

平成31年度

滋賀県立大学

特別入試試験問題

《推薦入学選抜》

《帰国子女特別選抜》

平成 31 年度
滋賀県立大学特別入試

総合問題

試験時間 9時30分～11時30分(120分)

『総合問題』は、募集単位(学部・学科)ごとに、問題Ⅰ～問題Ⅵのうち次に示す3問から構成されている。

環境科学部

環境生態学科 問題Ⅰ・Ⅲ・Ⅳ

生物資源管理学科 問題Ⅰ・Ⅲ・Ⅳ

人間文化学部

地域文化学科問題 問題Ⅰ・Ⅳ・Ⅴ

人間関係学科問題 問題Ⅰ・Ⅳ・Ⅴ

国際コミュニケーション学科 問題Ⅱ・Ⅳ・Ⅴ

人間看護学部 問題Ⅰ・Ⅴ・Ⅵ

注意事項

1. 解答開始の合図があるまで、この問題冊子および解答冊子の中を見てはいけません。
2. 問題は3題で、○ページから ○ページまであります。
3. 解答開始後、解答冊子の表紙所定欄に受験番号、氏名をはっきり記入しなさい。表紙にはこれら以外のことを書いてはいけません。
4. 解答は、すべて解答冊子の指定された箇所に記入しなさい。解答に関係のないことを書いた答案は無効にすることがあります。
5. 解答冊子は、どのページも切り離してはいけません。解答のための下書き、計算などには、解答冊子の下書き用紙を使いなさい。
6. 試験終了後、問題冊子は持ち帰りなさい。解答冊子を持ち帰ってはいけません。

目 次

『総合問題』

問題Ⅰ 1

問題Ⅱ 7

問題Ⅲ 11

問題Ⅳ 15

問題Ⅴ 21

問題Ⅵ 25

問題 I

- 1 Read the text and answer the questions below. Write your answers on the answer sheet.

(次の英文を読んで、後の問いに答えよ。答えは解答用紙に記入せよ。)

The wolf has long had a reputation among humans as a dangerous, violent animal. However, the experiences of Marcos Rodriguez Pantoja, who lived with wolves in the mountains for many years, suggest another side to the wolf. Rodriguez is one of the rare recorded cases of a child being raised by wild animals.

Rodriguez was born in Spain in 1946. His mother died when he was three. When he was six or seven, his father and his father's new wife sent him away to the mountains to help an elderly man who looked after goats. The boy did not know how to survive in the new environment at first. But the old man taught him a few basic skills, and he began to feel more comfortable. The man soon died, though, and when Rodriguez remembered the beatings which he had suffered at the hands of his stepmother, he decided to stay in the mountains alone.

In the mountains, Rodriguez learned from the birds and other animals what he could eat. When he saw that wild boars ate potato-like roots buried in the ground, he ate those, along with berries and mushrooms. Rodriguez also established a special relationship with a family of wolves. One day, he went into a cave and started to play with some baby wolves that lived there. Then he fell asleep. When the mother wolf brought food for her young ones, Rodriguez woke up. The mother looked at him fiercely. "She started to tear the meat apart," he recalled in an interview. "After feeding her little ones she threw me a piece of meat. I didn't want to touch it because I thought she was going to attack me, but she was pushing the meat with her nose. I took it, ate it, and thought she was going to bite me, but she put her tongue out and started to lick me. After that, I was one of the family."

The young wolves played and ate with Rodriguez. The female wolf, he said, acted as his second mother. Rodriguez lived in a cave which had been part of an old mine. Although he did not have human company in the mountains, (1)he felt lonely only when he could not hear the animals. At those times, he would call out to them – even now he is able to imitate the sounds of the deer, fox, owl, and eagle. "Once they answered, I would be able to sleep because I knew they hadn't abandoned me," he said.

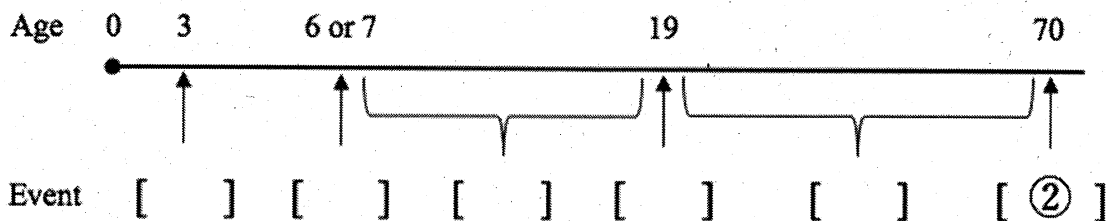
When Rodriguez was 19 years old, the Spanish police found him and made him come back to civilization. He found the return to human society difficult, struggling especially with the noise of cars, the pace of life, and the numbers of people. As an adult, he worked a series of jobs in the hospitality industry and construction. He sometimes felt cheated by (2) his ignorance of society.

