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令和6年1月17日実施

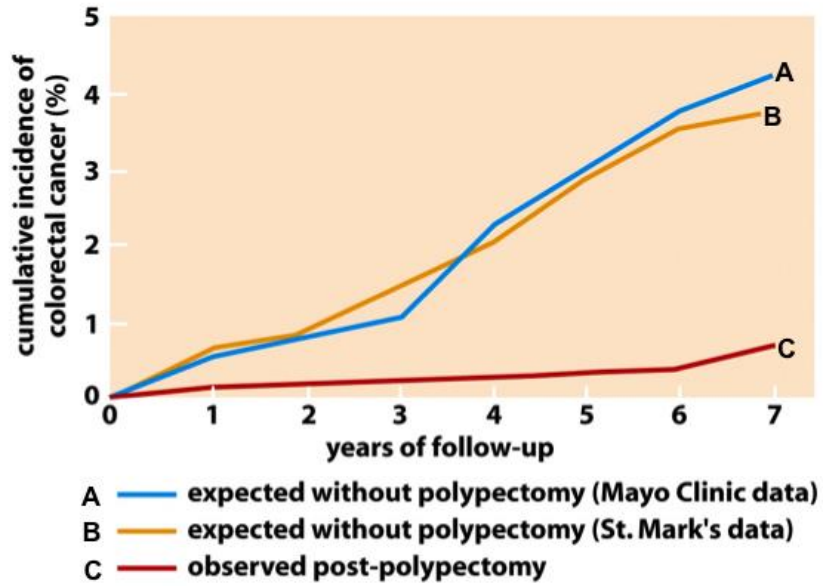
名古屋市立大学大学院医学研究科修士課程入学試験（2回目） 英語（出題言語－英語）

Answer questions 1 and 2. Write your examination number on all answer sheets.

English Question 1: Read the following sentences and answer the following 6 questions.

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問題から掲載することができませんので、ご了承ください。

Figure



1) Explain the underline (1) in your own words.

2) Explain the underline (2) in your own words.

Number ()

3) Explain the underline (3) in your own words.

4) Explain the underline (4) in your own words.

5) From the current article, explain the findings of the figure and discuss what you can say from the findings.

6) Give an appropriate title to the current article and explain the reason.

Number ()

English Question 2: The Nobel Prize in Medicine and Biology for 2023 was awarded to Katalin Karikó and Drew Weissman for their discoveries that enabled the development of effective mRNA vaccines against COVID-19. The following text is part of a press release by the Karolinska Institute, giving the reasons for the decision. The paragraph preceding this text mentions that in vitro transcribed mRNA is unstable and difficult to deliver and induces inflammatory reactions in vivo, which have hindered its clinical use. Read it and answer each question.

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Number ()

- 1) Briefly describe the bases constituting DNA and RNA and their relationship.

- 2) Explain Karikó and Weissman's questions about mRNA's nature and the anticipated answers.

- 3) What concretely does the underlined words 1) refer to?

- 4) Briefly describe two changes made by modifying mRNA bases that were useful in vaccine development.

- 5) Indicate two diseases against which mRNA vaccines were first developed.

- 6) When were the two mRNA vaccines against SARS-CoV-2 approved?

Number ()

Question 1: Fig. 1 shows the number of age-specific deaths per million population due to COVID-19 in Japan from November 2020 to December 2021, and Fig. 2 shows the average number of new corona vaccine doses (first and second doses combined) in Japan during the same period. Answer the following questions.

- 1) Given the nature of the vertical axis, what do you call the graph shown in Fig. 1?
- 2) In what year and month did the average number of vaccinations reach 1?
- 3) How did the number of deaths by age group in Fig. 1 change before and after 2)? Please state.

Before:

After:

3) In many countries, vaccination was given in a certain priority order. List two attributes that were actually prioritized in Japan.

4) What do you think about the effectiveness of the vaccine in preventing deaths from new coronas at this point in time? Answer with some evidence from the figure.

