

Environmental Science 20: Unit 1 Final Exam Review Package

Introduction

Welcome to your Unit 1 Final Exam Review Package. This guide has been carefully prepared to help you consolidate your knowledge of **“The Nature of Science & Human Populations.”** Early inhabitants of Canada depended on their knowledge of the environment for survival, using careful observations of wildlife and weather. Today, while we are often detached from nature in our daily lives, systematic scientific observation remains just as crucial for understanding ecosystems and managing human impacts. This package will bridge that gap by summarizing key concepts and providing practice questions to test your understanding. With focused preparation, you can approach your exam with confidence and a strong command of the material.

1. Glossary of Key Terms

Mastering the vocabulary of a subject is the foundation for understanding its more complex concepts. A strong command of these terms will enable you to interpret questions accurately and articulate your answers with precision on the exam. Think of this glossary as your toolkit for building a deeper understanding of environmental science.

Unit 1 Key Vocabulary

Term	Definition
Science	A systematic process used to understand the world and universe.
Inductive Reasoning	Generalizing from specific observations.
Deductive Reasoning	Drawing conclusions from logical assumptions (general to specific).
Counter Example	An observation that disproves a hypothesis.
Worldview	A set of commonly shared values and ideas concerning reality and humanity’s role within it.
Expansionist Worldview	Views nature as a resource to be used, not preserved, and has faith in technology to solve problems.
Ecological Worldview	Views nature as intrinsically valuable and believes human activities must work within ecosystem limitations.
Conservation (“Wise Management”)	The “Wise Management” or sustainable exploitation of natural resources, characteristic of the Expansionist Worldview.
Preservation	The “Righteous Management” and protection of natural

(“Righteous Management”)	systems from exploitation, characteristic of the Ecological Worldview.
Utilitarian Justification	The environment provides economic benefits or survival necessities.
Ecological Justification	Ecosystems provide functions necessary for life.
Aesthetic Justification	Nature is beautiful and offers psychological restoration.
Moral Justification	Elements of the environment have a “right to exist” independent of human desire.
Natality	The number of births in a population.
Mortality	The number of deaths in a population.
Immigration	The movement of individuals into a population.
Emigration	The movement of individuals out of a population.
Crude Birth Rate	The number of births per 1,000 people.
Total Fertility Rate (TFR)	The average number of children a woman will have in her lifetime.
Demographic Transition Model (DTM)	Describes four stages of economic development that nations tend to pass through, correlating to changes in birth and death rates.
Demographic Trap	Occurs when a country gets stuck in Stage 2 of the DTM, where explosive population growth overwhelms the economy.

These terms are the building blocks for the core concepts that are summarized in the next section.

2. Core Concept Summary

This section provides a structured summary of the major themes from Unit 1. It is designed to reinforce the logical flow of the material, moving from the abstract principles that guide scientific thought to their practical application in understanding and managing human population dynamics.

2.1 The Nature of Science

Science is a systematic process for understanding the world, involving questions, orderly observations, and analysis. It operates on five basic assumptions: that patterns in nature are observable and understandable, that generalizations arise from specific observations (inductive reasoning), that scientific rules are universal, that generalizations can be tested and disproved, and that science never provides absolute proof. This means that while science provides powerful explanations for natural phenomena, its conclusions are always open to modification based on new evidence.

There are two primary forms of scientific reasoning:

- **Inductive Reasoning:** This involves creating a general conclusion based on a limited set of specific observations. For example, after observing that the temperature was approximately 12°C for five consecutive years, one might inductively conclude that it will be 12°C next year as well.
- **Deductive Reasoning:** This involves drawing a specific conclusion from a general principle or logical assumption. For example, starting with the general principle that “All soils with pH < 5.5 cannot support plants,” if you find a soil sample with a pH of 4.0, you can deduce that it cannot support plants.

A counter example is a critical tool in this process. It is a single observation that disproves a general statement or hypothesis, forcing scientists to revise their understanding.

