以下の1〜5の問に答えよ。
解答は裏面の使用も可とする。

1. 細胞間シグナル伝達の代表的な4つの型を答えよ。
2. 局所仲介物質として作用するタンパク質を1つ挙げ、その生産部位と働きを答えよ。
3. シグナル分子として作用するホルモンを1つ挙げ、その生産部位と働きを答えよ。
4. 細胞表面にある受容体タンパク質の種類を3つ挙げ、それぞれの役割を述べよ。
5. 毛周期の制御についてそれに関わる分子を挙げて説明せよ。

試　験　日 Date of the exam	課　程 Program	科　目 Examination subjects	受験番号 Application No								氏　名 APPLICANT NAME
☑ 2021年9月11日 ☐ 2021年10月2日 11th September, 2021	博士後期課程 Doctoral Program	英語 English									

1. 以下の英文を和訳せよ。

2. FGF5のFGFドメインの部分欠失はマウスにおいて、どのような表現型を示すと予想されるか。英文で示しなさい。この時、推測した理由も述べること。解答は裏面を使用する。

水産増殖学

2022 The Graduate School Entrance Examination　（General exam, April admission　1st term)

試　験　日 Date of the exam	課　程 Program	科　目 Examination subjects	受験番号 Application No	氏　名 APPLICANT NAME
☑ 2021年9月11日 ☐ 2021年10月2日	博士後期課程 Doctoral Program	水産増殖学 Fisheries Ecology		

問1. 栽培漁業（種苗生産と放流）は代表的な水産増殖のひとつであるが、有効な増殖手段となっていない事例が多い。その場合に考えられる問題点を論じなさい。

問2. 気候変動がオホーツク海南部（亜寒帯域）の水産増殖に及ぼす影響を論じなさい。

＊どの問に対する回答であるかを明記すること。裏面に回答を記しても構わないが、おもて面に「裏へ続く」等と明記すること。

2022 The Graduate School Entrance Examination (General exam, April admission　1st term)

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以下の英文を和訳しなさい。

（1）Invertebrates inhabiting marine and freshwater ecosystems make important contributions to global biodiversity and provide significant services that have cascading effects across ecosystems. However, this group is grossly under-represented in assessments of conservation status and often neglected in targeted aquatic conservation efforts. Of the invertebrate groups that could be assessed, those with poor dispersal abilities and high local endemism, such as many gastropods, crayfish and mussels, are the most threatened. Springs and subterranean hydrological systems support the highest proportions of threatened freshwater species, while in marine environments coral reefs, lagoons and anchialine systems are particularly vulnerable. Key agents of biodiversity decline in aquatic ecosystems are water pollution, overexploitation and harvesting, habitat degradation and destruction, alien invasive species, and climate change. Effects of dams and water management along with pollution from urban, agricultural and forestry sources are the main threats in freshwater ecosystems, whereas a broad range of factors have impacts on marine invertebrates, including biological resource use.

出典: Collier et al. (2016) Conservation of aquatic invertebrates: concerns, challenges and conundrums. Aquatic Conservation: Marine and Freshwater Ecosystems 26, 817 - 8371.

（2）Population endangerment typically arises from multiple, potentially interacting anthropogenic stressors. Extensive research has investigated the consequences of multiple stressors on organisms, frequently focusing on individual life stages. Less is known about population-level consequences of exposure to multiple stressors, especially when exposure varies through life. We provide the first theoretical basis for identifying species at risk of magnified effects from multiple stressors across life history. By applying a population modeling framework, we reveal conditions under which population responses from stressors applied to distinct life stages are either magnified (synergistic) or mitigated. We find that magnification or mitigation critically depends on the shape of density dependence, but not the life stage in which it occurs. Stressors are always magnified when density dependence is linear or concave, and magnified or mitigated when it is convex. Using Bayesian numerical methods, we estimated the shape of density dependence for eight species across diverse taxa, finding support for all three shapes.

出典: Hodgson et al. (2017) Density dependence governs when population responses to multiple stressors are magnified or mitigated. Ecology 98, 267 -2683