DARIEN PUBLIC SCHOOLS

CURRICULUM GUIDE (TEMPLATE FORMAT 2004-2005)

Marine Science

Approved by the Board of Education on May 23, 2006

DARIEN PUBLIC SCHOOLS

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Include:

DRAFT Completion Date: April 20, 2006

Board of Education Approval:

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SECTION I - Course Information

STATEMENT OF PHILOSOPHY

The objectives of the Science Department are:

1. To acquaint students with the presently accepted theories and laws of the universe and the methods used to develop and test new theories and laws.

2. To help students acquire skills in making accurate observations, assembling and evaluating facts and reaching conclusions.

3. To help students develop an understanding and appreciation of the role of science in humankind's attempts to relate to the universe.

4. To help students appreciate the role they can and should play in protecting and improving their environment.

5. To help students appreciate how their lives are enhanced by future scientific endeavor.

PROGRAM GOALS

Objectives:

1. To enlighten students by exposing them to the world of marine organisms.
2. To help students see the critical relationship between one organism and another.
3. To provide knowledge of the structure and functions of organisms and populations.
4. To prepare students as responsible community members for their role in making educated decisions regarding community goals and environmental impact.
5. To help students compare and contrast marine environments and the diversity **of marine life from around the world.**

OVERVIEW

300 Marine Science
Grades 11 or 12 (elective course)
1 semester (1/2 credit)
Lab Requirement

Prerequisite: Completion of 300 Biology with a C+ or better, or permission of instructor.

Description: This course is an introduction to the world's oceans and to the inhabitants and processes contained within its vast boundaries. Topics will include oceanography, aquaculture, diversity, ecology, living components, and man's interrelationship with the marine community. The course will place an emphasis on the ecology of our local waters. Interrelationships among animals, plants, and physical and chemical aspects of the environment will be studied, with stress on adaptations for survival unique to the marine environment. This course involves a wide variety of lab work, including animal dissections and field studies.

Expectations: Students are expected to complete laboratory investigations, homework, and research projects. They will also be responsible for group cooperation in laboratory investigations as well as field studies. Students will demonstrate their understanding in a variety of forms including presentations, tests, lab reports, and lab practicals

ESSENTIAL QUESTIONS

1. How is science as a discipline defined by its process?
2. How does an individual observe, record, analyze, interpret, make predictions and form conclusions based upon their observations?
3. How do the abiotic factors of marine environments impact marine life?
4. What variety of organisms lives in the sea and how are they classified?
5. How and why does the design of the marine organism suit the environment in which it lives?
6. How has marine life evolved and what is the resulting classification of organisms?
7. What are the structure and functions of marine ecosystems?
8. How do marine organisms interact with and impact their environment?
9. What is the human impact on the world's oceans?

PROCESS SKILLS

- Reading (Decoding)
- Reading (Comprehending)
- Reading (Analyzing)
- Reading (Appreciating)
- Writing and Language Mechanics
- Speaking
- Listening
- Viewing
- Studying
- Reasoning and Reflecting
- Using Learning Resources and Technology
- Working Independently and Collaboratively
- Maintaining Physical Fitness
- Inventing
- Designing
- Creating
- Performing
- Quantifying
- Understanding Number Operations
- Using and Creating Formulas
- Problem Solving
- Graphing
- Applying Probability and Statistics
- Applying Scientific Method
- Inquiry (critical questioning)

STUDENT PERFORMANCE SUMMARY

Lab Report

- How Temperature and Salinity Effect Density
- Factors Effecting Algal Populations
- Field Studies of Various ecosystems

Lab Practical Exam

- Marine Specimen Practical (throughout dissections)

Model with Written Explanation

- Creating a food dish of a marine organism

Dissection

- Crayfish
- Perch
- Starfish
- Squid
- Shark (optional)

GRADING GUIDELINES

	Expectations of Students	**% of Report Card Grade**
Homework	100% of all assignments	10%-15%
Laboratory	100% of all assignments	20%-35%
Tests	All tests taken/made up	35%-55%
Quizzes	All quizzes taken/made up	20%-40%
Performance Task	Dissection Practicals	10%-15%
1st Quarter Grade		40% of 1st semester grade
2nd Quarter Grade		40% of 1st semester grade
Mid-Year Exam		20% of 1st semester grade

SECTION II – Units of Study

SUMMARY OF UNITS

	Unit Title	**Duration (Days)**
Semester 1		
Unit 1:	Marine Science as a Science and the Properties of the World Ocean…	14
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UNIT 1: Marine Science as a Science and the Properties of the World Ocean

UNIT 1: Marine Science as a Science and the Properties of the World Ocean

Essential Question 1: How is Marine Science a "Science"?

Essential Question 2: What are the physical and chemical characteristics of the world ocean?

Expectations from DHS Mission Statement

ACADEMIC EXPECTATIONS
1. Read actively and critically for a variety of purposes.
4. Listen actively and critically.
6. Reason effectively and solve problems.
7. Demonstrate the skills and real-world contextual knowledge to meet the demands of a changing world.

SOCIAL
3c. Participates effectively and efficiently in groups to pursue and generate information.

CIVIC
4. Understands the human impact on the environment.

ETHICAL EXPECTATIONS
1. Acts responsibly and respectfully toward him/herself and others.
2. Follows the established rules, guidelines and laws of the school community.
3. Explores, discusses and questions the moral issues that arise within the context of his/her day.
4. Demonstrates sensitivity to, and respect for, the perspectives, opinions, needs and customs of others.

List State Framework Standards Addressed:

Grades 9-10 Core Scientific Inquiry, Literacy and Numeracy
How is scientific knowledge created and communicated?

SCIENTIFIC INQUIRY

- Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.
- Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.
- Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.

SCIENTIFIC LITERACY

- Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.

SCIENTIFIC NUMERACY

- Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.

D INQ.1 Identify questions that can be answered through scientific investigation.
D INQ.3 Formulate a testable hypothesis and demonstrate logical connections between the scientific concepts guiding the hypothesis and the design of the experiment.
D INQ.4 Design and conduct appropriate types of scientific investigations to answer different questions.
D INQ.5 Identify independent and dependent variables, including those that are kept constant and those used as controls.
D INQ.6 Use appropriate tools and techniques to make observations and gather data.