2.2 Environmental Worldviews and Ethics

A fundamental tension in environmental thought exists between two competing worldviews that shape our approach to resource management and conservation.

Criterion	Expansionist Worldview	Ecological Worldview
View of Nature	Nature is a resource to be used.	Nature is intrinsically valuable and must be protected.
Approach to Management	Conservation (“Wise Management”) for sustainable exploitation.	Preservation (“Righteous Management”) to protect systems.
Faith in Technology	Strong faith that science and technology can solve problems.	Belief that human activities must operate within ecosystem limits.

Conservation efforts are often supported by four distinct types of justifications:

- **Utilitarian:** Argues for conservation based on the direct economic and survival benefits the environment provides to humans.
- **Ecological:** Argues for conservation because ecosystems perform essential life-support functions, such as air and water purification.
- **Aesthetic:** Argues for conservation on the grounds that nature’s beauty is of profound importance for human psychological well-being.
- **Moral:** Argues that parts of the environment, including other species, have a right to exist, independent of their usefulness to humans.

Modern environmentalism has evolved through two distinct phases. The **First Wave (1968-1976)** focused on pollution and protection. This movement largely ended when economic troubles and inflation shifted public priority away from environmental issues. The **Second Wave (1985-Present)** re-emerged with a broader focus on global issues like climate change and the ozone layer, championing the concept of “**Sustainable Development.**”

2.3 Societal Development and Environmental Impact

Human history can be viewed through four major stages of societal development, each with a distinct relationship to the environment:

1. **Hunters and Gatherers:** Characterized by low population density and minimal environmental impact.
2. **Pre-industrial Agriculture:** The domestication of plants and animals allowed for a slight increase in population density and early forms of land modification.
3. **The Machine Age:** Fueled by the Industrial Revolution, this era saw massive resource consumption and rapid population growth due to advances in medicine and sanitation.
4. **The Modern Era:** Defined by high levels of urbanization and technological advancement, this is the stage Canada is currently in.

2.4 Human Population Dynamics

The change in a population over time can be calculated with a simple formula that accounts for the four factors of demographic change:

$$\text{Population Growth} = (\text{Natality} + \text{Immigration}) - (\text{Mortality} + \text{Emigration})$$

The **Demographic Transition Model (DTM)** provides a framework for understanding how population dynamics change as a country develops economically:

- **Pre-industrial Stage:** Both birth rates and death rates are high, leading to a stable population with very little growth.
- **Transitional Stage:** Improvements in healthcare and sanitation cause death rates to fall rapidly, while birth rates remain high. This gap creates the fastest rate of population growth.
- **Industrial Stage:** As education and modernization increase, birth rates begin to decline, slowing the rate of population growth.
- **Post-industrial Stage:** Birth rates fall to meet or drop below death rates, resulting in zero or even negative population growth (a declining population).

The **Demographic Trap** is a critical challenge for developing nations. It occurs when a country gets stuck in Stage 2; its death rates have fallen, but its birth rates remain high, causing population growth to outpace economic development and overwhelm resources.

Population pyramids are graphical representations that provide insight into a population's structure and stage of development:

- **Youthful/Expanding:** A classic triangle shape with a wide base and narrow top. This indicates a high birth rate, rapid growth, and a large proportion of young people, typical of a developing nation in Stage 2 or 3.
- **Ageing/Stable:** A rectangular or “beehive” shape with nearly vertical sides. This shows that birth rates and death rates are balanced, resulting in a stable population size, typical of a developed nation in Stage 4.
- **Aged/Declining:** An inverted or cup-like shape with a narrow base and a wider middle/top. This indicates a low birth rate that has fallen below the replacement level, leading to a shrinking and aging population.

