PHMS 210 Intro to Marine Science **Midterm exam 2 (take-home)**
Due beginning of class, Monday April 11

Answer all questions in complete sentences. Questions that ask you to "explain" should be answered with a well reasoned, concise paragraph. You may use whatever resources you like. Your textbook and lecture notes would be a good places to start. If you wandering around the internet, make sure that what you are reading there makes sense to you. Much of what is on the internet probably doesn't even make sense to the person who wrote it.

1) Explain why ocean currents do not move in the same direction of the wind.

2) Explain why it is necessary for the ocean currents and winds to transport heat from the tropics to the poles.

3) (a) When two waves meet, they interfere. Under what conditions will two waves constructively interfere?

   (b) Will the crest of the resulting wave be larger or smaller that either of the two initial waves?

4) Global maps of upwelling appear in figure 9.13 of your book for January and July. Global maps of chlorophyll concentration as measured by a satellite appear in figure 15.9 of your book.

   (a) Off the coasts of Somalia and the Arabian Peninsula (15 degrees north latitude, 50 degrees longitude) the vertical motion from Ekman transports in the upper ocean changes from 40-50 cm/day downwelling in January to 40-50 cm/day upwelling in July. What direction does the wind blow in July to generate such strong upwelling along this coast?

   (b) Chlorophyll is the primary chemical in algae used for photosynthesis. Is the chlorophyll concentration generally high or low where the upwelling is high?

   (c) If chlorophyll concentration is high, would you assume that the level of biological activity is generally high as well? Explain your answer.

   (d) Where is the Sargasso Sea? Is the upwelling positive or negative there? Are chlorophyll concentrations high or low there?

   (e) The Sargasso Sea gets its name from a specific type of seaweed that collects there (sargassum). Based on what you know about the Ekman transports in this region, explain why seaweed might accumulate in the middle of the Sargasso Sea.

5) (a) Which is likely to absorb more solar energy, a glacier or brown soil? Explain why.

   (b) A likely consequence of global warming is the melting of glaciers covering Greenland. Based on your answer to (a) what do you think may happen to the climate of Greenland if the ground underneath the glacier is exposed?

(c) Explain the process that leads to the sinking of surface water in the Labrador Sea and the Norwegian Sea, thus forming the North Atlantic Deep Water.

(d) The glacier atop Greenland is composed of fresh water, meaning it has very little salt. Were the glacier to melt and empty into the Labrador and Norwegian Seas would the surface water be more likely or less likely to sink? Explain why.

(e) The deep water that sinks around Antarctica (the Antarctic Bottom Water) is saltier than the water that remains at the surface around Antarctica. Explain how the excess salt gets into the Antarctic Bottom Water.