問題①　Question①

Read the article and answer the following questions in English.

The text of the question has been omitted for copyright protection. Please refer to the following sources.

(From Kim N, NEWS AND VIEWS, *Nature,* 11 June 2025)

Question①

1. Answer the following question within 40 words each.

(1) What makes chest X-rays both widely used AND challenging for diagnosing lung diseases?

(2) How does the Ark+ model improve the interpretation of chest X-rays compared to traditional AI models?

2. According to the article, are the following statements True or False? Circle “True” or “False” on the answer sheet.

(1) Chest X-rays are rarely used for diagnosing serious respiratory conditions due to high radiation exposure.

(2) The AI model Ark+ was trained using expert annotations and can improve diagnostic accuracy for both common and rare chest diseases.

(3) Foundation models like Ark+ require complete retraining when applied to new diagnostic tasks or settings.

(4) Ark+ uses federated learning to improve performance while protecting patient data privacy.

問題②　Question②

Read the article and answer the following questions in English.

The text of the question has been omitted for copyright protection. Please refer to the following sources.

(Adapted from Montero D et.al, Two centuries of vaccination: historical and conceptual approach and future perspectives. *Front. Public Health*, 2024 Jan 9;11:1326154.)

Question②

1. Answer the following questions within 40 words each.

   (1) According to Roush et al., what was the impact of vaccination programs on vaccine-preventable diseases (VPDs) in the United States?
   (2) Why are vaccines considered important tools in the context of climate change? Name two diseases mentioned that illustrate this point.
   (3) List three reasons why vaccines help prevent or slow the development of antimicrobial resistance.

2. Are the following statements True or False? Circle “True” or “False” in the parentheses on the answer sheet.

   (1) Vaccination against measles only reduces measles-specific morbidity and has no broader health benefits.
   (2) One mechanism by which vaccines help prevent antimicrobial resistance is by decreasing the incidence of infections that would otherwise require antibiotic treatment.
   (3) The effect of herd immunity is limited to diseases transmitted by vectors such as mosquitoes.
   (4) Global increases in vaccine coverage over the past four decades have contributed to a significant reduction in vaccine-preventable diseases even in low- and middle-income countries (LMICs).

問題③　Question③

Read the article and answer the following questions in English.

The text of the question has been omitted for copyright protection. Please refer to the following sources.

(From Smriti Mallapaty, What's the secret to living to 100? Centenarian stem cells could offer clues, ***Nature***, Nov 29 (2024), doi: 10.1038/d41586-024-03886-1)

Question③

1. Answer the following questions within 40 words each.

(1) What is the stated plan for the centenarian cells that researchers aim to share, according to the article?

(2) According to unpublished results, how did centenarian-derived neurons react when a stressor was introduced?

2. According to this article, are the following statements True or False? Circle "True" or "False" on the answer sheet.

(1) George Murphy knows a centenarian who recovered from both the 1912 Spanish influenza and COVID-19 three times.

(2) The process of creating induced pluripotent stem (iPS) cells significantly alters the genetic code of the original cells.

(3) Many centenarians participating in the New England Centenarian Study were found to be cognitively healthy and self-sufficient.

(4) Preliminary studies suggest that brain cells derived from centenarians express lower levels of genes associated with protection from Alzheimer’s disease.

(5) Researchers hope to eventually use centenarian-derived iPS cells to develop mini organs.

Answers to Question ①

1. （各 30 点）

（1）Chest X-rays are widely used because they are non-invasive, fast, low-cost, and low-radiation. However, they are challenging to interpret because multiple anatomical structures are projected onto a single 2D image

（2）Ark+ continuously updates its knowledge using diverse expert annotations and handles rare diseases, data biases, and varied imaging protocols, improving diagnostic accuracy and adaptability in real-world clinical settings.

2.（各 10 点）

(1) False

(2) True

(3) False

(4) True

Answers to Question ②

1. （各 20 点：計 60 点）

(1) The study by Roush et al. showed that after vaccination programs were introduced, the incidence of 13 vaccine-preventable diseases dropped by over 90%, demonstrating the powerful effect of immunization on reducing morbidity and mortality.

(2) Vaccines are crucial in controlling climate-sensitive diseases like cholera and dengue. These diseases are spreading to new regions due to flooding, vector changes, and temperature variations.

(3) Vaccines reduce infections, lower the need for antibiotics, and limit bacterial exposure to these drugs. This reduces selective pressure and slows the development of drug-resistant bacteria.

2. （各 10 点：計 40 点）

(1) False

(2) True

(3) False

(4) True

Answers to Question ③

1. 各 25 点

(1) They plan to share the cells with other researchers to improve understanding of the factors that contribute to a long and healthy life.

(2) When a stressor was introduced, the centenarian-derived neurons efficiently and robustly switched those processes on, swiftly separating the bad proteins from the good ones at a more intense rate.

2. 各 10 点

(1) False

(2) False

(3) True

(4) False

(5) True