2.5 Strategies for Population Management

Global efforts to stabilize population growth focus on reducing the Total Fertility Rate (TFR). The three primary strategies are:

1. **Education:** Increasing access to education, especially for women, is strongly correlated with delayed marriage, career pursuits, and smaller family sizes.
2. **Health:** Lowering infant and child mortality rates gives parents confidence that their children will survive to adulthood, reducing the perceived need to have many children.
3. **Contraception:** Ensuring access to and education about family planning methods allows individuals to make informed choices about family size.

Different countries have adopted different approaches. **China** implemented the strict “One Child Policy” with regulations and fines. **India** has relied on a slower approach based on education and government programs. **Iran** successfully used a combination of education, freely available contraception, and religious endorsement to dramatically lower its TFR.

Four of the **Millennium Development Goals** are particularly effective at helping to reduce the TFR:

- Achieve universal primary education.
- Promote gender equality and empower women.
- Reduce child mortality.

- Improve maternal health.

The following questions will give you an opportunity to apply this summarized knowledge and test your comprehension.

3. Practice Questions

Active recall—the process of actively retrieving information from memory—is one of the most effective ways to study. Before consulting the answer key, make a genuine attempt to answer every question in this section. This will help you accurately gauge your level of understanding and pinpoint concepts that require further review.

3.1 Fill-in-the-Blanks

1. Drawing a general conclusion from specific observations is known as _____ reasoning.
2. The worldview that views nature as a resource to be used through “wise management” is the _____ worldview.
3. A country gets stuck in a _____ when its death rate falls but its birth rate remains high, overwhelming the economy.
4. A population pyramid with a wide base and narrow top indicates a _____ population.
5. The first wave of environmentalism ended largely due to _____ trouble and inflation.

3.2 Short Answer Questions

1. Explain the difference between the Utilitarian and Moral justifications for conservation.
2. Describe the key events of the “Transitional Stage” (Stage 2) in the Demographic Transition Model and explain why it leads to the fastest rate of population growth.
3. What are the five basic assumptions of science?
4. Why is Environmental Science considered an “interdisciplinary” field? List three other scientific disciplines that contribute to it.
5. What was the primary focus of the Second Wave of environmentalism, and how did it differ from the First Wave?

4. Answer Key

This section contains the answers to all practice questions. Use it as a tool for checking your work and, more importantly, for identifying any concepts that may require further review in your course notes. Understanding why an answer is correct is the key to effective learning.

4.1 Fill-in-the-Blanks Answers

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|---------------------|-----------------------|
| 1. Inductive | 4. Youthful/Expanding |
| 2. Expansionist | 5. Economic |
| 3. Demographic Trap | |

4.2 Short Answer Question Answers

1. **Difference between Utilitarian and Moral justifications:** The Utilitarian justification argues for conserving the environment because it provides direct economic benefits and survival necessities to humans (e.g., jobs from fisheries). The Moral justification argues that elements of the environment have a “right to exist” entirely separate from any human desire or use.
2. **Transitional Stage (Stage 2) events:** In the Transitional Stage (Stage 2), death rates drop rapidly due to improvements in healthcare, sanitation, and food supply. However, birth rates remain high because social norms and values change more slowly. This large gap between a low death rate and a high birth rate results in the fastest period of population growth.
3. **Five basic assumptions of science:** (1) we can understand patterns in the natural world through observation, (2) science is based on inductive reasoning (generalizing from specific observations), (3) scientific rules apply throughout the universe, (4) generalizations can be tested and disproved, and (5) science never provides absolute proof.
4. **Interdisciplinary field:** Environmental Science is considered “interdisciplinary” because it incorporates knowledge from many different scientific fields to understand complex environmental systems. Contributing disciplines mentioned in the text are Chemistry, Biology, Statistics, Ecology, and Meteorology.
5. **Second Wave of environmentalism:** The focus of the Second Wave of environmentalism is on global issues like global warming, ozone depletion, and the concept of “Sustainable Development.” This differs from the First Wave, which was focused more narrowly on issues like pollution and protection at a local or national level.