- 2 things that control the density of seawater: temp & salinity
- major salt in seawater: NaCL
- Ocean currents moving from S to N curve LEFT in the northern hemisphere because coriolis effect
- Water in the deep sea is cold & salty
- seawater contains approx 35 g/L of dissolved salt
- C:N:P in phytoplankton biomass = 106:16:1 (redfield ratio)
- humans can stimulate phytoplankton growth in certain areas of open ocean to sequester carbon dioxide from the atmosphere by manipulating availability of which nutrient? Iron
- daily variation in pH of seawater is controlled by photosynthesis & cellular respiration
- Scyphozoa & Hydrozoa are found in Cnidaria
- Earliest & simplese invertebrate = sponge
- name 3/7 classes of mollusks (bivalvia, cephalopoda, gastropoda)
- Asteroidae, Ophiuroidea, and Holothuroidea are classes in the phylum **echinodermata**
    - give common names: starfishes, brittle stars, sea cucumbers
- Members of phylum Urochordata all feed by: FILTER FEEDING
- Name 3 invertebrate phyla that have bilateral symmetry: ARTHROPODA, MOLLUSCA, ECHINODERMATA
- Difference between meroplankton & holoplankton (mero spend part of their lives in plankton, holo spend whole lives as plankton)
- Lecithotrophic vs Planktotrophic:
    - dispersal (P high, L low)
    - number of eggs (P high, L low)
    - larval mortality (P high, L low)
    - adult investment per egg (P low, L high)
    - feeding mode (P feed, L don't feed)
    - location where favored (P shallow tropical, L deep polar)
- efficient coupling in tropical waters (phytoplankton/zooplankton)
    - inefficient coupling in polar waters
        - nutrients are constantly available in tropical- less seasonal variation
        - polar- all nutrients available in one short bloom but not really steadily available for rest of year
- vertical migration IS a behavior exhibited by many zooplankton- it may help them (predator avoidance, sun damage avoidance, etc)
- describe 3 ways food from the ocean's epipelagic zone reaches the ocean's bathypelagic zone
    - ocean snow
    - dead animals sinking
    - vertical migration- predators move up into photic zone to capture prey & then return to deep
- the extent of the oxygen minimum zone tends to be greatest at approximately 200 m
- atlantic IS NOT the largest ocean

  all of the oceans DO NOT connect in the southern hemisphere
- the density of seawater IS greatest at 0 deg celsius
- water DOES mix between ocean basins on a time scale of 1000 years
- phytoplankton depend on solar energy to fix carbon
- 2 environmental factors that together lead to high primary productivity in the oceans:
    - available light
    - available chlorophyll/nutrients

- the following compounds can serve as antenna pigments for phytoplankton: carotenoids
- how are the timing and intensity of the annual cycle of primary production in temperate versus polar oceans different
    - tropical- little seasonal variation
    - temperate- 1 large spring bloom, 1 smaller fall bloom
    - polar- 1 HUGE bloom in the spring/summer
- radiolaria have skeletons composed of silicate
- radiolaria and foraminifera feed by trapping particles
- centric diatoms differ from pennate diatoms because centric diatoms primarily live attached to surfaces FALSE- (centric have radial symmetry, pennate have bilateral, also pennate are freshwater and centric are marine)
- longer wavelengths of light penetrate to greater depths in the water column FALSE
- 2 characteristics that distinguish diatoms from dinoflagellates
    - dinoflagellates have tail-like appendage for movement
    - diatoms are coated in silica
- are phytoplankton-measuring satellite devices likely to over or **UNDER**estimate standing crop & why? -cannot always sense plankton that is deeper in the ocean
- Net PP = gross PP - cellular respiration
- the critical depth theory was developed to explain: ??
    - open ocean surface waters have high nutrient concentrations FALSE
    - polar seas typically have 2 large productivity blooms/year FALSE
    - tropical seas have shallow compensation depths FALSE
    - upwelling zones are regions of low primary productivity FALSE
    - marine productivity is high in oligotrophic regions FALSE
    - the critical depth model depends on nutrient concentrations FALSE
- seabirds conserve energy while flying by soaring
- penguins are members of the order: spheniscifórmes
- among the nekton fish have developed unique sensory organs called lateral lines that are used to sense movement in water
- other nekton use "ampullae of lorenzini" to detect what? electrical activity in the water
- how do sea snakes stay hydrated? drinking freshwater
- what are the major pinniped groups (seals and walruses and sea lions)
- 2 external morphological characteristics that distinguish between pinniped groups (external ears, neck length, rear flipper movement)
- 2 physiological adaptations used by marine mammals in swimming and diving to prolong their bottom time while diving (feet are modified flippers, bradycardia, increased # of red blood cells, more hemoglobin per cell)