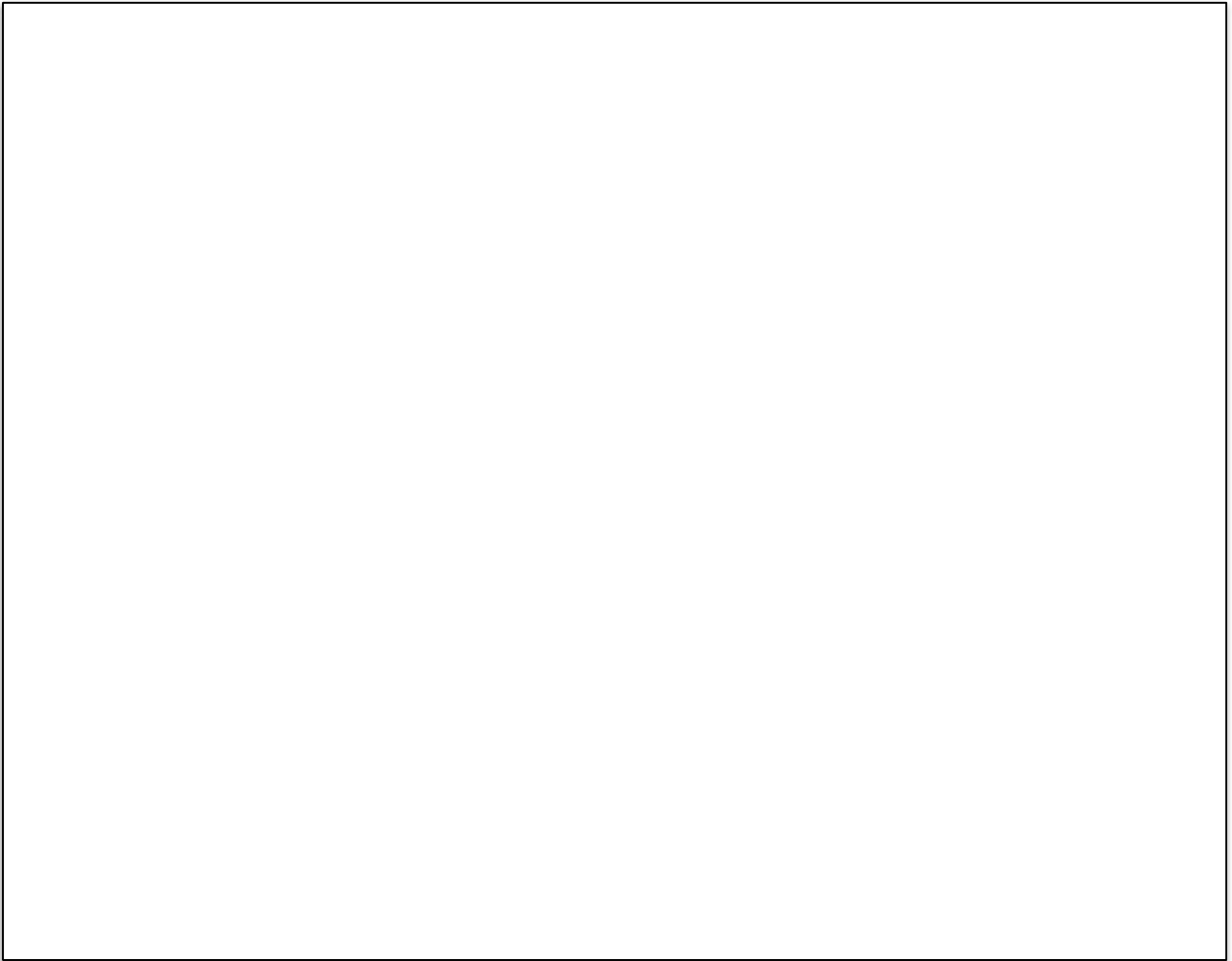


令和4年8月3日実施

名古屋市立大学大学院医学研究科修士課程入学試験(1回目) 英語(出題言語一英語)

I. Read the following article and answer the questions. (100 Points)

この部分に掲載されている文章に就いては、著作権法上の
問題から掲載することができませんので、ご了承願います。



Reference: Nature 2022 602: 18.

Question 1. List an animal name in (1).

Question 2. Give reasons for the underlined part (2).

Question 3. What is one of the things that may define the size of a dog? Explain it in your words.

