【問題用紙】

令和８年度　愛媛大学大学院農学研究科入学者選抜学力検査

（生物環境学専攻　環境保全学コース）

外国語

問１～３に答えよ。解答は解答用紙に記入すること。

問１．次の英文（1）～（20）の下線部について、選択肢 A～D の内で最も適切と思われるものを選んで記せ。

（1）　Environmental risk is commonly defined as the probability of adverse effects resulting from exposure to a _____ in the environment.

A. benefit　　B. resource　　C. substance　　D. habitat

（2）　Risk assessment generally consists of hazard identification, dose–response assessment, exposure assessment, and risk _____.

A. characterization　　B. communication　　C. perception　　D. mitigation

（3）　PFAS are often referred to as “forever chemicals” because of their extreme _____ in the environment.

A. volatility　　B. persistence　　C. solubility　　D. reactivity

（4）　Bioaccumulation refers to the process by which chemicals _____ in organisms over time.

A. degrade　　B. accumulate　　C. disperse　　D. evaporate

（5）　In ecological risk assessment, the ratio of PEC to PNEC is used to estimate potential _____.

A. exposure　　B. toxicity　　C. hazard　　D. risk

（6）　Recycling reduces waste and helps conserve natural _____.

A. resources　　B. environments　　C. disasters　　D. habits

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（7） Persistent organic pollutants are characterized by toxicity, persistence, and long-range _____.

A. diffusion　B. transport　C. exposure　D. accumulation

（8） Mixture toxicity occurs when multiple chemicals interact to produce effects that differ from those predicted by _____ toxicity.

A. acute　B. chronic　C. individual　D. environmental

（9） Chronic exposure refers to long-term exposure to relatively _____ concentrations of a substance.

A. variable　B. increasing　C. high　D. low

（10） The concept of “no observed effect concentration” is commonly abbreviated as _____.

A. LOAEL　B. EC50　C. NOEC　D. PNEC

（11） Endocrine-disrupting chemicals (EDCs) interfere with the normal functioning of the _____ system in fish.

A. nervous　B. immune　C. endocrine　D. digestive

（12） Estrogen receptors (ERs) are nuclear receptors that regulate gene expression upon binding to _____.

A. cholesterol　B. cortisol　C. estradiol　D. thyroxine

（13） Exposure to anti-androgenic chemicals may result in reduced expression of _____-dependent genes in male fish.

A. estrogen　B. thyroid　C. androgen　D. glucocorticoid

（14） “Rome wasn’t built in a day” emphasizes that meaningful achievements require time and _____.

A. urgency　B. patience　C. authority　D. opportunity

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（15）　“Actions speak louder than words” indicates that behavior is a more reliable indicator than verbal _____.

A. promises　　B. skills　　C. intentions　　D. arguments

（16）　“Where there’s smoke, there’s fire” implies that persistent rumors often indicate an underlying _____.

A. coincidence　　B. misunderstanding　　C. truth　　D. exaggeration

（17）　The concept of sustainable development aims to balance economic growth with environmental _____ and social equity.

A. protection　　B. exploitation　　C. extraction　　D. expansion

（18）　Technological progress often brings convenience, but it may also create new forms of social _____.

A. stability　　B. inequality　　C. cooperation　　D. mobility

（19）　Scientific knowledge is always subject to revision as new evidence _____.

A. disappears　　B. accumulates　　C. contradicts　　D. stabilizes

（20）　Many environmental problems are caused by human _____ rather than natural processes alone.

A. activities　　B. benefits　　C. resources　　D. limits

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問２．次の英文を読んで、後の（１）および（２）の問いに日本語で答えよ。

Besides serving as sources of food, insects provide humans with a variety of other valuable products. Honey and silk are the most commonly known insect products. Bees deliver about 1.2 million tonnes of commercial honey per year, while silkworms produce more than 90,000 tonnes of silk. Carmine, a red dye produced by scale insects[*1] (order Hemiptera[*2]), is used to color foods, textiles[*3] and pharmaceuticals[*4]. Resilin in fleas[*5], a rubber-like protein that enables insects to jump, has been used in medicine to repair arteries[*6] because of its elastic properties. Other medical applications include maggot[*7] therapy and the use of bee products – such as honey, propolis, royal jelly and venom[*8] – in treating traumatic and infected wounds and burns.

Insects have also inspired technology and engineering methods. The silk proteins of arthropods (e.g. spiders) are strong and elastic and have been used as biomaterials. The unique structure of silk, its biocompatibility[*9] with living systems, its function as a tool for new materials engineering and its thermal stability are only a few of the features that make it a promising material for many clinical functions. For example, researchers inserted a spider's dragline silk[*10] gene into goat DNA in such a way that the goats would make the silk protein in their milk. This "silk milk" could then be used to manufacture a weblike material. Chitosan, a material derived from chitin that makes up the exoskeleton of insects, has also been considered as a potential intelligent and biodegradable[*11] biobased polymer for food packaging. Such natural packaging using the "skin" of insects can acclimatize[*12] the internal environment, protecting the product from food spoilers and micro-organisms. In particular, chitosan can store antioxidants and exhibits antimicrobial

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activity against bacteria, molds and yeasts. However, the chitosan polymer is sensitive to moisture and could therefore be impractical in its 100 percent natural form. Termite[*13] hills and their complicated network of tunnels and ventilation systems serve as useful models for constructing buildings in which air quality, temperature and humidity can be regulated efficiently. Drawing on nature – or rather imitating it – to solve human problems is called a) biomimicry.