List National Standards addressed:

Science as Inquiry: CONTENT STANDARD A:
As a result of activities in grades 9-12, all students should develop

- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

CONTENT STANDARD B:
As a result of their activities in grades 9-12, all students should develop an understanding of

- Structure and properties of matter
- Chemical reactions
- Motions and forces
- Interactions of energy and matter

Life Science: CONTENT STANDARD D:

As a result of their activities in grades 9-12, all students should develop an understanding of

- Geochemical cycles
- Origin and evolution of the earth system

Science and Technology: CONTENT STANDARD E:
As a result of their activities in grades 9-12, all students should develop an understanding of

- Abilities of technological design
- Understandings about science and technology

History and Nature of Science: CONTENT STANDARD G:
As a result of their activities in grades 9-12, all students should develop an understanding of

- Science as a human endeavor
- Nature of scientific knowledge
- Historical perspectives

CONTENT KNOWLEDGE OBJECTIVES

Initial Understanding:

Identify the steps of the scientific method.
Examine the chemical make-up of seawater and how physical changes to seawater occur.
Identify the tools and instruments used to calculate and measure light, salinity, pressure, and turbidity.
Identify the 5 major oceans.

Developing an Interpretation:

Relate how the scientific improvements have furthered our knowledge of oceans.
Explain the forces that cause the different tides.

Making Connections:

Apply their understanding of a controlled experiment to the testing of a hypothesis.
Relate the theories of continental drift and plate tectonics to the formations of the continents and oceans.
Examine the various zones of the ocean topography including those of the continental margin and the ocean abyss.

Taking a Critical Stance:

Evaluate samples of ocean topography and explore the role of plate tectonics in its formation.
Create an experimental plan to determine the relationship between salinity, temperature and density.

VOCABULARY

Scientific method
hypothesis
controlled experiment
theory
variables
core
mantle
crust
plate tectonics
continental drift
Mid Atlantic ridge
magnetic anomalies
lithosphere
asthenosphere
subduction
Secchi disk
trench
Refractometer
oceanic crust
continental crust
continental shelf
continental slope
continental rise

active margin
passive margin
abyssal plain
density
salinity
heat capacity
transparency
pressure
wave – trough, height, wavelength,
period
tides – neap, spring, semidiurnal, mixed, diurnal
tsunami

ACTIVITIES

LAB: Lithospheric Plates and Ocean Basin Topography
LAB: Converting Saltwater into Freshwater
LAB: How much does your Boat Float?

PERFORMANCE ASSESSMENT

LAB: How Does Temperature and Salinity Affect the Density of Ocean Water?

CAREER AWARENESS (where appropriate)

Marine scientist
Oceanographer (Chemical, Physical, Biological, and Geophysical)
Marine Archeologist
Meteorologist

CORE TEXT FOR STUDENTS

Marine Biology by Peter Castro and Michael Huber /Published by McGraw-Hill

ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS

http://highered.mcgraw-hill.com/sites/0072509341/information_center_view0/

MATERIALS AND SUPPLIES

Materials as per lab procedures

INTEGRATED TECHNOLOGY

Exploring Density on the Internet

UNIT 2: Biology Review and Primary Producers

UNIT 2 Biology Review and Primary Producers

Essential Question 1**:** What are the basic shared life functions required by marine organisms?

Essential Question 2**:** How is marine microbe structure related to function?

Essential Question 3: What is the importance of microscopic and macroscopic algae?

Expectations from DHS Mission Statement

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D INQ.4 Design and conduct appropriate types of scientific investigations to answer different questions.
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D INQ.6 Use appropriate tools and techniques to make observations and gather data.

Strand IV: Cell Chemistry and Biotechnology
Content Standards Expected Performances
Structure and Function – How are organisms structured to ensure efficiency and survival?
10.1 - Fundamental life processes depend on the physical structure and the chemical activities of the cell.

- The cellular processes of photosynthesis and respiration involve transformation of matter and energy.

D 1. Describe significant similarities and differences in the basic structure of plant and animal cells.
D 4. Explain the role of the cell membrane in supporting cell functions.

List National Standards addressed:

Science as Inquiry: CONTENT STANDARD A:
As a result of activities in grades 9-12, all students should develop

- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

CONTENT STANDARD C:
As a result of their activities in grades 9-12, all students should develop an understanding of

- The cell
- Biological evolution
- Interdependence of organisms
- Matter, energy, and organization in living systems
-

CONTENT STANDARD D:
As a result of their activities in grades 9-12, all students should develop an understanding of

- Energy in the earth system
- Geochemical cycles
- Origin and evolution of the earth system
- Origin and evolution of the universe

History and Nature of Science: CONTENT STANDARD G:
As a result of their activities in grades 9-12, all students should develop an understanding of

- Science as a human endeavor
- Nature of scientific knowledge
- Historical perspectives

CONTENT KNOWLEDGE OBJECTIVES

Initial Understanding:

Identify the basic structure of seaweeds.
Identify the basic characteristics of the 3 Domains

Developing an Interpretation:

Understand and apply the rules of classification.
Discuss the adaptations of Kelp and microalgae that help them survive in the photic zone.
Examine the rules of binomial nomenclature.

Making Connections:

Relate how various biological processes that marine organisms undergo help maintain homeostasis.
Explain how the structural adaptations in mangrove trees allow it to survive in a marine life.
Compare and **contrast** diatoms, dinoflagellates and cyanobacteria

Taking a Critical Stance:

Defend the classification scheme identified for algae samples collected locally.

VOCABULARY

kelp
holdfast
Mangrove
seagrasses/ cordgrasses
Eubacteria
Eukarya
algin
red algae (Rhodophyta)
brown algae (Heterokontophyta)
green algae (Chlorophyta)
thallus
stipe
pneumatocyst
chemosynthesis
photosynthesis
homeostasis
photosynthetic pigments
autotroph/producer
heterotroph/consumer
prokaryote
eukaryote
chloroplast
diffusion
osmosis
phylogeny
theory of evolution
binomial nomenclature
levels of classification
Archaea
cyanobacteria
diatom
frustule
dinoflagellate
zooanthellae

red tide
brown tide
forminiferans
radiolarians

ACTIVITIES

LAB: Algae Press
LAB: Plasmolysis: effects of salt on aquatic plants
LAB: Classification of Fishes: Use of dichotomous key
LAB: Diversity and Adaptations : Marine Phytoplankton
LAB: Diversity and Adaptations : Seaweeds and Marine Plants