Rodriguez considers his time living with the wolves in the mountains to be the happiest period of his life. Everything that he needed was there, and the life was peaceful. He has tried to return to the mountains since. But life there is no longer the same. The wolves no longer treat him as a brother. He calls, and they respond, but they will not approach him.

Recently retired and in his early 70s, Rodriguez now lives in a small town in northwest Spain. He has gotten used to civilized life and says he is happy. His many friends and neighbors are supportive of him. He plays the guitar and piano and is a great talker and storyteller. (3) Children are the humans with whom he feels most comfortable. He makes visits to a local school to talk to students about his love for animals and the natural environment, and his experiences growing up with wolves.

Q1. Look at the events in Rodriguez' life, ① to ⑥. About how old was Rodriguez when they happened? Complete the timeline on the answer sheet.

- ① He lived with wild animals.
- ② He retired.
- ③ He was returned to civilization.
- ④ He was sent away by his parents.
- ⑤ He worked various jobs.
- ⑥ His mother passed away.



- Q2. According to the second paragraph, why did Rodriguez start living alone in the mountains as a young boy? Choose the best answer.
- ① He had lived with his mother in the mountains, but his mother died.
 - ② He ran away from an elderly man who worked in the mountains.
 - ③ He recalled bitter experiences at home and decided not to return.
 - ④ He wanted to help his father work in the mountains.
- Q3. According to the third paragraph, how did Rodriguez know what to eat in the mountains? Choose the best answer.
- ① A family of wolves taught him.
 - ② Birds spoke to him and gave him good advice.
 - ③ He observed birds, boars, and other animals.
 - ④ He studied how to grow berries and mushrooms.
- Q4. According to the third and fourth paragraphs, how did the wolves treat Rodriguez? Choose the best answer.
- ① They abandoned him in the mountains.
 - ② They accepted him as a member of the family.
 - ③ They approached him aggressively and bit him.
 - ④ They attacked him for eating their food.
- Q5. Choose the best Japanese translation for underlined section (1).
- ① 動物の鳴き声が聞けないと彼の孤独感は増すばかりだった。
 - ② 動物の鳴き声が聞こえないと彼だけが孤独になった。
 - ③ 動物の鳴き声が聞こえないときだけ彼は寂しくなった。
 - ④ 動物の鳴き声が聞こえると彼には寂しさが増す一方だった。
- Q6. Write the words in the correct order for blank (2).
[advantage / employers / of / took / who]
- Q7. Choose the best meaning for underlined sentence (3).
- ① He feels children are becoming more comfortable spending time with him.
 - ② He feels life is more comfortable after having his own children.
 - ③ He feels more comfortable talking with children than adults.
 - ④ He feels more comfortable with children than animals.

Q8. Choose the two correct statements about Rodriguez, based on the reading.

- ① He can make the sounds of various animals even today.
- ② He immediately adjusted to civilization as an adult.
- ③ He is happily retired but also misses life in the mountains.
- ④ His father was sad to send Rodriguez away.
- ⑤ Listening to classical music is especially enjoyable for him.
- ⑥ Most of his life has been spent with wolves.

Q9. Choose the best title for the reading.

- ① A Rare Environmental Movement in Spain
- ② Experiencing a Childhood among Wolves
- ③ Struggling Simply to Survive in the Wild
- ④ The Dangerous and Violent Nature of Wolves

2 Read the following conversation between two friends in a bookstore in the U.S. Choose the best expression to fill each blank and write the number on the answer sheet.

(以下はアメリカの書店での友達同士の対話である。会話の流れをふまえて空欄 A ~ F に入れるのに最も適切なものをそれぞれ①~③のうちから一つ選び、その番号を解答用紙に記入せよ。)

Andy: I love this book!

Sue: Oh? What's the title?

Andy: It's called *Spark Joy*. It's the new book by Marie Kondo. Do you know her? I'm one of her biggest fans.

Sue: She's the Japanese organizing consultant, right? I heard her books sell well.

Andy: A There are TV shows about her approach, and she gives talks and holds workshops, all kinds of things. This new book has definitely brought her a lot of attention.

Sue: Yeah, I'm surprised that a book about tidying has become such a big hit. I wonder what makes people respond to it so positively?

Andy: Well, the only way to truly know is to give it a try yourself.