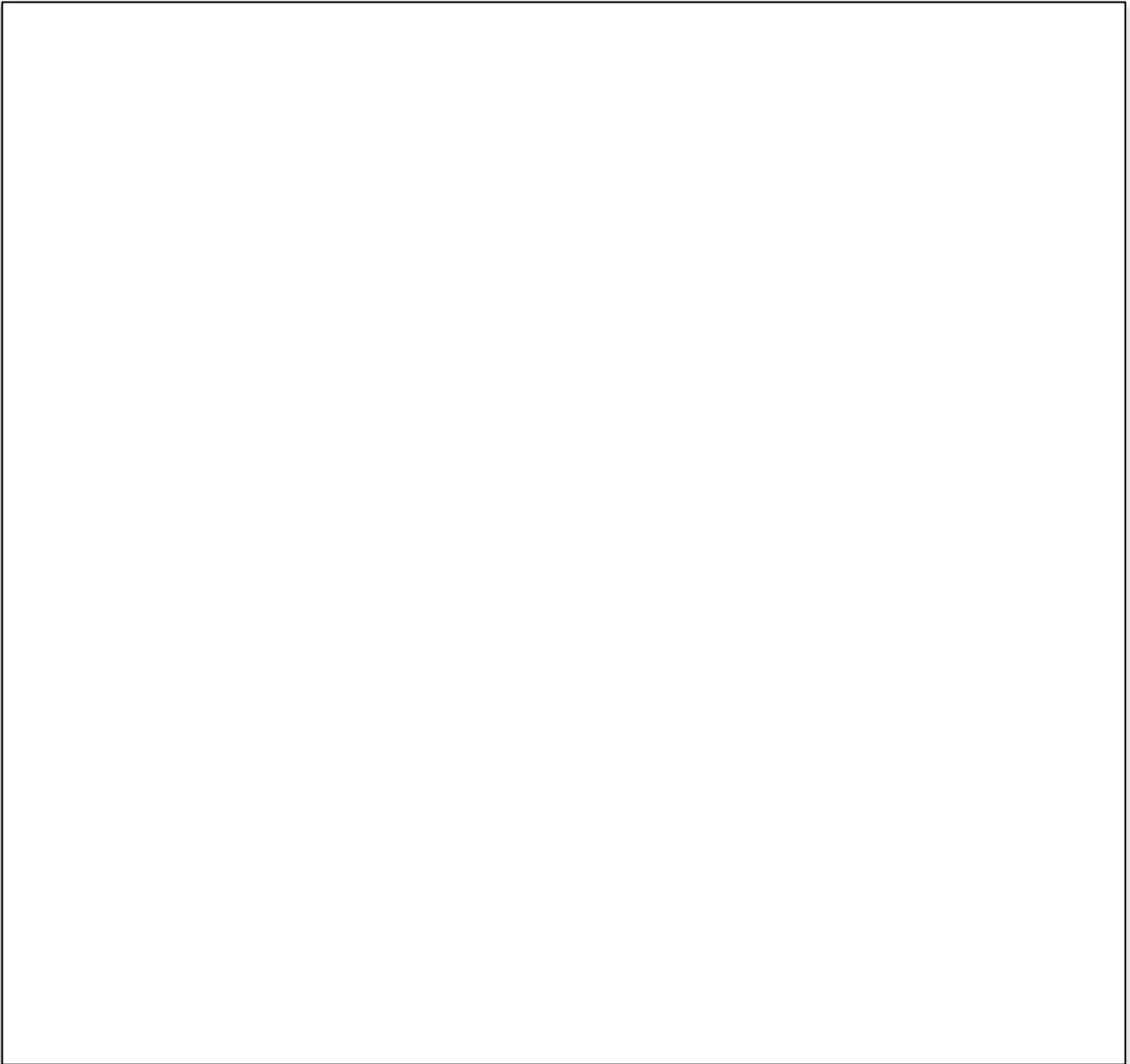
Question 4. Give reasons for the underlined part (3).

令和4年8月3日実施

名古屋市立大学大学院医学研究科修士課程入学試験(1回目) 英語(出題言語一英語)

II. The following sentences are a part of the preface *Tomorrow's doctor* which was a guideline of medical education for medical schools in the United Kingdom. Read the following text and answer the questions. (100 Points)

この部分に掲載されている文章に就いては、著作権法上の
問題から掲載することができませんので、ご了承願います。



Quoted from: General Medical Council (GMC), *Tomorrow's doctor* (2009)

Question 1. In paragraph (1), the author explains his idea about important roles which medical schools have. Please explain this author's idea within 50 words.

Question 2. In paragraph (2), the author explains his idea about 'good doctor'. Please explain the author's idea within 50 words.

Question 3. Please summarize the author's idea in paragraph (3) within 50 words.

Question 4. Please summarize the author's idea in paragraph (4) within 50 words.

令和4年8月3日実施

名古屋市立大学大学院医学研究科修士課程入学試験(1回目) 基礎科学(出題言語-英語)

Select and answer any 3 questions from the following 5 ones, and enter the selected question numbers in the box below.