PERFORMANCE ASSESSMENT

Field collection and Identification of Marine Algae (season permitting)

CAREER AWARENESS (where appropriate)

Marine ecologist
Marine paleontologist
Mariculturist
Microbiologist

CORE TEXT FOR STUDENTS

Marine Biology by Peter Castro and Michael Huber /Published by McGraw-Hill

ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS

http://highered.mcgraw-hill.com/sites/0072509341/information_center_view0/
Marine Science by Thomas F. Greene / Published by Amsco
Marine Animals of Southern New England by Howard M. Weiss / Published by State Geological and Natural History of Connecticut Department of Environmental Protection
Seaweeds of the Long Island Sound by USGS

MATERIALS AND SUPPLIES

Microscopes
Field Guides
Materials as per lab procedures

INTEGRATED TECHNOLOGY

Microscopy Lab – Observation and application of technology, data collection

UNIT 3: Marine Animals without Backbones

UNIT 3: Marine Animals without Backbones

Essential Question 1: What are the identifying characteristics of the major invertebrate phyla?

Essential Question 2: How has phylogeny of invertebrates lead to greater complexity?

Expectations from DHS Mission Statement

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4. Demonstrates sensitivity to, and respect for, the perspectives, opinions, needs and customs of others.

List State Framework Standards Addressed:

SCIENTIFIC NUMERACY
- Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.

D INQ.6 Use appropriate tools and techniques to make observations and gather data.

Grade 10
Core Themes, Content Standards and Expected Performances
Strand IV: Cell Chemistry and Biotechnology

Structure and Function – How are organisms structured to ensure efficiency and survival?
10.1 - Fundamental life processes depend on the physical structure and the chemical activities of the cell.

- Most of the chemical activities of the cell are catalyzed by enzymes that function only in a narrow range of temperature and acidity conditions.

10.5 - Evolution and biodiversity are the result of genetic changes that occur over time in constantly changing environments.
D 7. Describe how structural and behavioral adaptations increase the chances for organisms to survive in their environments.

Science and Technology in Society – How do science and technology affect the quality of our lives?
10.6 - Living organisms have the capability of producing populations of unlimited size, but the environment can support only a limited number of individuals from each species.

List National Standards addressed:

CONTENT STANDARD C:
As a result of their activities in grades 9-12, all students should develop an understanding of

- Behavior of organisms

Science and Technology

CONTENT STANDARD E:
As a result of their activities in grades 9-12, all students should develop an understanding of

- Understandings about science and technology

CONTENT KNOWLEDGE OBJECTIVES

Initial Understanding:

Identify the basic physiological characteristics of poriferans, marine worms, cnidarians, mollusks, arthropods, and echinoderms.
Survey the differences among the various classes of poriferans, cnidarians, mollusks, arthropods, and echinoderms.

Developing an Interpretation:
Examine various structures of invertebrates and demonstrate how these structures are designed to perform specific functions

Making Connections:

Demonstrate an ability to classify various marine invertebrates using a dichotomous key and/or distinguishable characteristics.
Explain the benefits of external and internal forms of reproduction.

Taking a Critical Stance:
Analyze how changes in symmetry have caused the evolution of greater complexity.

Explore the concept of unity within diversity by judging various strategies of reproduction and nutrition.

VOCABULARY

Poriferan
Cnidarian
Ctenophora
Mollusca
Arthropoda
Echinodermata
Annelida
Polychaeta
spicule
sessile
collar cells
amebocytes
broadcast spawning
suspension/deposit feeding
siliceous
calcareous
asymmetry
radial symmetry
bilateral symmetry
tentacle
nematocyst
polyp
medusa
hydrozoans
siphonophores
scyphozoans

anthozoans
corals
comb jellies
posterior
anterior
dorsal
ventral
segmentation
open circulation
closed circulation
swarming reproduction
mantle
foot
radula
chitin
gastropods
bivalves
siphon
byssal threads
nudibranchs
cephalopods
inc sac
pen
chitins
hermaphrodite
veliger
exoskeleton
molt
crustaceans
copepods
barnacles
amphipods
isopods
Krill/Euphausids
carapace
cephalothorax
swimmerets
chelicerae
maxillipeds
mandible
compound eyes
Merostomata
zoea
nauplius
pentamerous radial symmetry
endoskeleton
water vascular system
ampullae
madreporite
ambulacral groove
pedicellariae
Asteroidea/Sea Star
Echinodea/ Sea Urchin
Holothuroidea/ sea cucumber
Crinodea/ crinoids/ sea lily
Aristotle's lantern
regeneration

ACTIVITIES

LAB: Squid Dissection
LAB: Crayfish Dissection
LAB: Starfish Dissection
Yellow Page Ad for Invertebrate Restaurant
Identify Various Marine Invertebrates

CAREER AWARENESS (where appropriate)

Museum/Aquarium Currator
Invertebrate Zoologist

PERFORMANCE ASSESSMENT

LAB: Lab Practical: A Survey of Marine Invertebrates

CORE TEXT FOR STUDENTS

Marine Biology by Peter Castro and Michael Huber /Published by McGraw-Hill

ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS

http://highered.mcgraw-hill.com/sites/0072509341/information_center_view0/
Marine Animals of Southern New England by Howard M. Weiss / Published by State Geological and Natural History of Connecticut Department of Environmental Protection

MATERIALS AND SUPPLIES

Materials as per lab procedure
Microscopes
Dissection supplies

INTEGRATED TECHNOLOGY

Dissection Software CD: Crayfish, Starfish, Squid, and Earthworm
Flex Camera

UNIT 4: Marine Animals with Backbones

UNIT 4: Marine Animals with Backbones

Essential Question 1: What are the identifying characteristics of the major marine vertebrate phyla?

Essential Question 2: How are marine vertebrates adapted to life in the water?

Expectations from DHS Mission Statement

ACADEMIC EXPECTATIONS
1. Read actively and critically for a variety of purposes.
4. Listen actively and critically.
6. Reason effectively and solve problems.
7. Demonstrate the skills and real-world contextual knowledge to meet the demands of a changing world.

SOCIAL
3c. Participates effectively and efficiently in groups to pursue and generate information.

