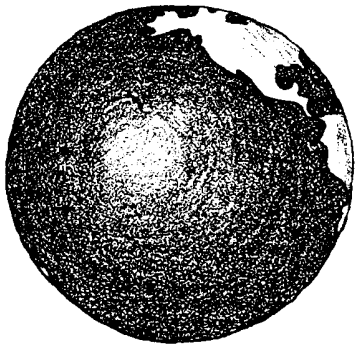
A CONCEPTUAL SCHEME FOR AQUATIC STUDIES



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1. WATER EXHIBITS IMPORTANT PROPERTIES WHICH PLAY A VITAL ROLE ON EARTH

1.1 The earth is unique in our solar system.

1.11 The earth's mass is such that the planet has an atmosphere which supports life.

1.12 Water and carbon dioxide are the most abundant compounds on the earth's surface.

1.13 The earth's proximity to the sun enables water to exist in three phases; solid, liquid and gas.

1.2 The earth's water is constantly recycled through a process known as the hydrologic cycle.

1.21 The hydrologic cycle consists of the process of evaporation, condensation, precipitation and percolation.

1.22 The earth's surface water is constantly recycled through the oceans.

1.23 Water is purified through the hydrologic cycle.

1.24 Naturally occurring processes and human activities affect the hydrologic cycle.

1.3 Water has unique chemical and physical properties.

1.31 The chemical and physical behavior of water results from the geometry of the water molecule.

1.32 Large amounts of heat are involved in changing water from one state to another.

1.33 Water is a very effective solvent.

1.34 Dissolved and suspended substances affect the properties of water.

1.35 Water in nature usually contains gases, organic compounds and minerals.

1.36 Many elements dissolved in water are cycled through biological, geological, and chemical systems.

2. AQUATIC ENVIRONMENTS INTERACT WITH THE LAND AND ATMOSPHERE

2.1 The oceans constitute the largest aquatic environment on earth.

2.11 Oceans formed early in the history of the earth.

2.12 Approximately 70% of the earth's surface is covered by water.

2.13 Approximately 97% of the earth's water is salt water.

2.2 The ocean waters are influenced by the earth's movements and position in the solar system.

2.21 Ocean currents are affected by the absorption of solar energy.

2.22 Ocean currents are affected by the earth's rotation.

2.23 Tides result from gravitational forces of the earth, the moon, and the sun.

2.3 Energy is transferred where water meets air, land, or subsurface topography.

2.31 Air movements generate waves and surface currents.

2.32 Moving water constantly shapes land forms.

2.33 Subsurface topography is constantly changing.

2.34 Land sea floor movements generate waves.

2.35 Ocean currents affect the earth's semi-permanent wind patterns.

2.36 The earth's water masses are the major factor influencing climates.

2.37 Subsurface topography affects tides, currents, and waves.

2.4 Materials carried from land masses influence the physical and chemical features of lakes, rivers, wetlands and oceans.

2.41 Water, ice and air carry organic and inorganic materials into lakes, rivers, wetlands and oceans.

2.42 Fresh water from the land dilutes ocean water.

2.5 Changes in aquatic environments occur naturally.

2.51 Changes can occur over long periods of time or can occur quickly.

2.52 Changes in aquatic environments affect the land and atmosphere.

2.53 Changes occurring on land and in the atmosphere affect the aquatic environment.

3. AQUATIC ORGANISMS INTERACT IN COMPLEX ECOSYSTEMS

3.1 Life probably originated in the aquatic environment.

3.11 Water aided the chemical evolution of life forms.

3.12 Aquatic environments have supported and continue to support the evolution of a diversity of species.

3.2 The aquatic environment enables terrestrial life forms to evolve.

3.21 The majority of the oxygen in the atmosphere has been and continues to be produced by one-celled aquatic plants.

3.22 Ultra-violet radiation from the sun acts upon oxygen in the atmosphere to produce the ozone layer.

3.23 The ozone layer, which absorbs most of the harmful ultraviolet

radiation, facilitated the evolution of terrestrial organisms from aquatic organisms.

