

第 1 問から第 4 問では、問題文の中の [] 内の数字はマークシートの間番号を示している。該当する問番号の解答記入欄に答をマークしなさい。

第 1 問 次の問 1～6 の空所 [1]～[6]に入れるのに最も適切なものを(1)～(4)から 1 つ選び、その番号をマークしなさい。

問 1. He [1] the job by the time we get back to our office.

- (1) did (2) had done (3) has done (4) will have done

問 2. He was very interested in how cow's milk was made [2] various other dairy products.

- (1) from (2) into (3) of (4) with

問 3. [3] number of people who were on this train escaped from the accident with only minor injuries.

- (1) A (2) Almost (3) Most (4) The

問 4. Thanks to his doctor's advice, he could be [4] of his alcohol addiction.

- (1) cared (2) cured (3) recovered (4) saved

問 5. The conflict between the two countries is almost on the [5] of breaking out.

- (1) behalf (2) case (3) part (4) verge

問 6. The rescue team is searching for the man and his dog [6] were carried away by the river.

- (1) that (2) what (3) which (4) whom

第2問 次の問1～4においては、それぞれ日本語の意味に合うように下の(1)～(7)の語句を並べかえて空所を補い、適切な文を完成させなさい。解答は[7]～[14]に入れるものの番号のみをマークしなさい。ただし文頭にくる文字も小文字にしてある。

問1. いっそ行かせてやったらいい。

_____ [7] _____ [8] _____.

- | | | | |
|-----------|----------|---------|---------|
| (1) as | (2) go | (3) him | (4) let |
| (5) might | (6) well | (7) you | |

問2. 構成員は変わっても、我々の理念が変わることはなかった。

_____ [9] _____, our _____ [10] _____.

- | | | | |
|-------------|----------------|------------|-------------|
| (1) changed | (2) has | (3) have | (4) members |
| (5) never | (6) philosophy | (7) though | |

問3. 彼女はこの県で最初の女性知事だ。

_____ [11] _____ [12] _____.

- | | | | |
|------------------|------------------|--------------|--------|
| (1) ever | (2) first female | (3) governor | (4) is |
| (5) prefecture's | (6) she | (7) this | |

問4. どうしてそんなに大きな車を借りたの？

_____ [13] _____ [14] _____ car?

- | | | | |
|----------|---------|-----------|----------|
| (1) a | (2) did | (3) large | (4) rent |
| (5) that | (6) why | (7) you | |

第3問 Read the interview transcript and answer the questions that follow.

第3問の問題文は、著作権の都合により掲載しておりません

第3問の問題文は、著作権の都合により
掲載しておりません

This interview transcript was created based on content in the following article:
<https://edition.cnn.com/travel/article/japan-hakone-aquarium-penguins-fish-intl-hnk/index.html>

注 otter: カワウソ

woe: 苦難

plague: ～を悩ます

sniff: ～のにおいをかぐ

hassle: 面倒

問 1. Based on the context of the interview, which phrase best fits (あ)? Write the number of your answer in [15].

(1) dealing with (2) immune to (3) to blame for (4) worried about

問 2. Based on the context of the interview, which phrase best fits (い)? Write the number of your answer in [16].

(1) affected how we feed

(2) been noticed by any of

(3) been well-received by

(4) caused issues with feeding

問 3. Which statement is the closest to what the Hakone-en representative mentions about the aquarium? Write the number of your answer in [17].

- (1) Altering the animals' diets has enabled the aquarium to reduce electricity costs.
- (2) It is unavoidable that the price of the aquarium's entrance fee will be increased.
- (3) The aquarium cut costs by displaying mackerel swimming in tanks instead of aji.
- (4) The cost of feeding the animals aji exceeds that of feeding the animals mackerel.

問 4. Which statement is the closest to what the Hakone-en representative mentions about feeding the animals? Write the number of your answer in [18].

- (1) Animals in the aquarium have gradually started to prefer mackerel to aji.
- (2) Employees have not had any reaction about changing what to feed the animals.
- (3) It was necessary to come up with new techniques to get the animals to eat.
- (4) The only way that employees can get the animals to eat now is by terrorizing them.

第4問 Read the article and answer the questions that follow.

Researchers at the Department of Energy's Oak Ridge National Laboratory (ORNL) have developed a new method for producing a key component of lithium-ion batteries.

Lithium-ion batteries — used in products from appliances to cell phones, as well as in most electric vehicles — are composed of a cathode and an anode with an electrolyte in between. Ions move from anode to cathode through the electrolyte in a reaction that converts chemical energy to electrical energy.

The drive toward decarbonization and the demand for electric cars has increased the focus on sustainably producing energy-dense cathodes. However, conventional processing presents challenges.

The first obstacle is a reliance on cobalt, a rare metal mined and refined abroad. This dependence on foreign sources poses risks to American manufacturing supply chains and transportation infrastructure.