ETHICAL EXPECTATIONS
1. Acts responsibly and respectfully toward him/herself and others.
2. Follows the established rules, guidelines and laws of the school community.
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List State Framework Standards Addressed:

Grade 10
Core Themes, Content Standards and Expected Performances
Strand IV: Cell Chemistry and Biotechnology

Structure and Function – How are organisms structured to ensure efficiency and survival?
10.1 - Fundamental life processes depend on the physical structure and the chemical activities of the cell.

- Most of the chemical activities of the cell are catalyzed by enzymes that function only in a narrow range of temperature and acidity conditions.
- The cellular processes of photosynthesis and respiration involve transformation of matter and energy.

D 1. Describe significant similarities and differences in the basic structure of plant and animal cells.
D 3. Describe the general role of enzymes in metabolic cell processes.
D 4. Explain the role of the cell membrane in supporting cell functions.

List National Standards addressed:

CONTENT STANDARD C:
As a result of their activities in grades 9-12, all students should develop an understanding of

- The cell
- Matter, energy, and organization in living systems

History and Nature of Science

CONTENT STANDARD G:
As a result of their activities in grades 9-12, all students should develop an understanding of

- Science as a human endeavor
- Nature of scientific knowledge
- Historical perspectives

CONTENT KNOWLEDGE OBJECTIVES

Initial Understanding:

Identify the basic physiological characteristics of marine birds and marine reptiles.
Survey the morphological differences among the various orders of marine mammals including pinnepeds, carnivores (sea otters and polar bears), sirenians, and cetaceans.

Developing an Interpretation:

Compare the various shapes of fishes and marine mammals with there efficiency in locomotion and feeding behaviors.
Discuss schooling, territorial, and migration behaviors of marine vertebrates.
Compare and contrast the toothed and baleen whales

Making Connections:

Correlate how salinity plays an important role in how a fish regulates its blood chemistry.
Describe how gills function to maximize fish respiration.
Illustrate the adaptations evolved by marine mammals to deal with the physiological pressures (diving, temperature, oxygen) of the world oceans.
Analyze statistics on shark attacks and identify possible causations.

Taking a Critical Stance:

Defend the distinctions between the three classes of fish including reproduction style, basic structural differences, and feeding styles.

Assess the relationship between the morphology of marine mammals and their ability to succeed in a marine environment.

VOCABULARY

Vertebrate
nerve cord
Class Agnatha
Class Chondrichthyes
Class Osteichthyes
Class Mammalia
Order Pinnepedia
Order Carnivora
Order Cetacea

Class Aves
dolphin
porpoise
Mysticete
Odontocete
placoid scales
caudal fin
pectoral fin
dorsal fin
anal fin
adipose fin
pelvic fin
demersal
rays and skates
chimeras
ctenoid scales
swim bladder
countershading
chromatophores
gill arches
capillaries
gill filaments
spiracle
countercurrent system of flow
hemoglobin
myoglobin
lamellae
lateral line
ampullae of Lorenzini
schools
andromonous
catadromous
broadcast spawning
oviparous
ovoviviparous
viviparous
claspers
homeotherm
endotherm
salt glands
mammary glands
blubber
Mantatee
convergent evolution
baleen
spout/blowhole

spermaceti organ
echolocation
bends
melon
breaching

ACTIVITIES

LAB: Comparing Bony, Cartilaginous, and Jawless Fish.
LAB: Shark Classification Key
LAB: Common Fish Identification Key
LAB: Shark Dissection (optional)
LAB: Perch Dissection

PERFORMANCE ASSESSMENT

Food Festival: creating a food dish and report of a marine specimen

CAREER AWARENESS (where appropriate)

Marine Biologist
Marine Mammal Trainer
Ichthyologist
Ornithologist
Marine Mammal Veterinarian

CORE TEXT FOR STUDENTS

Marine Biology by Peter Castro and Michael Huber /Published by McGraw-Hill

ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS

http://highered.mcgraw-hill.com/sites/0072509341/information_center_view0/
Marine Science by Thomas F. Greene / Published by Amsco
Marine Animals of Southern New England by Howard M. Weiss / Published by State Geological and Natural History of Connecticut Department of Environmental Protection

MATERIALS AND SUPPLIES

As per lab procedures

INTEGRATED TECHNOLOGY

Video: Blue Planet
Cite specific areas where technology is used to advance student learning

UNIT 5: Marine Ecology

UNIT 5: Marine Ecology

Essential Question 1: How are energy and nutrients made available to all members of a community?

Essential Question 2: What are the various relationships between trophic levels?

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List State Framework Standards Addressed:

Grade 9: Core Themes, Content Standards and Expected Performances
Strand I: Energy Transformations Content Standards
Energy Transfer and Transformations – What is the role of energy in our world?
9.1 - Energy cannot be created or destroyed; however, energy can be converted from one form to another.
• Energy enters the Earth system primarily as solar radiation, is captured by materials and photosynthetic processes, and eventually is transformed into heat.

Grade 10: Core Themes, Content Standards and Expected Performances
Science and Technology in Society – How do science and technology affect the quality of our lives?
10.6 - Living organisms have the capability of producing populations of unlimited size, but the environment can support only a limited number of individuals from each species.
D 8. Describe the factors that affect the carrying capacity of the environment.
D 9. Explain how change in population density is affected by emigration, immigration, birth rate and death rate, and relate these factors to the exponential growth of human populations.

List National Standards addressed:
Life Science: CONTENT STANDARD C:
As a result of their activities in grades 9-12, all students should develop an understanding of
- Interdependence of organisms
- Matter, energy, and organization in living systems
- Behavior of organisms

Science in personal and cultural perspectives: CONTENT STANDARD F:
As a result of their activities in grades 9-12, all students should develop an understanding of
- Population growth
- Natural resources
- Environmental quality
- Natural and human-induced hazards
- Science and technology in local, national, and global challenges

CONTENT KNOWLEDGE OBJECTIVES

Initial Understanding:

Identify the various ways that species interact.
Categorize the major ecological zones in a world ocean.

Developing an Interpretation:

Distinguish between producers and consumers and their roles in photosynthesis and cellular respiration.
Explain characteristics of oceanic food chains and food webs.

Making Connections:

Diagram the flow of energy and nutrients in an aquatic food web.
Exhibit an understanding of the relationship between photosynthesis and cellular respiration

Taking a Critical Stance:

Construct an explanation for the downfall of kelp forests after analyzing recent trends in otter populations.

