Erindale College

Assessment Period:	**2021 S2**
Course:	**EARTH & ENVIRONMENTAL SCIENCE**
Unit:	**Unit 2: Earth Processes (1.0)**
Accreditation:	**T**
Year:	**12**

Unit Goals

- understand how energy is transferred and transformed in Earth systems, the factors that influence these processes, and the dynamics of energy loss and gain
- understand how energy transfers and transformations influence oceanic, atmospheric and biogeochemical cycling
- understand how theories and models have developed based on evidence from multiple disciplines; and the uses and limitations of Earth and environmental science knowledge in a range of contexts
- use science inquiry skills to collect, analyse and communicate primary and secondary data on energy transfers and transformations between and within Earth systems
- evaluate, with reference to empirical evidence, claims about energy transfers and transformations between and within Earth systems
- communicate Earth and environmental understanding using qualitative and quantitative representations in appropriate modes and genres.

Content Description

Science Inquiry Skills

- identify, research and construct questions for investigation; propose hypotheses; and predict possible outcomes
- design investigations including the procedure/s to be followed, the information required and the type and amount of primary and/or secondary data to be collected; conduct risk assessments; and consider research ethics
- conduct investigations, including using map and field location techniques and environmental sampling procedures, safely, competently and methodically for the collection of valid and reliable data
- represent data in meaningful and useful ways; organise and analyse data to identify trends, patterns and relationships; qualitatively describe sources of measurement error, and uncertainty and limitations in data; and select, synthesise and use evidence to make and justify conclusions
- interpret a range of scientific and media texts and evaluate processes, claims and conclusions by considering the quality of available evidence; use reasoning to construct scientific arguments
- select, construct and use appropriate representations, including maps and other spatial representations, diagrams and flow charts, to communicate conceptual understanding, solve problems and make predictions
- communicate to specific audiences and for specific purposes using appropriate language, genres and modes, including compilations of field data and research reports

Science as a Human Endeavour

- science is a global enterprise that relies on clear communication, international conventions, peer review and reproducibility
- development of complex models and/or theories often requires a wide range of evidence from

multiple individuals and across disciplines

- advances in science understanding in one field can influence other areas of science, technology and engineering
- the use of scientific knowledge is influenced by social, economic, cultural and ethical considerations
- 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

Science is a global enterprise that relies on clear communication, international conventions, peer review and reproducibility

- energy is neither created nor destroyed, but can be transformed from one form to another (for example, kinetic, gravitational, thermal, light) and transferred between objects
- processes within and between earth systems require energy that originates either from the sun or the interior of earth
- thermal and light energy from the sun drives important earth processes including evaporation and photosynthesis
- transfers and transformations of heat and gravitational energy in earth's interior drives the movement of tectonic plates through processes including mantle convection, plume formation and slab sinking

Scientific knowledge can enable scientists to offer valid explanations and make reliable predictions (EESA13)

- the net transfer of solar energy to Earth’s surface is influenced by its passage through the atmosphere, including impeded transfer of ultraviolet radiation to Earth’s surface due to its interaction with atmospheric ozone, and by the physical characteristics of Earth’s surface, including albedo
- most of the thermal radiation emitted from earth’s surface passes back out into space but some is reflected or scattered by greenhouse gases back toward earth; this additional surface warming produces a phenomenon known as the greenhouse effect
- the movement of atmospheric air masses due to heating and cooling, and earth’s rotation and revolution, cause systematic atmospheric circulation; this is the dominant mechanism for the transfer of thermal energy around earth’s surface
- the behaviour of the global oceans as a heat sink, and earth’s rotation and revolution, cause systematic ocean currents; these are described by the global ocean conveyer model
- the interaction between earth’s atmosphere and oceans changes over time and can result in anomalous global weather patterns, including el nino and la nina

Energy for biogeochemical processes

- photosynthesis is the principal mechanism for the transformation of energy from the sun into energy forms that are useful for living things; net primary production is a description of the rate at which new biomass is generated, mainly through photosynthesis
- the availability of energy and matter are one of the main determinants of ecosystem carrying capacity; that is, the number of organisms that can be supported in an ecosystem
- biogeochemical cycling of matter, including nitrogen and phosphorus, involves the transfer and transformation of energy between the biosphere, geosphere, atmosphere and hydrosphere
- energy is stored, transferred and transformed in the carbon cycle; biological elements, including living and dead organisms, store energy over relatively short timescales, and geological elements (for example, hydrocarbons, coal and kerogens) store energy for extended periods

Assessment Tasks

Name	Due Date	Weighting
Assignment	6 September - 10 September	40%
Exam 1	27 August - 8 September	30%
Exam 2	17 November - 19 November	30%

School Assessment Information

For penalties for late and non-submission of work
See BSSS Policy and Procedure Manual 4.3.10 for further information.

For academic integrity
See BSSS Policy and Procedure Manual 4.3.12 for further information.

For appeals processes
See BSSS Policy and Procedure Manual 7.2 for further information.

For moderation procedures (internal and external)
See BSSS Policy and Procedure Manual 5 for further information.