Sue: No doubt. B *Spark Joy*. How does that phrase relate to cleaning?

Andy: Well, the book shows how to organize your belongings – all your stuff – in a simple and easy way.

Sue: That sounds like just what I need, actually. So, tell me, how do you do it?

Andy: She says that when you clean out your closet, for example, you should sort things into two piles. You put the clothes you don't actually wear anymore on the "go" pile, and later you throw them out or give them away.

Sue: And all the other stuff?

Andy: You put that on the "keep" pile. C

Sue: That all makes sense. But, honestly, that's the hardest part of dealing with a messy closet for me: deciding what to part with and what to keep. It seems like I never succeed in getting through that first step. It's so hard to throw something away.

Andy: Exactly. D It says that all you need to do is develop the ability to recognize which possessions make you happy. You keep only the ones that bring you joy – the things that spark joy for you.

Sue: Ah! Now I see what the title means. E It's also a kind of philosophy.

Andy: Right. And there are even bigger benefits. Once you develop the skill of seeing what is important to you, life itself becomes more organized and joyful.

Sue: F OK, I'll give it a try. Thanks for the tip on *Spark Joy!*

- A
- ① That's right, her books are hard to sell.
 - ② Yeah, it's a very good organization.
 - ③ Yes, she's really gotten popular here.

- B
- ① But I'd like to know how the novel ends.
 - ② For starters, I'm curious about the title.
 - ③ I do enjoy reading books in parks.

- C
- ① It all makes very little sense.
 - ② Those are the things you really need.
 - ③ You can throw them away right away.

- D
- ① And that's what this book really helps with.
 - ② I can't read what they wrote on the back here.
 - ③ If you played catch more often, you could throw a ball much better.

- E
- ① It's not just practical advice.
 - ② That is not a kind thing to do.
 - ③ You don't understand it very well at all.

- F
- ① I can't see how that would be useful for anyone.
 - ② I've never left a tip at a bookstore.
 - ③ That's something which appeals to everyone.

問題 II

- 1 Read the text and answer the questions below. Write your answers on the answer sheet.

(次の英文を読んで、後の問いに答えよ。答えは解答用紙に記入せよ。)

The wolf has long had a reputation among humans as a dangerous, violent animal. However, the experiences of Marcos Rodriguez Pantoja, who lived with wolves in the mountains for many years, suggest another side to the wolf. Rodriguez is one of the rare recorded cases of a child being raised by wild animals.

Rodriguez was born in Spain in 1946. His mother died when he was three. When he was six or seven, his father and his father's new wife sent him away to the mountains to help an elderly man who looked after goats. The boy did not know how to survive in the new environment at first. But the old man taught him a few basic skills, and he began to feel more comfortable. The man soon died, though, and when Rodriguez remembered the beatings which he had suffered at the hands of his stepmother, he decided to stay in the mountains alone.

In the mountains, Rodriguez learned from the birds and other animals what he could eat. When he saw that wild boars ate potato-like roots buried in the ground, he ate those, along with berries and mushrooms. Rodriguez also established a special relationship with a family of wolves. One day, he went into a cave and started to play with some baby wolves that lived there. Then he fell asleep. When the mother wolf brought food for her young ones, Rodriguez woke up. The mother looked at him fiercely. "She started to tear the meat apart," he recalled in an interview. "After feeding her little ones she threw me a piece of meat. I didn't want to touch it because I thought she was going to attack me, but she was pushing the meat with her nose. I took it, ate it, and thought she was going to bite me, but she put her tongue out and started to lick me. After that, I was one of the family."

The young wolves played and ate with Rodriguez. The female wolf, he said, acted as his second mother. Rodriguez lived in a cave which had been part of an old mine. Although he did not have human company in the mountains, (1)he felt lonely only when he could not hear the animals. At those times, he would call out to them – even now he is able to imitate the sounds of the deer, fox, owl, and eagle. "Once they answered, I would be able to sleep because I knew they hadn't abandoned me," he said.

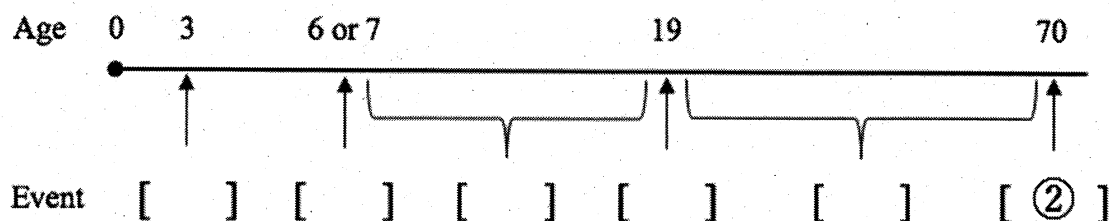
When Rodriguez was 19 years old, the Spanish police found him and made him come back to civilization. He found the return to human society difficult, struggling especially with the noise of cars, the pace of life, and the numbers of people. As an adult, he worked a series of jobs in the hospitality industry and construction. He sometimes felt cheated by (2) his ignorance of society.