VOCABULARY

biotic
abiotic
nutrients
density dependent
density independent
autotroph
chemotroph
carrying capacity
limiting resource
competition
carnivore
herbivore
symbiosis
commensalism
parasitism
mutualism
predator / prey
food chain / food web
trophic level
primary consumer
secondary consumer
tertiary consumer
scavenger
omnivore
pyramid of energy
pyramid of biomass
decomposer
detritus
plankton
benthos
zooplankton
phytoplankton
intertidal zone
supratidal zone
subtidal zone
abyssal zone
nertic zone
pelagic zone
abyssal pelagic zone
kelp forest ecology

ACTIVITIES

Antarctic Food Web Card Game: Krill A Whale of a Game
- Rules
- Pregame Questions
- Postgame Questions

PERFORMANCE ASSESSMENT

CAREER AWARENESS (where appropriate)

Marine Conservationist
Naturalist
Field Technician

CORE TEXT FOR STUDENTS

Marine Biology by Peter Castro and Michael Huber /Published by McGraw-Hill

ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS

http://highered.mcgraw-hill.com/sites/0072509341/information_center_view0/

MATERIALS AND SUPPLIES

Krill, A Whale of a Game Card Game

INTEGRATED TECHNOLOGY

Cite specific areas where technology is used to advance student learning

UNIT 6: Varieties in Marine Ecosystems

UNIT 6: Varieties in Marine Ecosystems

Essential Question 1: What are the abiotic factors associated with various marine habitats?

Essential Question 2: What adaptations do marine organisms possess to live in the variety of marine habitats?

Expectations from DHS Mission Statement

ACADEMIC EXPECTATIONS
1. Read actively and critically for a variety of purposes.
4. Listen actively and critically.
6. Reason effectively and solve problems.
7. Demonstrate the skills and real-world contextual knowledge to meet the demands of a changing world.

SOCIAL
3c. Participates effectively and efficiently in groups to pursue and generate information.

ETHICAL EXPECTATIONS
1. Acts responsibly and respectfully toward him/herself and others.
2. Follows the established rules, guidelines and laws of the school community.
3. Explores, discusses and questions the moral issues that arise within the context of his/her day.
4. Demonstrates sensitivity to, and respect for, the perspectives, opinions, needs and customs of others.

List State Framework Standards Addressed:

Grade 10
Core Themes, Content Standards and Expected Performances
Strand IV: Cell Chemistry and Biotechnology

Structure and Function – How are organisms structured to ensure efficiency and survival?

10.1 - Fundamental life processes depend on the physical structure and the chemical activities of the cell.

- Most of the chemical activities of the cell are catalyzed by enzymes that function only in a narrow range of temperature and acidity conditions.

Grade 10

Core Themes, Content Standards and Expected Performances
Strand V: Genetics, Evolution and Biodiversity
Content Standards Expected Performances
Heredity and Evolution – What processes are responsible for life's unity and diversity?
10.4. - In sexually reproducing organisms, each offspring contains a mix of characteristics inherited from both parents.

- Genetic information is stored in genes that are located on chromosomes inside the cell nucleus.
- Most organisms have two genes for each trait, one on each of the homologous chromosomes in the cell nucleus.

D 1. Explain how meiosis contributes to the genetic variability of organisms.

List National Standards addressed

Life Science

CONTENT STANDARD C:
As a result of their activities in grades 9-12, all students should develop an understanding of

- The cell
- Molecular basis of heredity
- Biological evolution
- Interdependence of organisms
- Matter, energy, and organization in living systems
- Behavior of organisms

History and Nature of Science

CONTENT STANDARD G:
As a result of their activities in grades 9-12, all students should develop an understanding of

- Science as a human endeavor
- Nature of scientific knowledge
- Historical perspectives

CONTENT KNOWLEDGE OBJECTIVES

Initial Understanding:

Identify the characteristics of a variety of marine environments including the ocean depths (abyssal), and coastal waters (such as littoral zone, neritic, and intertidal zone)

Developing an Interpretation:

Distinguish between the different life zones along a shore.
Describe the effects of tides on marine organisms.
Explain interactions that occur between the physical environment and biotic factors for the identified marine environments.

Making Connections:

Describe the typical inhabitants of discussed marine environments.
Compare the ocean depths (abyssal), coastal waters (such as littoral zone, neuritic, and intertidal zone) as to variations in salinity, temperature, light penetration, current, producers and consumers (including plankton, nekton, and benthos).

Taking a Critical Stance:

Jusitfy the evolutionary adaptations of marine life to the dramatically varied environments of the oceans in which they live.

VOCABULARY

tidal pool
rocky shore
intertidal zones
vertical zonation
infauna
estuary
mud flats
wetland
tidal marsh
nitrogen fixation
kelp forest
coral reef
zooxanthellae
bleaching
atoll
reef
pelagic
epipelagic
photic zone
neritic zone
plankton sizes (pico – mega)
migration
deep sea
bioluminescence
benthos
hydrothermal vents
hydrogen sulfide
subtidal zone

ACTIVITIES

Field studies: students will visit various marine environments such as rocky shore, sandy beaches, and salt marshes and compare the physical and biological characteristics of each**.**

PERFORMANCE ASSESSMENT

Various Ecosystems Analysis

CAREER AWARENESS (where appropriate)

Field Technician

CORE TEXT FOR STUDENTS

Marine Biology by Peter Castro and Michael Huber /Published by McGraw-Hill

ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS

http://highered.mcgraw-hill.com/sites/0072509341/information_center_view0/
Atlantic Sea Shore Field Guide by Peterson. (or other comparable guide)
Marine Animals of Southern New England by Howard M. Weiss / Published by State Geological and Natural History of Connecticut Department of Environmental Protection

MATERIALS AND SUPPLIES

Materials as per lab procedures
Suggested field equipment
Seine net
Secchi disk
waders
salinity meter
DO meter
temperature meter
local field guide
drift net

INTEGRATED TECHNOLOGY

Cite specific areas where technology is used to advance student learning

UNIT 7: Impacts of Humans on the Marine Environment

UNIT 7: Impacts of Humans on the Marine Environment

Essential Question 1: How have we impacted the world's marine environments?

Essential Question 2: What measures must be taken to ensure the survival of the world's marine environments?

Expectations from DHS Mission Statement

ACADEMIC EXPECTATIONS
1. Read actively and critically for a variety of purposes.
4. Listen actively and critically.
6. Reason effectively and solve problems.
7. Demonstrate the skills and real-world contextual knowledge to meet the demands of a changing world.
8. Analyze problems from multiple perspectives by understanding past and present cultures.

