Marine Life and Ecosystem Studies, students will build on this basic biology knowledge to enable an understanding of marine organisms and their interactions.

# Student Assessment

No identified student assessments for this course.

## Course Approval Implementation and Evaluation

The Associate Superintendent, Learning Services, in collaboration with the school Principal, will evaluate and monitor this course to ensure that all requirements (by Alberta Education, by the developing school board, and by Chinook's Edge) are met. The school Principal will supervise course implementation at the school level.
Course prerequisites, copyright privileges, and conditions listed by the developing board will be strictly adhered to.