Rodriguez considers his time living with the wolves in the mountains to be the happiest period of his life. Everything that he needed was there, and the life was peaceful. He has tried to return to the mountains since. But life there is no longer the same. The wolves no longer treat him as a brother. He calls, and they respond, but they will not approach him.

Recently retired and in his early 70s, Rodriguez now lives in a small town in northwest Spain. He has gotten used to civilized life and says he is happy. His many friends and neighbors are supportive of him. He plays the guitar and piano and is a great talker and storyteller. (3) Children are the humans with whom he feels most comfortable. He makes visits to a local school to talk to students about his love for animals and the natural environment, and his experiences growing up with wolves.

Q1. Look at the events in Rodriguez' life, ① to ⑥. About how old was Rodriguez when they happened? Complete the timeline on the answer sheet.

- ① He lived with wild animals.
- ② He retired.
- ③ He was returned to civilization.
- ④ He was sent away by his parents.
- ⑤ He worked various jobs.
- ⑥ His mother passed away.



- Q2. According to the second paragraph, why did Rodriguez start living alone in the mountains as a young boy? Choose the best answer.
- ① He had lived with his mother in the mountains, but his mother died.
 - ② He ran away from an elderly man who worked in the mountains.
 - ③ He recalled bitter experiences at home and decided not to return.
 - ④ He wanted to help his father work in the mountains.
- Q3. According to the third paragraph, how did Rodriguez know what to eat in the mountains? Choose the best answer.
- ① A family of wolves taught him.
 - ② Birds spoke to him and gave him good advice.
 - ③ He observed birds, boars, and other animals.
 - ④ He studied how to grow berries and mushrooms.
- Q4. According to the third and fourth paragraphs, how did the wolves treat Rodriguez? Choose the best answer.
- ① They abandoned him in the mountains.
 - ② They accepted him as a member of the family.
 - ③ They approached him aggressively and bit him.
 - ④ They attacked him for eating their food.
- Q5. Choose the best Japanese translation for underlined section (1).
- ① 動物の鳴き声が聞けないと彼の孤独感は増すばかりだった。
 - ② 動物の鳴き声が聞こえないと彼だけが孤独になった。
 - ③ 動物の鳴き声が聞こえないときだけ彼は寂しくなった。
 - ④ 動物の鳴き声が聞こえると彼には寂しさが増す一方だった。
- Q6. Write the words in the correct order for blank (2).
[advantage / employers / of / took / who]
- Q7. Choose the best meaning for underlined sentence (3).
- ① He feels children are becoming more comfortable spending time with him.
 - ② He feels life is more comfortable after having his own children.
 - ③ He feels more comfortable talking with children than adults.
 - ④ He feels more comfortable with children than animals.

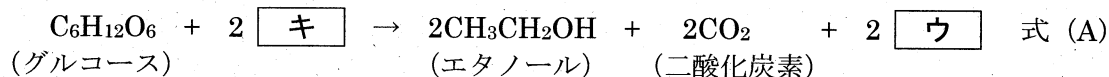
- Q8. Choose the two correct statements about Rodriguez, based on the reading.
- ① He can make the sounds of various animals even today.
 - ② He immediately adjusted to civilization as an adult.
 - ③ He is happily retired but also misses life in the mountains.
 - ④ His father was sad to send Rodriguez away.
 - ⑤ Listening to classical music is especially enjoyable for him.
 - ⑥ Most of his life has been spent with wolves.
- Q9. Choose the best title for the reading.
- ① A Rare Environmental Movement in Spain
 - ② Experiencing a Childhood among Wolves
 - ③ Struggling Simply to Survive in the Wild
 - ④ The Dangerous and Violent Nature of Wolves
- Q10. [Writing.] Imagine that you are the mother wolf in the reading. You took care of Rodriguez for many years. Describe your thoughts and feelings about the young human who came to live with you. Write about 150 words.