For meshing procedures
See BSSS Policy and Procedure Manual 5.4.1 for further information.

For method of unit score calculation
See BSSS Policy and Procedure Manual 4.3.6.2 for further information.

For procedures for calculating course scores
See BSSS Policy and Procedure Manual 4.3.13.2 for further information.

Achievement Standards for EARTH & ENVIRONMENTAL SCIENCE T - Year 12

	*A student who achieves an **A** grade typically*	*A student who achieves a **B** grade typically*	*A student who achieves a **C** grade typically*	*A student who achieves a **D** grade typically*	*A student who achieves an **E** grade typically*
Concepts, Models & Applications	• critically analyses the properties and functions of system components, processes and interactions, and the interplay and effects of factors across a range of scales • evaluates applications, limitations, and predictions of theories and models to explain systems and create solutions, with evidence, in unfamiliar contexts • evaluates evidence with reference to critical analysis of models and/or theories, and develops evidence-based conclusions and evaluates limitations	• analyses the properties and functions of system components, processes and interactions, and the interplay and effects of factors across a range of scales • analyses applications, limitations, and predictions of theories and models to explain systems and create plausible solutions, with evidence in familiar contexts • analyses evidence with reference to models and/or theories, and develops evidence-based conclusions and discusses limitations	• explains the fundamental properties and functions of system components, processes and interactions, and the effects of factors across a range of scales • explains applications, limitations, and predictions of theories and models to explain systems and create plausible solutions in familiar contexts • describes evidence with reference to models and/or theories, and develops evidence-based conclusions and identifies limitations	• describes the fundamental properties and functions of system components, processes and interactions, and the effects of one or more factors • describes the nature, functions, limitations and applications of theories and models to create solutions to problems with supporting evidence • describes evidence, and develops conclusions with some reference to models and/or theories	• identifies the fundamental properties and functions of system components, processes and interactions, and some affective factors • identifies the nature, functions, limitations and applications of theories and models, and suggest solutions to problems with supporting evidence • identifies evidence, and asserts conclusions with little or no reference to models and/or theories
Contexts	• critically analyses epistemology, role of peer review, collaboration, and technology in developing knowledge • critically analyses the influence of social, economic, ethical and cultural factors on Science	• analyses epistemology, role of peer review and technology in developing knowledge • analyses the influence of social, economic, ethical and cultural factors on Science	• explains epistemology, role of peer review and technology in developing knowledge • explains the influence of social, economic, ethical and cultural factors on Science	• describes role of peer review and technology in developing knowledge • describes the influence of social, economic, ethical and cultural factors on Science	• identifies that scientific knowledge has changed over time • identifies the influence of social, economic, ethical and cultural factors on Science
Inquiry Skills	• designs, conducts and improves safe, ethical and original inquiries individually and collaboratively, that collect valid, reliable data in response to a complex question • critically analyses cause and correlation, anomalies, reliability and validity of data and representations, and critically analyses errors • evaluates processes and claims, and provides a critique based on evidence, and critically analyses alternatives • reflects on own thinking and evaluates planning, time management, use of appropriate work strategies • communicates concisely, effectively and accurately, with scientific literacy in a range of modes, representations, and genres for specific audiences and purposes, and accurate referencing	• designs, conducts and improves safe, ethical inquiries individually and collaboratively, that collect valid, reliable data in response to a question • analyses cause and correlation, anomalies, reliability and validity of data and representations, and analyses errors • explains processes and claims, and provides a critique with reference to evidence, and analyses alternatives • reflects on their own thinking and analyses planning, time management, use of appropriate work strategies • communicates clearly and accurately, with scientific literacy in a range of modes, representations and genres for specific audiences and purposes, and accurate referencing	• plans and conducts safe, ethical inquiries individually and collaboratively, that collect valid data in response to a familiar question • describes causal and correlational relationships, anomalies, reliability and validity of data and representations, and discusses common errors • describes processes and claims, and identifies alternatives with reference to reliable evidence • reflects on their own thinking and explains planning, time management, use of appropriate work strategies • communicates accurately demonstrating scientific literacy, in a range of modes, representations, and genres for specific purposes, and mostly consistent referencing	• follows a procedure to conduct safe, ethical inquiries individually and collaboratively, to collect data in response to a simple question with varying success • describes trends, relationships and anomalies in data, identifies anomalies, and cites sources of error • describes processes and claims, and identifies the need for improvements with some reference to evidence • reflects on their own thinking, with reference to planning and the use of appropriate work strategies • communicates demonstrating some scientific literacy, in a range of modes, representations, and genres with some evidence and inconsistent referencing	• follows a procedure to conduct safe, ethical inquiries individually and collaboratively, to collect data with little or no connection to a question • identifies trends and relationships in data with reference to sources of error • identifies processes and the need for some improvements, with little or no reference to evidence • reflects on their own thinking with little or no reference to planning, time management, and use of work strategies • communicates demonstrating limited scientific literacy, in a range of modes and representations, with inconsistent and inaccurate referencing