

Department of biology

Examination paper for BI3061 Biological oceanography

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Informasjon om trykking av eksamensoppgave

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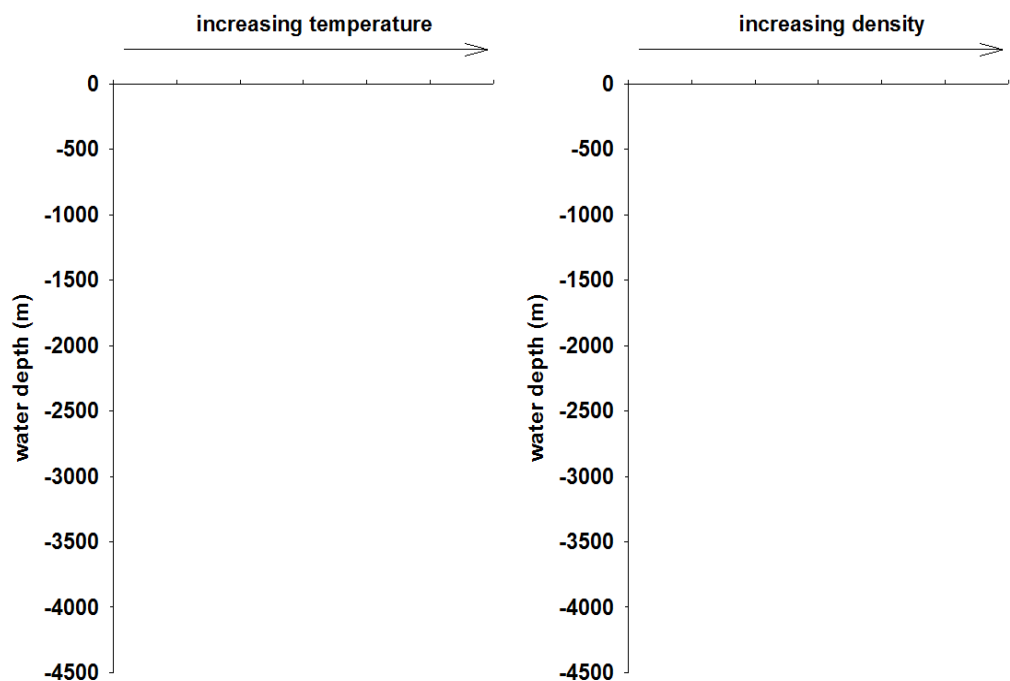
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QUESTIONS

Question 1: Ocean characteristics

- Density of seawater is temperature dependent. How does density change when seawater is heated up from 0°C to 10°C?
- The figure below shows a vertical profile of the ocean. Please draw the *thermocline* and the *pycnocline* of a typical mid-latitude summer situation to the respective graphs.
- T-S diagrams are widely used in oceanography. What is a T-S diagram and how can water masses be distinguished using a T-S-diagram?
- North Atlantic Deep Water (NADW) is important for the climate in Northern Europe. Describe the process of NADW formation in the Arctic ocean.
- How does the NADW affect the climate in Northern Europe?



Question 2: Phytoplankton, remote sensing and pigments

- Marine microalgae can be divided into four groups related to (1) water column, (2) sea-floor, (3) sea-ice and (4) marine invertebrates. Name these groups. Describe the typical ecological function of each of these 4 groups?
- The diversity of light harvesting pigments differs tremendously in the plant kingdom. Why do microalgae obtain a high diversity in light harvesting pigments compared to terrestrial plants?
- Phytoplankton can be investigated by remote sensing using satellites. Why can it be difficult to detect different pigment groups of phytoplankton in the world ocean.

Question 3: Ocean geography

- A. How are marginal seas defined? Provide five examples of marginal seas.
- B. Name the 5 different divisions of the pelagial and the corresponding water depth ranges starting with the uppermost division in the photic zones down to the deep sea.
- C. Fjords are not only found in Norway. How are fjords defined and where on the globe can they be found?

Question 4: Ocean characteristics

- A. Describe the principle of the Ekman spiral and how it affects uppermost and deeper water layers.
- B. Upwelling systems are important areas in the world's ocean. Describe the physical process of upwelling. Where do we find upwelling regions and why are these regions so important for fisheries?

Question 5: Oceans' biological carbon pump

- A. Define the three phases of the oceans' biological carbon pump and describe major processes which characterize each phase.
- B. Which components of the plankton are part of the microbial loop?
- C. Describe the role of dissolved organic carbon (DOC) within the microbial loop and mention the three most important processes in the plankton where DOC is released.

Question 6: Deep sea sediments and biogeochemical cycles

- A. An important biogenous sediment type in the deep sea is the so-called ooze. Provide a definition for the term 'ooze' and mention the two most important ooze forms and their origin.
- B. Only a small proportion of particulate organic carbon (POC) reaches the deep seafloor. What happens to POC when it reaches the sea floor?