問題 Ⅲ

- 1 次の文章を読んで、問 1～問 7 に答えよ。ただし、炭素 C、水素 H、酸素 O の原子量はそれぞれ 12.0、1.00、16.0、気体定数は $8.31 \times 10^3 \text{ Pa} \cdot \text{L} / (\text{mol} \cdot \text{K})$ とする。

グルコースは **ア** に必要な物質の一つである。**ア** は生物に必要なエネルギーを供給するための **イ** であり、**イ** に伴うエネルギーの吸収や放出は **ウ** と呼ばれる物質を仲介して行われる。このことから **ウ** は **エ** ともいわれる。**ア** の反応は細胞基質と **オ** といわれる細胞小器官に存在する **カ** に触媒される。

酵母 (*Saccharomyces cerevisiae*) は上述した反応を行うことができるが、低酸素分圧下においてはアルコール発酵を行い、式 (A) に示すように酸素を使用せずにグルコースを 2 分子のエタノールと 2 分子の二酸化炭素に分解する。この際に行われる基質レベルのリン酸化により 2 分子の **キ** から 2 分子の **ウ** が生産される。



酢酸菌 (*Acetobacter aceti*) はさらに酢酸発酵により、エタノールを酢酸と水に分解する。酢酸菌は核を持たない生物である。酢酸は水の中において条件に応じた割合で式 (B) に示すように電離する。



酢酸などが混入していない純水では、水分子はごくわずかではあるが電離しており、25°C において水素イオン濃度は $1.00 \times 10^{-7} \text{ mol/L}$ 、水酸化物イオン濃度は **ク** となる。ブロモチモールブルー (BTB) 溶液を含んだ 25°C の純水に酢酸を添加していくと、水溶液は次第に **ケ** 色になっていく。

問1 空欄 ～ にあてはまる最も適当な語句または数値を、以下の語群から選択して記せ。1つの語句について選択は1回までとする。

(語群)

光合成, 呼吸, 同化, 代謝, ATP, ADP, アルギニン, リン脂質, エネルギーの通貨, 葉緑体, ゴルジ体, ミトコンドリア, 酵素, 金属イオン, 1.00×10^{-5} mol/L, 1.00×10^{-7} mol/L, 1.00×10^{-10} mol/L, 赤, 青, 黄

問2 太古に細胞に取り込まれた他生物が の起源といわれているが、その説の根拠を40字以内で述べよ。

問3 酵母 (*Saccharomyces cerevisiae*) は真核生物, 原核生物のいずれか。解答用紙に記載された語句のうち, 正しい方を○で囲め。同様に酢酸菌 (*Acetobacter aceti*) についても正しい方を○で囲め。

問4 90.0 g のグルコースが全て式 (A) の反応に使用された場合, 何 g のエタノールが生産されるかを有効数字3桁で示せ。計算過程も示せ。

問5 標準状態 (0°C, 1.013×10^5 Pa) において, 問4において生産されたエタノールのうち, 気体として4.48 Lが蒸発で失われたとする。液体として残ったエタノールは何 g かを有効数字3桁で示せ。計算過程も示せ。

問6 0.0200 mol/L の酢酸水溶液における水素イオン濃度を有効数字3桁で示せ。計算過程も示せ。ただし, 電離度を 5.00×10^{-2} とする。

問7 問6の溶液のpHを有効数字3桁で示せ。

2 次の文章を読んで、問1～問5に答えよ。

空気中の酸素は、微量ではあるが水に溶ける。図1に示したように、水1Lに溶ける酸素の最大量(飽和溶存酸素量)は温度によって変化する。そのため、⁽¹⁾小さな池などで水温が急激に上昇すると、酸素欠乏によって魚が死ぬことがある。水中に溶けている酸素の量は、ウインクラフ法で測定できる。この方法では、まず⁽²⁾試料水に水酸化マンガンを加えて水中の酸素と反応させ、沈殿を生じさせる。この沈殿にヨウ化カリウム水溶液と硫酸を加えると、ヨウ素が遊離する。溶液は黄褐色であるが、**ア**溶液を加えると溶液は青紫色になる。最後に、⁽³⁾この溶液をチオ硫酸ナトリウムで滴定し、溶液がちょうど無色になるまでの滴定値から水中の酸素濃度が計算できる。

天然に存在する酸素原子には、陽子数が8、中性子数が8で質量数が16であるもの(^{16}O で表すことがある)のほかに、質量数が17、18でそれぞれ ^{17}O 、 ^{18}O で表される酸素原子などが存在する。このように、原子番号が同じでも質量数の異なる原子を互いに**イ**という。天然水の99%以上は質量数が16の酸素原子を含む H_2^{16}O であるが、質量数が18の酸素原子を含む H_2^{18}O も約0.2%含まれている。南極大陸では、降った雪は氷床となり、一部は⁽⁴⁾氷山になる。過去の気候を推定する手段として、南極の氷床から取り出した筒状の氷柱を溶かして、水分子中に含まれる酸素の**イ**の比率を解析する手法が用いられることもある。

