國立臺灣海洋大學一〇二學年度研究所碩士班暨碩士在職專班招生考試試題

考試科目： 英文閱讀

系所名稱： 海洋環境化學與生態研究所碩士班不分組

＊可使用紙本英漢字典

1.答案以橫式由左至右書寫。2.請依題號順序作答。

請以中文翻譯並詳述以下各段英文之內容 (不需逐字翻譯，但求語意完整)。

(A) Rising atmospheric carbon dioxide (CO_2), primarily from human fossil fuel burning, reduces ocean pH and causes extensive shifts in seawater carbonate chemistry. The process of ocean acidification is well documented in field data, and the rate will accelerate over this century. Acidification alters seawater chemical speciation and biogeochemical cycles (生地化循環) of many elements and compounds. One well-known effect is the lowering of calcium carbonate saturation states, which impacts shell-forming marine organisms from plankton (浮游生物) to benthic mollusks (底棲貝類), echinoderms (棘皮動物), and corals (珊瑚). Many calcifying species exhibit reduced calcification and growth rates in laboratory experiments under high-CO_2 conditions. Ocean acidification also causes an increase in carbon fixation rates in some photosynthetic organisms (both calcifying and noncalcifying).The potential for marine organisms to adapt to increasing CO_2 and broader implications for ocean ecosystems are not well known; both are high priorities for future research...(節錄自 Doney et al. (2012). Annu. Rev. Mar. Sci. vol.4:11) (30%)

(B) One of the largest effects of climate change on marine ecosystems will be changes in the rate and distribution of primary production, because primary production plays a fundamental role in structuring marine food webs. Climate change has already been observed to strongly influence the distribution and abundance of ocean primary production and these changes have been linked to changes in higher trophic level organisms. Furthermore, primary producers, particularly phytoplankton (浮游植物), are likely to show the most rapid response to climate change due to their small size and fast population turnover. Effects of primary production change on marine ecosystems will have important implications for conservation of marine
biodiversity and sustainable fisheries management...(節錄自 Brown et al. (2010). Glob. Change Biol. vol.16:1194) (20%)

(C) Marine microbes (微生物) are present at billions of cells per litre in seawater. They double every few days and are consumed at about the same rate by viral parasites and protistan (原生生物) predators. These activities capture and process energy and drive major elemental cycles. Hidden within these dynamic assemblages and diverse genomic structures are fundamental but, at present, incomplete lessons about

environmental sensing, response and adaptation, gene regulation, species and community interactions and genomic plasticity and evolution. The genomic diversity, evolutionary dynamics and ecological processes contained in these populations have global effects on the rates and flux of energy and matter in the sea, biogeochemical cycling, the Earth's atmospheric composition and global climate trends. Over the 3.8 billion years of life on Earth, microbes have been the factors of geochemical balance and as biotic recorders of evolutionary history their 'biological memories' extend backwards further than other life forms. Additionally, they are excellent Nature's biosensors, but we still need to decode their code to interpret their outputs and understand the underlying strategies and mechanisms of their survival in nature. The current convergence of microbiology, ecology, genomics (基因體學) and ocean science has the potential to be focused in unique ways through the lens of microbial oceanography. By working together, molecular biologists, microbiologists and oceanographers have new opportunities to advance observation, method and theory, which together will better describe the living ocean system…(節錄自Delong & Karl. (2005). Nature vol.437:336) (30%)

(D) The first phage (bacterial virus) isolated from the marine environment was reported more than 50 years ago, but not until the abundance of viruses was recognized in the late 1980s did scientists began to consider their ecological impacts in the oceans. It is now well accepted that viruses are abundant and ecologically important components of the marine environment. There are an average of 10^7 virus-like particles per milliliter of surface seawater. This makes viruses approximately an order of magnitude more abundant than prokaryotes (原核生物), which are the second most abundant biological group. With total estimated numbers of ~10^{30} in the oceans, viruses are by far the most abundant predators in the marine environment. Despite their small size (~100 nm), viruses compose the ocean's second largest biomass, exceeded only by the total biomass of prokaryotes. Viral abundance is generally highest in the euphotic zone (有光層) and then decreases exponentially with depth. Typically, viral abundance is higher in coastal environments than in offshore waters. Seasonal variations in viral abundance, the virus-to-bacteria ratio, and the degree of lysogeny (潛溶生活階段, 除了簡單裂解宿主細胞外，virus另一種的生活方式) have also been observed, demonstrating the dynamic nature of marine viral communities…(節錄自Breitbart (2012). Annu. Rev. Mar. Sci. vol.4:5) (20%)