3.24 Throughout the evolutionary process water has been and is today essential to the survival of all organisms.

3.3 Aquatic organisms adapt to their environments in different ways.

3.31 Aquatic organisms adapt developmentally, structurally, functionally, and behaviorally to their environments.

3.32 Organisms in aquatic communities interact with their environments.

3.33 Populations of aquatic organisms are unevenly distributed.

3.4 Aquatic ecosystems depend on a constant flow of energy and the recycling of materials.

3.41 Aquatic ecosystems are maintained by energy which comes from the sun.

3.42 Aquatic plants convert solar energy to food energy.

3.43 Aquatic organisms depend on life sustaining minerals which are recycled through the ecosystem.

3.44 Aquatic bacteria reduce organic materials to simpler forms.

3.5 Stable ecosystems are essential to the health of the aquatic environment.

3.51 The stability of aquatic ecosystems tends to be directly proportional to the diversity of their population.

3.52 The stability of aquatic ecosystems tends to be directly proportional to the complexity of relationships among the populations.

4. PEOPLE ARE PART OF THE AQUATIC ENVIRONMENT

4.1 The aquatic environment has affected the course of history and the development of human cultures.

4.11 Waterways have served as routes for the dispersal and concentration of human populations and cultures and for military and commercial transport.

4.12 Proximity to aquatic environments and the availability of aquatic resources have influenced the values, religion, lifestyles, politics, science and technology, arts and humanities of cultures.

4.2 People use the aquatic environment.

4.21 People collect and culture aquatic resources.

4 .22 People use water for energy production .

4.23 People change the pathways of water for their own benefit.

4.24 People's activities change the contours of shorelines and the ocean floor.

4.25 Use of aquatic environments can degrade habitats and deplete aquatic species.

4.26 People change aquatic ecosystems by adding pollutants to land air, and water.

4.27 People make laws which affect aquatic systems.

4. 3 The lifestyle which people choose has an affect on aquatic environments.

4.31 The majority of the world's population lives near bodies of water.

4.32 Water recreation is important to some people's lifestyle.

4.33 Misuse of the shoreline zone can result in complex environmental problems.

4.4 People work in careers which involve the aquatic environment.

4.41 Aquatic careers involve varying employment opportunities, wages, working conditions and educational requirements.

5. PEOPLE CAN ACT TO PRESERVE THE HEALTH OF AQUATIC ENVIRONMENTS.

5.1 Existing technology affects the health of aquatic environments and their usefulness to people.

5.11 Technologies have been developed to increase the usefulness of aquatic environments for humans.

5.12 Some technological development has adversely affected the aquatic environment.

5.13 Technologies have been developed to improve the health of aquatic environments and to rectify adverse effects caused by people.

5.2 Political and legal systems must concern themselves with the health of aquatic environments from a local, regional, national and international perspective.

5.21 Aquatic ecosystems do not conform to political boundaries.

5.22 Acting alone or in large groups, people can use their political and/or legal systems to resolve water issues.

5.23 Aquatic laws influence relations between countries.

5.3 Ethical choices affect the aquatic environment.

5.31 Knowledge and understanding of the aquatic environment affects ethical choices.

5.32 People have different ethical standards which frequently result in conflict over aquatic issues.

5.4 The aesthetic perceptions of humans affect their relationship to the world of water.

5.41 Involvement with aquatic environments has influenced the aesthetic expression of people.

5.42 People value aesthetic interpretations of the aquatic environment.

5.5 Economic considerations often play a role in decisions which

people make concerning aquatic environments.

5.51 When people make decisions involving the aquatic environment, they consider the cost in relation to the benefits to be derived.

5.52 Many important aspects of the aquatic environment cannot be measured in terms of economic factors.

5.6 Aquatic education affects people's knowledge of, attitude toward and involvement with the aquatic environment.

5.61 Aquatic education is essential for all people.

5.62 Aquatic education involves many disciplines.