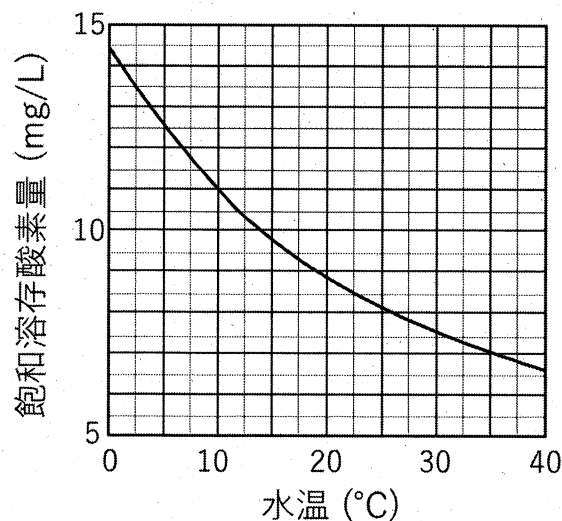
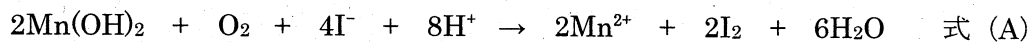


図1 飽和溶存酸素量と温度の関係

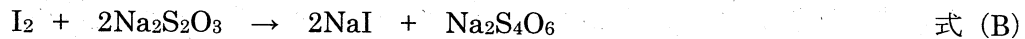
問1 , にはいる最も適切な語句を記せ。

問2 下線部(1)について、酸素で飽和している 10℃ の水の水温が 35℃ に上昇したとき、10℃ の水に溶存していた酸素のうち、水から大気へ失われた酸素の比率をパーセントで求め、有効数字 2 桁で示せ。計算過程も示せ。ただし、温度上昇後の水は酸素で飽和しており、飽和溶存酸素量以上の酸素はすべて大気へ失われたものとする。

問3 下線部(2)の操作は 2 つの反応からなるが、これをまとめると式 (A) になる。式 (A) の中で、酸化された元素および還元された元素の名称と、それぞれの反応前後の酸化数の変化を示せ。



問4 下線部(3)の反応式は式 (B) で表すことができる。式 (B) において、終点に達するまでに消費されたチオ硫酸ナトリウムの物質量が $1.0 \times 10^{-2} \text{ mol}$ のとき、試験水に存在していた酸素の物質量を有効数字 2 桁で示せ。



問5 下線部(4)について、密度が $1.02 \times 10^3 \text{ kg/m}^3$ の海水に、体積が $V \text{ m}^3$ 、密度が $0.920 \times 10^3 \text{ kg/m}^3$ の氷を浮かべたとき、水面より上の部分にある氷の体積が、氷全体に占める比率をパーセントで求め、有効数字 2 桁で示せ。計算過程も示せ。

問題 IV

次の文章は、宮内泰介『歩く，見る，聞く 人びとの自然再生』の一部である。これを読んで，後の問1～問5に答えよ。

(宮内泰介『歩く，見る，聞く 人びとの自然再生』，岩波書店，2017年，一部改変)

(注) 蓋然性：ある事柄が起こる確実性の度合い。

問1 下線部(a)～(c)のカタカナを漢字に直せ。

問2 下線部(ア)～(ウ)の漢字の読みをひらがなで書け。

問3 下線部①について、自然環境の管理はローカルにおこなったほうがよいとされる一般的な理由を最も適切に述べている文章を、本文中から100字以内で抜き出せ。ただし、句読点も字数に入れ、1マスに1字使うこと。

問4 下線部②について、以下の問いに答えよ。

(1) 順応的管理を言い換えた四字熟語を本文から抜き出せ。

(2) 順応的管理はどのような手順でおこなわれるか。本文を参考にしながら、解答用紙に示した図のそれぞれの空欄にあてはまる語句を書け。ただし、次の五つの語句、「評価」、「実行」、「計画」、「既存のデータ・知見」、「モニタリング」を用いること。

問5 下線部③について、粗朶の大量流出によって引き起こされた問題に対し、漁業者や湖岸の住民が強く反発したのはなぜか。本文中の言葉を使いながら、40字以内で答えよ。ただし、句読点も字数に入れ、1マスに1字使うこと。