SOCIAL EXPECTATIONS:
3c. Participates effectively and efficiently in groups to pursue and generate information.

CIVIC EXPECTATIONS:
1. Develops a healthy sense of self-worth and the worth of others.
2. Demonstrates mutual respect for all members of the school and town community.
4. Understands the human impact on the environment.

ETHICAL EXPECTATIONS
1. Acts responsibly and respectfully toward him/herself and others.
2. Follows the established rules, guidelines and laws of the school community.
3. Explores, discusses and questions the moral issues that arise within the context of his/her day.
4. Demonstrates sensitivity to, and respect for, the perspectives, opinions, needs and customs of others.

SCIENTIFIC NUMERACY

• Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.
D INQ.1 Identify questions that can be answered through scientific investigation.
D INQ.2 Read, interpret and examine the credibility and validity of scientific claims in different sources of information.
D INQ.3 Formulate a testable hypothesis and demonstrate logical connections between the scientific concepts guiding the hypothesis and the design of the experiment.
D INQ.4 Design and conduct appropriate types of scientific investigations to answer different questions.
D INQ.5 Identify independent and dependent variables, including those that are kept constant and those used as controls.
D INQ.6 Use appropriate tools and techniques to make observations and gather data.
D INQ.7 Assess the reliability of the data that was generated in the investigation.
D INQ.8 Use mathematical operations to analyze and interpret data, and present relationships between variables in appropriate forms.
D INQ.9 Articulate conclusions and explanations based on research data, and assess results based on the design of the investigation.
D INQ.10 Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic

Grade 10
Core Themes, Content Standards and Expected Performances
Strand V: Genetics, Evolution and Biodiversity
Content Standards Expected Performances
Heredity and Evolution – What processes are responsible for life's unity and diversity?
10.5 - Evolution and biodiversity are the result of genetic changes that occur over time in constantly changing environments.
• Mutations and recombination of genes create genetic variability in populations.
• Changes in the environment may result in the selection of organisms that are better able to survive and reproduce.
D 7. Describe how structural and behavioral adaptations increase the chances for organisms to survive in their environments.

Science and Technology in Society – How do science and technology affect the quality of our lives?
10.6 - Living organisms have the capability of producing populations of unlimited size, but the environment can support only a limited number of individuals from each species.
• Humans modify ecosystems as a result of rapid population growth, use of technology and consumption of resources.

List National Standards addressed

CONTENT STANDARD A:
As a result of activities in grades 9 - 12, all students should develop
- Abilities necessary to do scientific inquiry

- Understandings about scientific inquiry

Life Science
CONTENT STANDARD C:
As a result of their activities in grades 9-12, all students should develop an understanding of
- Interdependence of organisms
- Matter, energy, and organization in living systems
- Behavior of organisms

CONTENT STANDARD D:
As a result of their activities in grades 9-12, all students should develop an understanding of
- Energy in the earth system

Science in personal and cultural perspectives

CONTENT STANDARD E:
As a result of their activities in grades 9-12, all students should develop an understanding of
- Abilities of technological design
- Understandings about science and technology

CONTENT STANDARD F:
As a result of their activities in grades 9-12, all students should develop an understanding of
- Personal and community health
- Population growth
- Natural resources
- Environmental quality
- Natural and human-induced hazards
- Science and technology in local, national, and global challenges

History and Nature of Science

CONTENT STANDARD G:
As a result of their activities in grades 9-12, all students should develop an understanding of
- Science as a human endeavor
- Nature of scientific knowledge
- Historical perspectives

CONTENT KNOWLEDGE OBJECTIVES

Initial Understanding:

List the important living and nonliving marine resources.
Identify recent problems in worldwide oceanic fisheries.

Developing an Interpretation:

Describe the different methods of farming aquatic life forms.
Discuss the impact of sewage pollution and toxic chemicals on aquatic environments.

Making Connections:

Explain the importance of clean waters to aquatic life forms.

Taking a Critical Stance:

Justify the protection of marine life and its environment.

VOCABULARY

continental shelf
purse seine
fish meal
trawls
longlines
gill nets
renewable resource
nonrenewable resource
overfishing
sustainable yield
commercial extinction
by-catch
Marine Mammal Protection Act
CITES
Endangered Species Act
mariculture
aquaculture
salmon ranching
bleaching
eutrophication
sewage
biological magnification
thermal pollution
invasive species
coastal management
biodegradable
oil spill

ACTIVITIES

LAB: Operation Oil Spill Cleanup

PERFORMANCE ASSESSMENT

Lab report: Effects of Pollutants on Algae

CAREER AWARENESS (where appropriate)

Aquarist
Conservationist
Maritime Lawyer
Fisherman
Fisheries Observer
Animal Husbandry

CORE TEXT FOR STUDENTS

Marine Biology by Peter Castro and Michael Huber /Published by McGraw-Hill

ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS

http://highered.mcgraw-hill.com/sites/0072509341/information_center_view0/

MATERIALS AND SUPPLIES

Materials as per lab procedures

INTEGRATED TECHNOLOGY

SECTION III - Goals and Standards

RELATED GOALS and STANDARDS

DHS MISSION

The mission of Darien High School is to nurture the mind, body, and spirit of each member of the school community and to encourage the development of all students as reflective thinkers who strive for excellence in their lives. In a rigorous intellectual environment students will develop the skills, values and integrity that will prepare them to become citizens with a commitment to lifelong learning and to lives of vision and consequence in the 21st century.

ACADEMIC EXPECTATIONS

Across content areas and in a variety of ways the DHS student will:

1. Read actively and critically for a variety of purposes.

2. Write effectively.

4. Listen actively and critically.

6. Reason effectively and solve problems.

7. Demonstrate the skills and real-world contextual knowledge to meet the demands of a changing world.

8. Analyze problems from multiple perspectives by understanding past and present cultures.

SOCIAL EXPECTATIONS: The DHS student:

1. Develops positive interpersonal skills.

3. Demonstrates emotional maturity by seeking support and responding constructively without violence, intimidation and aggression.

Participates effectively and efficiently in groups to pursue and generate information.

