

Bio 362 (Marine Biology)
Spring 2017
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Exam 1 Study Guide

1. Definitions (be able to define & give an example if appropriate)

Properties of water:

Hydrogen bonds, cohesion, viscosity, pH, rule of constant proportionality, dynamic similarity

Oceanography

Topographical features of seafloor (shelf, abyssal plain, etc.). Hadley cell. Ekman transport, pycnocline, thermocline

Organisms of the epipelagic:

Plankton, nekton, holoplankton/meroplankton, hyperosmotic/hypoosmotic, autotrophic/heterotrophic/mixotrophic, ram feeding/suction feeding, osmoconformer/osmoregulator, lateral line, ampullae of Lorenzini, otolith, echolocation

Productivity/food webs:

compensation point, saturation point, compensation depth, critical depth, accessory pigment, Redfield ratio, photoheterotrophy, DOC, TEP

2. Details to know

- Composition of seawater (identity of major and minor ions)
- General ocean circulation patterns (major ocean gyres and currents)
- Major groups of phytoplankton: know names, whether they are motile or not, accessory pigments, and storage products
- Toxic effects of dinoflagellates
- Major groups of zooplankton, key distinguishing features, modes of feeding: Choanoflagellates, Heterokonts, Ciliates, Hydrozoans, Siphonophores, Cubozoa, Scyphozoa, Ctenophora, Salps, Appendicularia, Copepods, Euphausia, Pteropoda, thecosomates vs. gymnosomates, Chaetognatha
- Copepod anatomy
- Copepod life cycle (Nauplius, Copepodite, Adult, diapause/resting eggs. Number of stages is not necessary)
- Major groups of nekton; know an example of a typical organism in each group and distinguishing trait(s). Osteichthyes, Chondrichthyes, Mammalia, Odontocetes, Mysticetes, Phocidae, Otariidae, Cheloniidae, Sphenisciformes, Procellariiformes, Pelecaniformes, Suliformes, Charadriiformes, Cephalopoda.

3. Equations (be able to explain what each element of the equation means, what it is used for, what the units are, and how changes in different terms would affect the outcome)

- Buoyancy
- Reynolds number
- Rossby number
- Lift and drag

4. Concepts (understand these ideas well enough to apply the concept to a novel situation)

- What are the consequences of hydrogen bonds? Latent heat of vaporization/fusion, heat capacity, freezing point depression/boiling point elevation
- Density of seawater, factors affecting it
- Laminar vs. turbulent flow. Effects on transport, particle encounter rate, swimming, feeding
- Plate tectonics: difference between spreading regions (oceanic ridges), subduction zones, trenches, transform faults
- General pattern of atmospheric circulation (circulation cells. Where are low and high pressure zones? Prevailing winds at latitude)
- Coriolis effect. Where does it produce upwelling? Downwelling?
- Deepwater formation, thermohaline circulation. Why does deepwater form where it does?
- Stokes law: ways to reduce sinking rate at low Re
- Photosynthesis: pattern with depth, critical depth theory
- Relative loss of different light wavelengths with depth (exact depths not necessary, just general pattern)
- Phosphorus cycle. Where does P come from, what causes it to be locally abundant?
- Nitrogen cycle. Major pathways and forms of N. How does it enter marine ecosystems, what causes it to be locally abundant?
- Forms of N used by phytoplankton, relative abundance vs. depth in mixed layer
- HNLC zones, iron limitation, iron fertilization hypothesis
- Vertical mixing and critical depth theory. Seasonal and regional variation in critical depth, phytoplankton bloom, and zooplankton bloom.
- Major hypotheses for the timing of the spring bloom: Sverdrup's critical depth theory, dilution/recoupling, stratification onset
- Diurnal vertical migration. Explanations & evidence for each
- Primary production: what factors limit it with depth, and in different regions/latitudes of the ocean
- Nekton adaptations. Buoyancy, lift, pressure drag, swimming, visibility, feeding, salt balance, vision, olfaction, reproduction
- Microbial loop, key elements in the planktonic food chain

Sections in the book not to worry about:

In general, you will not be tested on material in the “going deeper” and “hot topics” boxes.

Ch 2: Material on El Niño and North Atlantic Oscillation (pp. 24-26)

Ch 2: The Greenhouse Effect and Changing Climate (pp. 29-32)

Ch 4: Light (pp. 87-89)

Ch 4: "Oxygen" (pp 83-87)

Ch 8: "Deeper adaptations of mesopelagic and bathypelagic fishes" (pp (175-177)

Ch 9: "Phytoplankton succession..." (pp 216-219)

Ch 10: "Satellite color scanning and productivity models" (pp 231-233)

Things you should know that were not in lecture but are in the book:

Ch 10: Measuring primary productivity