

令和4年度

東北大学大学院工学研究科

応用化学専攻・化学工学専攻・バイオ工学専攻

東北大学大学院環境科学研究科

先端環境創成学専攻（化学・バイオ群）

[博士課程前期2年の課程]

一般選抜試験

[英語]

I 注意事項

1. 試験時間は10:00～11:20である。
2. 配布された問題冊子、解答用紙および草案紙は、試験終了後すべて提出すること。

II 解答上の注意

1. 指定された解答用紙（「英語 解答用紙」1枚目および2枚目）の解答欄に解答を記述すること。
2. 解答用紙の裏面は使用しないこと。
3. 2枚の解答用紙の「受験記号番号」記入欄のそれぞれに受験記号番号を記入すること。
解答用紙に名前を記入してはならない。

英語

【問 1】 Translate the following terms into Japanese or English terms. Pay close attention to spelling. Do not use abbreviations or symbols.

- (a) 分子間力
- (b) covalent bond
- (c) steric hindrance
- (d) zeta potential
- (e) reverse micelle
- (f) 定性分析
- (g) defect concentration
- (h) 細胞内プロセス
- (i) 還流比
- (j) activation energy

【問 2】 Rewrite the following sentences on chain-growth polymerization to be grammatically correct and to have proper meaning using all of the given phrases. Begin each sentence with the underlined phrase.

Example: /within a fluid. /is the ratio/ The Reynolds number /to viscous forces/ of inertial forces/

Solution: The Reynolds number /is the ratio/ of inertial forces/ to viscous forces/ within a fluid./

Sentence 1: /Chain-growth polymerization / termination. / occurs in three stages / propagation, /
/ known as / initiation / and /

Sentence 2: /In the initiation stage, / is used to generate / a monomer. / to form an active center /
/ that is transferred to / an initiator molecule / a radical /

Sentence 3: In the propagation stage, / are / monomers / of growing / polymer chains. /
/ to the active center / sequentially added /

Sentence 4: / or presence / polymers cease / of active chains / to grow / of inhibitors./
/ due to combination / In the termination stage, /

【問3】 Read the following passage and translate the underlined sentences into Japanese.

Adapted from Nature ダイジェスト Vol. 14 No. 5 |2017

" How heat from the Sun can keep us all cool"

ホットでクールな太陽熱冷房

As demand for air conditioning climbs, some see a solution in the very thing that makes us sweat: the Sun. In both hotels and hospitals in dry hot areas, buildings are being designed that turn sunlight into cooling power, not via electricity, but through generation of heat that is known as "solar thermal-chillers". ⁽¹⁾ The Intergovernmental Panel on Climate Change (IPCC) predicts that by 2100, the demand for electricity to power cooling will have surged to more than 30 times to what it was in 2000. As solar-thermal technology is nearing a crucial turning point, research groups are showing off their systems at a growing number of buildings across the world.

(注: solar-thermal chiller: 太陽熱冷凍機 surge: 急増)

Today, there are some 1,200 installations — more than 10 times the total from a decade ago.

⁽²⁾ Companies that produce solar-thermal chillers say that they use 30–90% less electricity than conventional air conditioners that operate in most buildings. Researchers are working to make the systems cheaper to build.

However, solar cooling technology faces daunting hurdles and some experts doubt that it will ever be more than a niche in a world that each year adds 100 million conventional air conditioners powered by electricity. ⁽³⁾ Solar-thermal chillers are just too expensive, typically costing about five times more than conventional ones. Although the price is dropping, the technology lacks the subsidies and investment it needs to make it more competitive.

(注: daunting hurdle: 大きな困難)

Academic researchers and companies are trying to improve performance and reduce the cost of solar-thermal chillers in many ways. ⁽⁴⁾ To develop a cheaper alternative, a team led by Roland Winston at the University of California, is improving the design of solar energy collection tubes by adding a special metallic piece that transfers heat rapidly to a glycol fluid. In this way, the system can operate at temperatures as high as 200 °C, which increases performance and reduces cost.

(注: Roland Winston: ローランド ウィンストン)