CIVIC EXPECTATIONS: The DHS student:

1. Develops a healthy sense of self-worth and the worth of others.

2. Demonstrates mutual respect for all members of the school and town community.

4. Understands the human impact on the environment.

ETHICAL EXPECTATIONS: The DHS student:

1. Acts responsibly and respectfully toward him/herself and others.

2. Follows the established rules, guidelines and laws of the school community.

3. Explores, discusses and questions the moral issues that arise within the context of his/her day.
4. Demonstrates sensitivity to, and respect for, the perspectives, opinions, needs and customs of others.

Adopted June 2001

The Connecticut Framework – K-12 Curriculum Goals and Standards

Grades 9-10 Core Scientific Inquiry, Literacy and Numeracy
How is scientific knowledge created and communicated?
Content Standards Expected Performances
SCIENTIFIC INQUIRY
- Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.
- Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.
- Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.

SCIENTIFIC LITERACY
- Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.
- Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media.

SCIENTIFIC NUMERACY
- Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.

D INQ.1 Identify questions that can be answered through scientific investigation.
D INQ.2 Read, interpret and examine the credibility and validity of scientific claims in different sources of information.
D INQ.3 Formulate a testable hypothesis and demonstrate logical connections between the scientific concepts guiding the hypothesis and the design of the experiment.
D INQ.4 Design and conduct appropriate types of scientific investigations to answer different questions.
D INQ.5 Identify independent and dependent variables, including those that are kept constant and those used as controls.
D INQ.6 Use appropriate tools and techniques to make observations and gather data.
D INQ.7 Assess the reliability of the data that was generated in the investigation.
D INQ.8 Use mathematical operations to analyze and interpret data, and present relationships between variables in appropriate forms.
D INQ.9 Articulate conclusions and explanations based on research data, and assess results based on the design of the investigation.
D INQ.10 Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.

Grade 9
Core Themes, Content Standards and Expected Performances
Strand I: Energy Transformations Content Standards
Energy Transfer and Transformations – What is the role of energy in our world?

9.1 - Energy cannot be created or destroyed; however, energy can be converted from one form to another.

- Energy enters the Earth system primarily as solar radiation, is captured by materials and photosynthetic processes, and eventually is transformed into heat.

Grade 10

Core Themes, Content Standards and Expected Performances
Strand IV: Cell Chemistry and Biotechnology
Content Standards Expected Performances
Structure and Function – How are organisms structured to ensure efficiency and survival?
10.1 - Fundamental life processes depend on the physical structure and the chemical activities of the cell.

- Most of the chemical activities of the cell are catalyzed by enzymes that function only in a narrow range of temperature and acidity conditions.
- The cellular processes of photosynthesis and respiration involve transformation of matter and energy.

D 1. Describe significant similarities and differences in the basic structure of plant and animal cells.
D 4. Explain the role of the cell membrane in supporting cell functions.

Science and Technology in Society – How do science and technology affect the quality of our lives?
10.2 - Microorganisms have an essential role in life processes and cycles on Earth.

- Understanding the growth and spread patterns of viruses and bacteria enables the development of methods to prevent and treat infectious diseases.

Science and Technology in Society – How do science and technology affect the quality of our lives?

Grade 10

Core Themes, Content Standards and Expected Performances
Strand V: Genetics, Evolution and Biodiversity
Content Standards Expected Performances
Heredity and Evolution – What processes are responsible for life's unity and diversity?
10.4. - In sexually reproducing organisms, each offspring contains a mix of characteristics inherited from both parents.

- Genetic information is stored in genes that are located on chromosomes inside the cell nucleus.

Heredity and Evolution – What processes are responsible for life's unity and diversity?
10.5 - Evolution and biodiversity are the result of genetic changes that occur over time in constantly changing environments.

- Changes in the environment may result in the selection of organisms that are better able to survive and reproduce.

D 5. Explain how the processes of genetic mutation and natural selection are related to the evolution of species.

D 6. Explain how the current theory of evolution provides a scientific explanation for fossil records of ancient life forms.
D 7. Describe how structural and behavioral adaptations increase the chances for organisms to survive in their environments.

Science and Technology in Society – How do science and technology affect the quality of our lives?
10.6 - Living organisms have the capability of producing populations of unlimited size, but the environment can support only a limited number of individuals from each species.
• Human populations grow due to advances in agriculture, medicine, construction and the use of energy.
• Humans modify ecosystems as a result of rapid population growth, use of technology and consumption of resources.
D 8. Describe the factors that affect the carrying capacity of the environment.
D 9. Explain how change in population density is affected by emigration, immigration, birth rate and death rate, and relate these factors to the exponential growth of human populations.

NSTA National Standards

National committee on science education standards and assessment, national research council
ISBN: 0-309-54985-x, 272 pages, (1996)
This free PDF was downloaded from: http://www.nap.edu/catalog/4962.html

Science as Inquiry

CONTENT STANDARD A:
As a result of activities in grades 9 - 12, all students should develop
- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

CONTENT STANDARD B:
As a result of their activities in grades 9-12, all students should develop an understanding of
- Structure of atoms
- Structure and properties of matter
- Chemical reactions
- Motions and forces
- Conservation of energy and increase in disorder
- Interactions of energy and matter

Life Science

CONTENT STANDARD C:

As a result of their activities in grades 9-12, all students should develop an understanding of

- The cell
- Molecular basis of heredity
- Biological evolution
- Interdependence of organisms
- Matter, energy, and organization in living systems
- Behavior of organisms

CONTENT STANDARD D:
As a result of their activities in grades 9-12, all students should develop an understanding of

- Energy in the earth system
- Geochemical cycles
- Origin and evolution of the earth system
- Origin and evolution of the universe

Science and Technology

CONTENT STANDARD E:
As a result of their activities in grades 9-12, all students should develop an understanding of

- Abilities of technological design
- Understandings about science and technology

Science in personal and cultural perspectives

CONTENT STANDARD F:
As a result of their activities in grades 9-12, all students should develop an understanding of

- Personal and community health
- Population growth
- Natural resources
- Environmental quality
- Natural and human-induced hazards
- Science and technology in local, national, and global challenges

History and Nature of Science

CONTENT STANDARD G:
As a result of their activities in grades 9-12, all students should develop an understanding of

- Science as a human endeavor
- Nature of scientific knowledge
- Historical perspectives

SECTION IV – Learning Resources

SUPPLEMENTAL RESOURCES

Lab Report

Lab Reports should follow the following format.