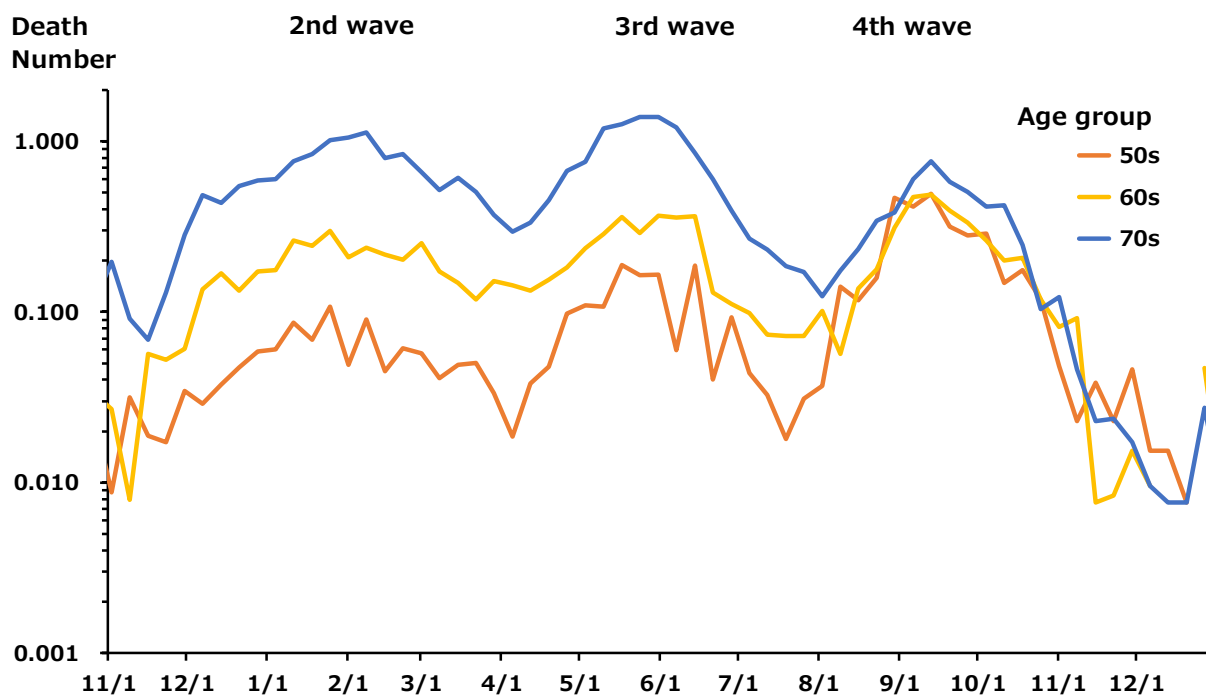


Fig.1 The number of deaths per million population due to COVID-19 in Japan

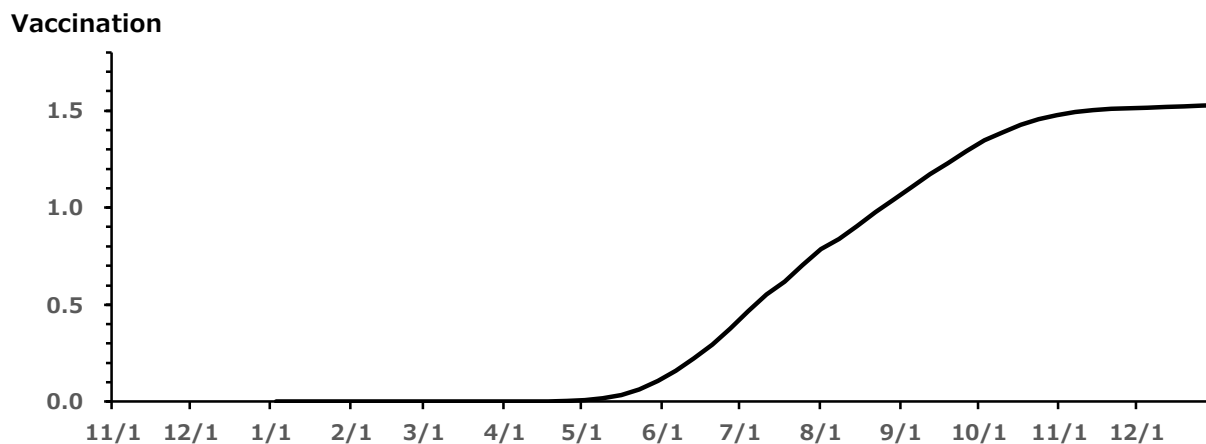


Fig.2 The average number of new corona vaccine doses in Japan

Number ()

Science Question 2: Ms. A has chosen to study stroke as the research topic for her master's program. Answer the following Questions regarding the research process.

1) Briefly explain the term “stroke”.

2) There are many different strategies for researching and developing methods of stroke prevention or treatment. Provide one example and explain.

3) Explain possible results of a two-year research project using the strategy described in Q2.

4) Describe what you expect to be the next subject to be studied after two years of research.

Number ()

Science Question 3: Answer to the following questions about mammalian cells.

1) There are various kinds of the organelles in the cytoplasm.

Write two representative organelles in the cytoplasm, and then explain its function easily

Name ()

function

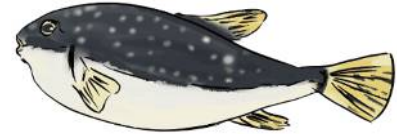
Name ()

function

2) Please explain the production process of proteins from DNA via mRNA.

Number ()

Science Question 4: Tetrodotoxin, known as blowfish poison, is tasteless, odorless, and colorless, and when it enters the human body, it inhibits and blocks nerve transmission. There is no specific drug or antidote to tetrodotoxin. Tetrodotoxin is mainly found in the liver and ovaries of blowfish, and depending on the type of blowfish, it can also be found in the skin and muscles. Answer the following questions.



Blowfish

- 1) Most blowfish farmed in fish pens (fish ponds for cultivation) are non-toxic. Why aren't farmed blowfish poisonous?

- 2) What symptoms can you expect to see in tetrodotoxin poisoning? What symptoms are considered to be the most fatal?

- 3) Please explain why the blowfish itself does not get tetrodotoxin poisoning?

- 4) Tetrodotoxin absorbed into the human body is metabolized and excreted from the body, although it takes some time. What do you think should be done to treat patients with tetrodotoxin poisoning?

- 5) If you apply tetrodotoxin in medicine, what kind of medical applications can you think of for tetrodotoxin?

Number ()

Science Question 5: Let the probability density function $f(x)$ for a continuous random variable X be given by

$$f(x) = \begin{cases} \frac{2}{x^2} & (1 \leq x \leq 2) \\ 0 & (x < 1, x > 2) \end{cases} .$$

Answer the following 4 questions.

1) Show that $f(x)$ is the probability density function of a random variable X .

2) Find the cumulative distribution function $F(x)$.

Number ()

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

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