**Exam 1 Study Guide:** Marine Biology

Through coral reefs

- *Read the chapters in the book*
- *Read your notes (my exams draw heavily from notes)*
- *Don’t stress, and don’t cram (it doesn’t work very well)*

This might seem like an overwhelming amount of information, but it’s just a detailed list. Many things are repeated in various ways. Answer these questions/know the concepts and you should be fine!

**History and exploration of the ocean:**
- What were the driving forces behind early exploration? (eg. very early, historical and modern exploration– navigation vrs. Scientific discovery vrs. Resources (fish etc.) vrs. Conquering etc.
- What were some trends in ocean technology (early to present) eg. what did people use in the early days and what is available today?
- *Scientific method:* be able to describe the scientific method, and what it means to be a critical thinker. Science is evidence based, and relies on repeatability. There are observations, data gathering, analyses, and conclusions – all well documented (this is covered well in your book)

**Geography and Geology:**
- What are the major oceans, and their locations
- Plate tectonics: know the process
- Know about subduction and spreading zones. Know about mid ocean ridges (rises) and what forms them (seafloor spreading). Know what causes subduction (heavy oceanic and lighter continental plates collide)
- Where are trenches found (in subduction zones)
- What happens to plate material after it subducts or as it comes out of spreading zones? (It either heats up and comes up through volcanoes, or it comes up as mountains etc. or comes out of spreading zones as new material on the ocean floor)
- Why are oceanic plates ‘younger’ than continental ones?
- Classification of general ocean habitats: continental shelf, continental slope, continental rise and abyssal plain.
- Active vrs. Passive margins (eg. East coast vrs. West coast)
- Pelagic realm (offshore), coastal (nearshore) intertidal realm (between the tides)
- Photic zone (zone with sunlight)

**Physical and chemical oceanography:**
- Know what makes water special: heat capacity, polarity of the molecules, solid state (ice) less dense etc.
- Know about the density of different states of water (eg, that it gets denser as it gets colder but floats as ice).
- Know about salinity: causes, distribution in the ocean, and that salty water is dense and heavy
- Know what a thermocline is
- Know about gases dissolving in water (eg that they dissolve better in cold water)
- Know what diffusion is
- Know what osmosis is
- Know the behavior of oxygen (amount dissolved) as you go deeper
- Know what causes the oxygen minimum layer (organisms using the oxygen up there)
- Know about temperature/density relationships (eg salty cold water sinks)
- Where does deep ocean circulation originate (Poles, especially North Atlantic)?
- What causes it? (cold dense water – salty too makes it dense)
- Sound: know the properties of sound in water and potential effects on animals
- Know what causes waves
• Know what causes waves to break (‘feeling bottom’ or a force pushing the top over such as strong wind, or too steep)
• Know the major surface currents of the ocean (and that they flow in clockwise or counterclockwise motion in N and S hemisphere due to the coriolis effect)
• Know what eastern and western boundary currents are, where they are found, and major differences between the two. KNOW THIS!
• Know the name of the major current along our coast!
• Know where in the oceans productivity is highest (high primary productivity) and where the productivity is low
• Know what a gyre is and what characterizes them
• Know what happens to light and sound in water compared to air
• Know what happens to color in water
• Know what happens to pressure as you go deeper, and how that affects some organisms
• Be able to describe El Nino, what causes it, and what some of the major effects are.

Biology/Ecology:
• Be able to describe abiotic (non living such as temperature, waves etc.) and biotic factors living, such as competition, predation etc.) that affect marine communities
• Be able to explain reproduction (sexual and asexual), and list pros and cons of each
• Understand osmoregulation, osmoconformer, osmoregulator (regulating saltiness) and thermoregulation (regulating temperature). Know what isosmotic, hyperosmotic and hypoosmotic are.
• Know endothermy, ectothermy and counter current heat exchangers
• Know what a counter current heat exchanger is and how some ectotherms (‘cold blooded’ organisms such as large fish) use them
• Know what benthic, sessile, infauna, epifauna, pelagic, and planktonic mean
• Know what autotrophs and heterotrophs are
• Know what a primary producer (autotroph), a primary consumer, secondary consumer and tertiary consumer are (see book for clarification)
• Know what happens to energy as we move up trophic levels (~90% is lost at each level, leaving little for top predators). What management implications does this have?
• Know what photosynthesis is, and what it produces
• Know what a hermaphrodite is
• Know what broadcast spawning is, and other reproductive strategies (nesting/brooding, internal fertilization and live young etc.)
• Know the main differences between prokaryotic (smaller and simpler such as bacteria) and Eukaryotic (larger and more complex, capable of meiosis – sexual reproduction) cells
• What is biomagnification
• Niche, fundamental niche and realized niche

Habitats: open ocean and deep sea

Habitats:
Terms, concepts, and definitions(explanations):
• trophic pyramids
• primary productivity : what is it and where is it highest and lowest. What are the two primary sources of primary productivity (in shallow and deep waters)
• detritus based food web (eg. in the deep sea)
• Patchy distribution of resources
• zooanthellae
• Benthic
• Epifauna (lives ON the bottom, or on other organisms)
• Infauna (lives IN the bottom, in the mud etc.)
• Deposit feeders (eat detritus)
• Coral Bleaching
• What is a wetland?
• Food webs in the deep sea (they are detritus based)
• Abiotic and biotic factors affecting communities
• Fringing, barrier and atoll reefs
• Coral competition: they compete for sunlight due to their zooxanthellae
• Coral feeding and reproduction. Feed at night (10% of their energy) and use products of photosynthesis during the day (most of their energy needs!)
• Mangrove community: role of mangroves in building islands and filtering sediment. Important for coral reefs
• Coral reef community: be able to list characteristics of this ecosystem and threats to it. Keep in mind the role of mangroves, and the characteristics of their habitats (warm, low sediments etc.)
• Narrow tolerance ranges for coral animals

For the following, be able to list specific characteristics, ‘roles’ they play (e.g., trapping sediment, nursery etc.), some organisms or types of organisms found in each, and be able to compare and contrast them. For each, be able to discuss threats and conservation issues

• Deep sea community characteristics: keep in mind the lack of light, and the source of most food (detritus from above). We talked about cold seeps and hydrothermal vents. We also talked a bit about manganese nodules
• Resource extraction from the deep sea: oil, gas, manganese…
• What are sources of primary productivity in the deep sea (hydrothermal vents, chemosynthesis, cold seeps etc.).
• Open ocean habitats: major characteristics and descriptions
• Kelp forest ecosystem: keep in mind the role of urchins and sea otters. Also, some conservation implications and problems
• Estuaries/soft bottom community: keep in mind the role of burrowers (they oxygenate), and the three communities of organisms (marine, fresh and brackish) and the salt water wedge
• Intertidal community: keep in mind the causes of zonation, and organisms characteristic of each zone (including algae). Fundamental v.s. realized niches like mussels and sea stars
• Coral reef community: keep in mind the role of mangroves, and the characteristics of their habitats (warm, low sediments etc.). Also, the important role of zooxanthellae, and problems coral reefs face today
• Mangrove communities

Be able to describe intertidal zonation in Monterey Bay area intertidal communities (4 zones)
Be able to describe vertical zonation in a kelp forest, and what kinds of algae you would likely find in each
Be able to characterize the effects of sea otters and kelp harvesting on kelp forest communities
Be able to list and describe environmental concerns for each of the habitats we covered