令和３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 and do not use abbreviations. Note that term (b) is a biochemistry term.

(a) 光学異性体

(b) cofactor

(c) conjugated diene

(d) mass transfer coefficient

(e) reverse osmosis

(f) 界面張力

(g) lattice constant

(h) 分子軌道理論

(i) 核磁気共鳴

(j) lipid bilayer

【問 2 】 Explain the kinetics of a first-order chemical reaction in four (4) sentences with the below terms without using any equations or drawings. Additional words should be used to develop proper sentences. Underline each term and pay attention to spelling and grammar.

Sentence 1: (a) The speed (b) studied by reaction kinetics (c) chemical reaction

Sentence 2: (a) The rate (b) reactants (c) concentration (d) only one (e) a first-order (f) depends linearly

Sentence 3: (a) The reaction rate constant (b) inverse time or reciprocal time (c) units (d) chemical reaction

Sentence 4: (a) A plot of (b) straight line (c) natural logarithm (d) time (e) concentration (f) versus (g) chemical reaction

Begin Sentence 1 with: "The speed of a ..."
Continue the explanation and begin Sentence 2 with: "The rate of a..."
Continue the explanation with Sentences 3 and 4.

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

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"Celebrate the women behind the periodic table"

周期表の発展を支えた女性科学者たちの物語

The story of how dozens of elements were arranged into the periodic table reaches far beyond one person at one point in time. (1)Scientists classified elements before and after Dmitri Mendeleev's 1869 periodic table framework and tried to explain new substances. Noble gases, radioactivity, isotopes, subatomic particles and quantum mechanics were all unknown in the mid-nineteenth century.

（注: Dmitri Mendeleev:ドミトリ・メンデレーエフ, isotope: 同位体）

Marie Curie wasn't looking for elements when she started her PhD on 'uranium rays' in 1897. (2)Marie Curie wanted to explore radioactivity, which had just been discovered by Henri Becquerel in 1896. She came across pitchblende, an ore with radioactivity that was too strong to be explained by uranium alone. She suspected the presence of other elements, and brought in her husband, Pierre, to help.

（注: Marie Curie: マリー・キュリー, Henri Becquerel: アンリ・ベクレル）

Another element, number 75 — rhenium — was jointly discovered in 1925 by German chemists Ida Noddack and her husband Walter Noddack in Berlin, together with Otto Berg at the electrical-engineering company Siemens–Halske. (3)Ida Noddack was a chemical engineer who left industry to search for undiscovered elements. The Noddacks struggled to produce weighable quantities of rhenium, which they named after the Rhine; it is one of the rarest elements on Earth, and is not radioactive.

（注: Ida Noddack:イーダ・ノダック）

Japanese–American technician Toshiko 'Tosh' Mayeda mastered the measurement of oxygen radioisotopes in the 1950s. Appointed to wash glassware in Harold C. Urey's lab at the University of Chicago, Illinois, she was soon put in charge of the mass spectrometers. (4)Toshiko Mayeda developed a method to measure the ratio of oxygen isotopes in fossilized shells and expanded her method to analyze meteorites. Many more women expanded our knowledge of the elements.

（注: Toshiko Mayeda: トシコ・マエダ, fossilized shells: 貝殻の化石, meterorites: 隕石）