問題 V

次の文章を読んで、問1～問5に答えよ。

(桐野高明『医療の選択』，岩波書店，2014年より一部改変)

(注1) 権威をふりかざして他に臨み、また権威に対して無批判に服従する行動様式。

(注2) 科学技術，産業などにおける飛躍的な前進，発展。

問1 下線部 (a) ~ (d) のカタカナを漢字に直せ。

問2 下線部 (ア) ~ (エ) の漢字の読みをひらがなで書け。

問3 下線部①について、医療への信頼を回復させるために患者に対して医療現場で行われるようになったことを最も適切に述べている文章を、本文中から 50 字以内で抜き出せ。ただし、句読点も字数に入れ、1マスに1字使うこと。

問4 空欄 (A) ~ (D) に入るもっとも適切な語句を、以下の中からそれぞれ一つ選べ。ただし、同じ語句を二度使ってはならない。

たしかに もし したがって しかし

問5 下線部②について、以下の問に答えよ。

(1) 「最新の医療に期待できること」として、どのようなことがあげられるか。本文中の言葉を使いながら、40 字以内で答えよ。ただし、句読点も字数に入れ、1マスに1字使うこと。

(2) 「過剰な期待を抱くことにならないよう、注意が必要である」と著者は述べているが、人類の幸福のために、医療と人との関係はどうあるべきか、著者の主張をふまえ、あなたの考えを 300 字以内で述べよ。ただし、句読点も字数に入れ、1マスに1字使うこと。

問題 VI

次の文章を読んで、問 1～問 8 に答えよ。

ヒトのように陸上生活をする動物にとって、水や必要なミネラルを体内に保持するしくみはきわめて重要である。水やミネラルに関する体内環境を生命維持に適するよう調整する器官が腎臓である。腎動脈から腎臓に流入した血液の一部は(a)糸球体で **ア** されて(b)ボーマンのうに入り、**イ** とよばれる液体になる。この液体は次いで(c)腎細管(細尿管)、(d)集合管と順々に送られ、その過程で必要な成分が毛細血管に **ウ** される。最終的に(e)濃縮された尿が体外に排出される。

腎細管や集合管では鉱質コルチコイドやバソプレシンのようなホルモンが水分やミネラルの調節に関わっている。鉱質コルチコイドは **エ** から分泌される。一方、バソプレシンは(f)神経細胞で合成され、**オ** から分泌される。バソプレシンは(g)腎臓ばかりでなく血管にもはたらいて、血圧を上昇させる。

鉱質コルチコイドとバソプレシンのはたらきについて、以下の実験を行った。

実験 1

健康な人にナトリウム含有量の低い食事(低ナトリウム食)、正常の食事(正常食)、高い食事(高ナトリウム食)を食べてもらって、血液中のナトリウム濃度、尿中のナトリウム排泄量、血液中の鉱質コルチコイドとバソプレシンの濃度を測定した。結果は図 1 のようになった。

実験 2

バソプレシンの分泌量が減少したり、その受容体に異常が生じたりすると、バソプレシンの作用が低下するので尿量が増加する。1日の尿量が3Lをこえると、尿崩症と診断される。二人の尿崩症患者さん(AさんとBさん)について、水溶性のバソプレシンを注射してその効果を調べた。注射前の4時間、および注射後4時間ごとに3回(合計4回)採尿して尿量と尿中のナトリウム濃度を測定し、その変化を観察した。結果は図 2 のようになった。