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令和4年8月3日実施

名古屋市立大学大学院医学研究科修士課程入学試験(1回目) 基礎科学(出題言語-英語)

Question 1. Select any four cellular organelles from the following terms A – J, and briefly explain each of them. (100 points)

A. plasma membrane B. cytoplasm C. nucleus D. endoplasmic reticulum E. ribosomes
F. Golgi apparatus G. lysosome H. mitochondria I. cytoskeleton J. cilia

1) _____

2) _____

3) _____

4) _____

令和4年8月3日実施

名古屋市立大学大学院医学研究科修士課程入学試験(1回目) 基礎科学(出題言語-英語)

Question 2. Briefly define any three of the following terms A-E. (100 points)

- A. Meiosis
- B. DNA methylation
- C. genome imprinting
- D. de novo mutation
- E. DNA microarray analysis

1) _____

2) _____

3) _____

令和4年8月3日実施

名古屋市立大学大学院医学研究科修士課程入学試験(1回目) 基礎科学(出題言語－英語)

Question 3. Read a conversation between Students A and B, and answer the following questions (1) and (2). (100 points)

Student A: I investigated national statistical survey data to write a report entitled ‘Health status of high school students in Japan’, and found the data about asthma. ^(a)Its prevalence around 1980 was about 0.2% among both men and women, but increased to around 2% in 2010s. The prevalence was higher in men than in women. I wonder why the prevalence increased.

Student B: Somebody said that a research group investigated causative chemicals of allergic diseases in the diet. They recruited 100 patients suffering from allergic diseases such as asthma and atopic dermatitis, and collected their every meal including drinks throughout 3 days. They analyzed chemicals, and surprisingly, found that ^(b)about 70% of meal contained ‘Compound A’. The author of the web page wrote that it was the one evidence that ‘Compound A’ was the causative chemical of allergic diseases. I wonder if such a conclusion was right.

Student A: It was a laborious survey! I suppose that important results should come out.

- (1) Regarding the descriptions underlined (a), the survey to clarify health status of high school students in Japan is conducted among a portion of nationwide students every year in principle, which is based on the Statistics Act. Explain what to do to make sure that the survey results reflect the health status of whole students in Japan, and that the results are comparable between different years.

(2) Regarding the descriptions underlined (b), explain your opinions about the author's view.

令和4年8月3日実施

名古屋市立大学大学院医学研究科修士課程入学試験(1回目) 基礎科学(出題言語-英語)

Question 4. Answer the following questions (1) – (4). (100 points)

When $f(t)$ and $g(t)$ are both periodic functions with period T , the function $R(\tau)$ for analyzing their mutual correlation is defined as follows where τ is a variable that represents the time axis shift of the two functions.

$$R(\tau) = \lim_{T \rightarrow \infty} \frac{1}{T} \int_0^T f(t) g(t + \tau) dt$$

(1) Explain in detail the properties of the cross-correlation function.

(2) Evaluate $R(\tau)$ when $f(t) = \sin t$ and $g(t) = \cos t$.

- (3) The function that replaces the analog signal $g(t)$ of the cross-correlation function $R(\tau)$ by $f(t)$ is called the autocorrelation function. Explain what can be understood by using the autocorrelation function, considering a concrete example.

(4) The following table shows the average monthly temperatures in two cities. In this case, define the cross-correlation function for the observed values $f(i)$ and $g(i)$ ($i = 1, 2, \dots, 6$) as follows where j ($j = 0, 1, \dots, 5$) is an integer variable and \bar{f} and \bar{g} are the average values of f_i and g_i , respectively.

$$R(j) = \frac{1}{6} \sum_{i=1}^6 (f_i - \bar{f})(g_{i+j} - \bar{g})$$

Plot the cross-correlation function. The horizontal axis is the variable j and the vertical axis is $R(j)$.

For missing data due to the amount of deviation j , make up the missing data by circulating the data.

Also, explain what you found from the results.

i	1	2	3	4	5	6
Month	1	3	5	7	9	11
City F (f_i)	4	10	20	25	20	5
City G (g_i)	20	18	15	10	17	22

Temperature [$^{\circ}\text{C}$]

令和4年8月3日実施

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Question 5. Answer the following questions (1) – (4). (100 points)

Let the probability density function $f(x)$ for a discrete random value X be given by

$$f(x) = e^{-\lambda} \frac{\lambda^x}{x!} \quad (x = 0, 1, 2, \dots),$$

where λ is a real number with $\lambda > 0$.

(1) Prove that $\sum_{x=0}^{\infty} f(x) = 1$.

(2) Find the mean $E(X)$.

(3) Find the variance $V(X)$.

(4) Prove that $\lim_{n \rightarrow \infty} \binom{n}{x} \left(\frac{\lambda}{n}\right)^x \left(1 - \frac{\lambda}{n}\right)^{n-x} = f(x)$.