1. **Introduction:** Include a statement of the problem investigated, why the work was carried out, background of the problem including an explanation of how the problem relates to you and the world, a brief statement of the general method of approach to the problem, and expected results.

2. **Methods and materials:** This section tells the reader how and with what "stuff" the work was done. You should try to strike a balance between an over-detailed description of even the most trivial items and a very sketchy statement that provides insufficient information. The important guideline is that another worker of similar training and ability, following your description, should get the same results. This section should be written as a description of what you did, not as a set of instructions.

3. **Results:** Here is the real meat of a report. In this section you should **describe** the important qualitative and quantitative observations is your work. You are **not yet** drawing conclusions from you data. Data should be tabulated and/or graphed and described. One of the common errors in report writing is to say, "The data are plotted in Fig. 1" without saying something like, "As can be seen in the graph, the rate of germination over 5 days was slow for the first three days after which a sharp rise is noted." Be aware that tables and graphs are not self-explanatory, and must be summarized for the reader. All graphs and tables should be numbered and provided with a title. Any additional information that makes the data more comprehendible should be provided as needed.

4. **Discussion and conclusions:** This section serves two functions. First, it provides a place where the data may be fully discussed and interpreted (you answer all the WHYS and HOWS), and second, it allows the author to delve into the realms of speculation. Here one may address questions like "why did something unexpected happen?" or "what would happen if the HCl solution was of higher concentration" or "why did the expected results not materialize?" In this section the author may (discretely) pat him- or her-self on the back, criticize other workers results, suggest improvements in methodology, etc. You should also find and explain one major source of experimental error. This could be as simple as "why did not set the electronic balance to zero before measuring." To concepts as complicated as differences in the osmotic pressure at room temperature for liquids of varied specific gravity.

5. **References:** Some papers have no references while others have 200 or more.

Required Diagrams

- A diagram of your test tubes and egg white (including solutions) before you began
- A diagram of your test tubes egg white (including solutions) at the conclusion

Be sure you address the following in your lab report:

- Experimental error (human or otherwise)
- Your conclusion for the permeability of dialysis tubing to starch, iodine, glucose and water
- A labeled drawing of the lab apparatus used in this experiment

Lab Report Rubric

Student Name:	Due Date:

This analytic rubric is used to verify specific tasks performed when producing a lab report. If the task has been completed, all points are awarded. If the task is incomplete half points may be awarded. No points are awarded if the task is not complete.

Category	Scoring Criteria	Points	Student Evaluation	Teacher Evaluation
Lab Introduction ***15 points***	The question to be answered during the lab is stated.	5		
	The hypothesis clearly shows it is based on facts.	5		
	Specific predictions of solute diffusion are made. (Write these as procedures on the lab report.)	5		
	A connection is made between the lab and the "real world" (how might data from this lab improve life?)	5		
Methods ***15 points***	Procedures are written during pre-lab preparation and clearly state what is planned. *(not written in past tense.)*	5		
	There are no "understood" procedures. *(Such as: get out equipment or turn on gas.)*	5		
Results ***15 points***	"Results" of a procedure are clearly recorded. *(Some procedures might not have observations)*	5		
	Measurements, when required, show proper units. *(Write these as observations on the lab report.)*	5		
	Calculations, when required, are clearly shown. *(Write these as observations on the lab report.)*	5		
Discussion ***30 points***	Summarize the essential lab data. (come to a conclusion)	10		
	Show how the essential data answers the lab question.	10		
	Identify the one area of the lab most likely responsible for measurable experimental error. *(Think carefully.)*	10		
Presentation ***15 points***	Report is printed in black ink on white paper using 12 point Times New Roman or Aril font double spaced with one inch margins on all sides with no visible corrections (**Warning**: this is not Word's default setting).	5		
	A diagram of the essential apparatus used in the experiment is drawn in the largest available white space on the front of the lab report.	5		
	Report is written in such a way that others could accurately duplicate the experiment.	5		
Lab Participation ***10 points***	No group members were sited for safety or participation violations.	10		
Score	Total Points	100		
Self-evaluation	If the difference between the student evaluation and the teacher evaluation is less than 5 points, 5 points will added to the teacher's score when the grade is recorded.			
Deadline	Reports will be accepted after the beginning of class for 3/4 credit. Papers turned after that time will be mulched for use in the greenhouse and receive ¼ credit.			

Science Oral Presentation Evaluation Rubric

Group Name:	**Final Score:**

This analytic rubric is used to verify specific tasks performed when producing an essay. If the task has been successfully completed, all points are awarded. If the task is incomplete half points may be awarded. No points are awarded if the task is not attempted.

Category	Scoring Criteria	Points	Group Evaluation	Teacher Evaluation
Auditory 15 ***points***	A thesis statement makes the purpose of the presentation clear. *(Thesis statements do not begin, "this is about".)*	**5**		
	Presenters spoke clearly, loudly, and effectively	**10**		
Information ***40 points***	Chapter concepts for the topic are well covered. *DNA, RNA, Genes, Traits, Meiosis, Alleles, Chromosomes*	**10**		
	The project demonstrates the application of the most current scientific information to the student's ideas about the topic. *(Your ideas must be included, not just dictionary definitions.)*	**10**		
	Information in the project is presented in the student's own words, not "cut and pasted" from research sources. *(Any complex terms must be explained)*	**10**		
	Questions 1-6 are fully and completely answered	**10**		
Visual ***25 points***	Presenters maintained eye contact and proper body posture	**10**		
	Visual aides (posters, PowerPoint) are informative and used to increase understanding. (Not just a printout of facts)	**10**		
	Visual Aides are neatly made and easy to read	**5**		
Overall ***35 points***	Presentation contains contributions from all members of the group. (All members must speak)	**10**		
	Presentation is well prepared and organized with all materials present. (no ohh we forgot it at home)	**10**		
	Appropriate responses to audience question	**10**		
	There are no spelling errors or visible corrections. *(Proofreading is required - even with spell check.)*	**5**		
Score	**Total Points**	**115**		
Self-evaluation	Students are expected to honestly evaluate their own work. If the difference between the student evaluation and the teacher evaluation is less than 5 points, 5 points will be added to the final score when the grade is recorded.			
Deadline	All turned-in assignments will be completed by the assigned deadline. Materials submitted the day after the deadline will receive 1/4 credit. Materials turned in after that time will be mulched for use in the greenhouse. The due date for this assignment is: _____			