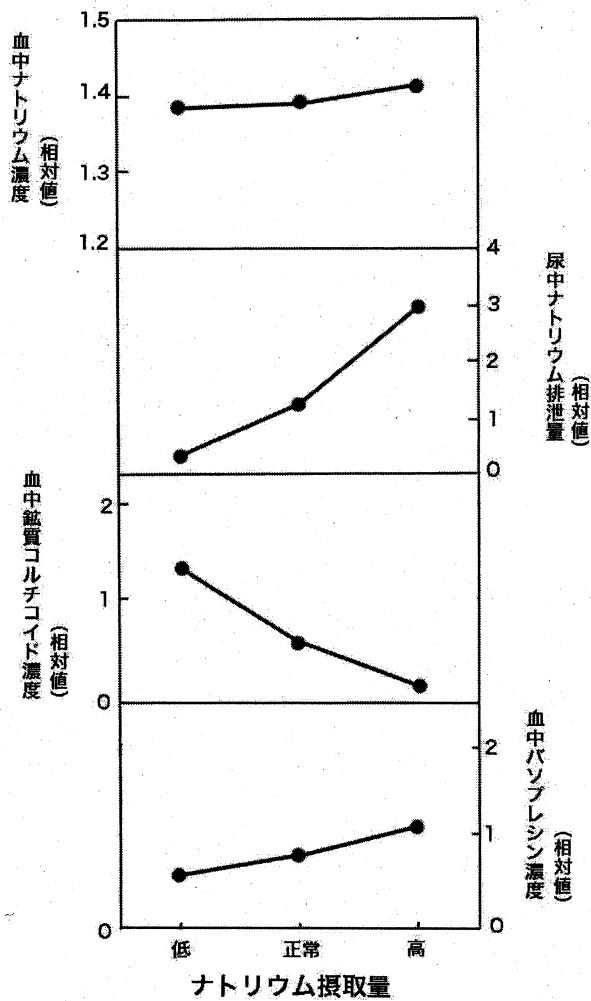


図1 低ナトリウム食，正常食，高ナトリウム食を摂取したときの血中ナトリウム濃度，尿中ナトリウム排泄量，血中鈣質コルチコイド濃度，血中バソプレシン濃度

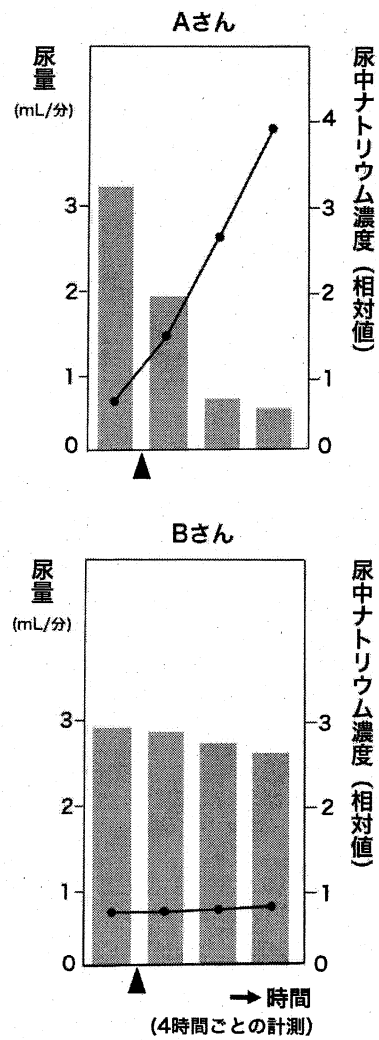


図2 水溶性バソプレシン注射前後のAさんとBさんの尿量(棒グラフ)と尿中ナトリウム濃度(折れ線グラフ)の変化

バソプレシン注射時点を矢頭で示す。

問1 **ア** ~ **オ** に適切な語句を入れよ。ただし **エ** と **オ** の欄には、例にならって器官名・区分名を入れよ（例：「肺・上葉」, 「大脳・皮質」）。

問2 腎小体を構成するすべての要素を下線部**(a)(b)(c)(d)**から選び、記号で答えよ。

問3 腎単位（ネフロン）を構成するすべての要素を下線部**(a)(b)(c)(d)**から選び、記号で答えよ。

問4 下線部**(e)**について、正常では **イ** の液体の量は最終的な尿の量の何倍か。下の選択肢から最も近い数値を選び、記号で答えよ。

カ 約 5 倍 キ 約 10 倍 ク 約 100 倍 ケ 約 1000 倍

問5 下線部**(f)**について、血液中に放出されるホルモンが、わずかな量で複数の異なる器官に異なる効果を発揮するのはなぜか。そのメカニズムを簡潔に説明せよ。

問6 下線部**(g)**について、以下の問いに答えよ。

- (1) 神経から分泌されるホルモンと神経伝達物質の違いは何か。簡潔に説明せよ。
- (2) 神経から分泌されるホルモンの名称（バソプレシンを除く）を一つ挙げよ。

問7 実験1について、以下の問いに答えよ。

- (1) 図1から、低ナトリウム食を摂取したときも高ナトリウム食を摂取したときも、血液中のナトリウム濃度はほぼ一定に保たれていることがわかる。このような内部環境を一定に保つ生体の働きを何というか、答えよ。
- (2) 低ナトリウム食や高ナトリウム食に反応してホルモン濃度が変化している。ホルモン作用の最終効果がホルモンの分泌を調節するしくみを何というか、答えよ。
- (3) 高ナトリウム食を摂取したとき、血液中のナトリウム濃度はホルモンによってどのように調節されているか。簡潔に説明せよ。

問8 実験2について、AさんとBさんの尿崩症の原因は何か。その違いを述べ、そう判断した理由を説明せよ。