出典　FAO 編 “Edible Insects”(2013) より抜粋、一部改変。

[*1] scale insects: カイガラムシ、[*2] Hemiptera: 半翅目、[*3] textiles: 布・繊維製品、
[*4] pharmaceuticals: 医薬品、[*5] fleas: ノミ、[*6] arteries: 動脈、[*7] maggot: ウジ虫、
[*8] venom: 毒、[*9] biocompatibility: 生体適合性、[*10] dragline silk: クモ糸（の一種）、
[*11] biodegradable: 生分解性の、[*12] acclimatize: 順応させる、[*13] termite: シロアリ

（１）本文中に記載されている内容で、人間が昆虫由来の素材を利用している例を６つ挙げよ。

（２）下線部 a の”biomimicry”とは何かを説明せよ。また、本文中に挙げられている”biomimicry”の例を３つ挙げよ。

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問３．次の英文を読んで、後の問いに答えよ。

A new subpopulation of polar bears (*Ursus maritimus*) was recently discovered in the South-East of Greenland. This isolated colony inhabits a warmer climate zone, akin to[*1] the predicted future environments of polar bears with vastly[*2] reduced sea ice habitats, rendering[*3] this population of bears particularly important. Over two-thirds of polar bears will be extinct[*4] by 2050 with total extinction predicted by the end of this century, therefore understanding possible mechanisms of adaptation via genomic analyses and preservation are critical. ①Transposable elements (TEs) [*5] are mobile elements that may play a role in an adaptive response to environmental challenges. We analysed transcriptome[*6] data from polar bear sub-populations in cooler North-East (NEG) and warmer South-East Greenland (SEG) to compare TE activity between the two populations and its correlation with temperature and associated changes in gene expression (Fig.).

We identified activity hotspots in the genome of regions with significantly differentially expressed TEs. Long Interspersed Nuclear Element (LINE) family TEs were the most abundant, and most differentially expressed and divergent in the SEG population compared to reference TEs. We report a significant shift in TE activity and age, with younger more abundant TEs in the SEG populations. Differentially expressed genes in SEG populations were linked to *Foxo* signalling, ageing and metabolic pathways. ②Our results provide insights into how a genomic response at the TE level may allow the SEG subpopulations to adapt and survive to climate change and provides a useful resource for conservation in polar bears.

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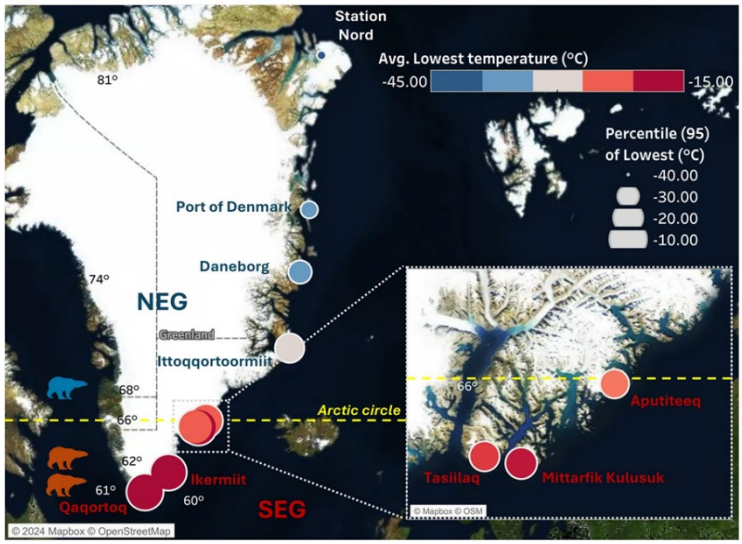

Fig. Meteorological[*7] observation data of temperature from the Danish Meteorological Institute. Colour of points indicates the average lowest observed temperature, with the size of point showing the variance[*8] at the 95th percentile. SEG locations included: Aputiteeq, Tasiilaq, Mittarfik, Kulusuk, Ikermit and Qaqortoq. NEG locations included: Ittoqqortoormiit, Daneborg, Port of Denmark and Station Nord. In this study north of 64° was considered NEG. The bear icons are indicative of the latitude where they were sampled, red meaning SEG and blue NEG. The Arctic circle is denoted by a dashed yellow line at 66° .

出典：Alice M Godden et al., (2025) Diverging transposon activity among polar bear sub-populations inhabiting different climate zones. Mobile DNA, 16(1):47. 一部改変

[*1] akin to: 似ている・近い、[*2] vastly: 非常に、[*3] rendering: ～と判断される、[*4] extinct: 絶滅した、[*5] Transposable elements (TEs): 転移因子、[*6] transcriptome: トランスクリプトーム（特定の細胞や組織において、ある特定の時点に存在するすべての mRNA の総体を指す）、[*7] Meteorological: 気象の、[*8] variance: 分散

（１）　下線①の英文について和訳せよ。

（２）　SEG 集団では年齢と TE 活性にどのような変化が見られたのか答えなさい。また、SEG 集団で発現差を示した遺伝子が関わる遺伝情報はどのようなものだったか、3 つ答えなさい。解答は日本語で答えること。

（３）　Fig.の中の色の付いた丸は何を示しているか、日本語で答えよ。

（４）　下線②の英文について和訳せよ。