The availability of cobalt is not the only (あ). The balance of other metals common in cathodes can also make the manufacturing process longer and more hazardous. For example, high nickel concentration has led to the widespread use of a chemical mixing method for cathode production that requires large quantities of ammonia for corrosive reactions. Using the toxic chemical increases costs, heightens health and environmental concerns, and wastes large amounts of water to reduce toxicity.

ORNL researchers report in the *Journal of Power Sources* that they have developed a cleaner, cheaper, more efficient method for making a new class of high-capacity cathode material without cobalt. Instead of continuously stirring cathode materials with chemicals in a reactor, their hydrothermal synthesis approach crystallizes the cathode using metals dissolved in ethanol. The ethanol is safer to store and handle than ammonia, and afterward it can be distilled and reused.

“This novel process offers the key advantage of moving the cathode industry to cleaner and more cost-competitive production while putting less burden on our environment,” said ORNL's Ilias Belharouak, the principal investigator for the project.

The hydrothermal synthesis method is also much faster, said ORNL lead researcher Rachid Essehli. Using this method, the time required to make particles and prepare for the next cathode batch (い).

In addition, the material produced has more uniform, round, tightly packed particles that are ideal for a cathode, Essehli said. Although the ORNL team has previously identified other cobalt-free combinations that work, the material developed through this study was better at maintaining stability throughout the battery charge cycle.

Because its properties are similar to those of today's cobalt-based cathodes, the new material can be seamlessly integrated into existing battery manufacturing processes. A patent is pending on the technology, which is ready to be scaled up for commercial production by industry, Essehli said. “This cathode material can give more energy and decrease the cost of electric car batteries,” he said.

<https://www.sciencedaily.com/releases/2022/12/221205121506.htm> (改変あり)

<https://www.ornl.gov/news/manufacturing-process-produces-better-cheaper-cathodes-lithium-ion-batteries>

注 cathode: 正極

anode: 負極

electrolyte: 電解液

decarbonization: 脱炭素化

corrosive: 腐食性の

hydrothermal synthesis: 水熱合成

ethanol: エタノール

batch: 一組

seamlessly: 継ぎ目なく

pending: 出願中の

問 1. Based on the context of the article, which of the following best fits (あ)? Write the number of your answer in [19].

- (1) benefit (2) complication (3) modification (4) similarity

問 2. Based on the context of the article, which of the following best fits (い)? Write the number of your answer in [20].

- (1) depends on the quality of the rare metal cobalt
(2) drops from as many as a few days to 12 hours
(3) increases from 12 hours to several days or more
(4) is not much different from the conventional method

問 3. Which statement is NOT true regarding the conventional manufacturing process? Write the number of your answer in [21].

- (1) It has health and environmental pollution problems.
(2) It is slower and more expensive than the new process.
(3) It needs large amounts of water to treat ammonia.
(4) Its raw material cobalt is mined and refined in the United States.

問 4. Which statement is true about the new method developed by ORNL researchers? Write the number of your answer in [22].

- (1) Ammonia dissolves more easily in water than ethanol and can be reused in the process.
(2) ORNL researchers have developed the first battery that does not use cobalt in this study.
(3) The newly developed material can be integrated into the process of manufacturing batteries already in use.
(4) The newly developed method has a longer but safer manufacturing process.

この後の第5問と第6問は記述用解答用紙に解答しなさい。

第5問 次の英文を読み、後の問いに答えなさい。

The moment a person dies, their body begins to break down as cells wither and bacteria invade. But how long does it take for a body to fully decompose?

【 あ 】

Although the process of decomposition starts within minutes of death, there are a number of variables, including the ambient temperature, soil acidity and coffin materials, which can affect how long it takes a body to skeletonize. However, on average, a body buried within a typical coffin usually starts to break down within a year, but takes up to a decade to fully decompose, leaving only the skeleton, said Daniel Wescott, director of the Forensic Anthropology Center at Texas State University.

A body buried without a coffin, which doesn't have protection from insects and other elements, typically skeletonizes within five years, according to Nicholas Passalacqua, an associate professor at the Forensic Osteology Research Station at Western Carolina University.

Decomposition itself is fairly straightforward. Once death occurs and oxygenated blood stops flowing, cells die; in a process called autolysis, cells release enzymes (especially those from the lysosomes, which contain digestive enzymes), which break down the cells themselves, as well as carbohydrates and proteins.

【 い 】

Putrefaction, or the decomposition of organic matter without oxygen by bacteria, fungi or other organisms, can turn parts of a body's skin green about 18 hours after death. This occurs simultaneously as bacteria in the abdomen rapidly multiply, creating gases that cause the body to bloat and smell. Putrefaction speeds up when the body is in a hot environment, which is why human remains are often kept in refrigerators until it's time for burial.

During this bloating stage, greenish-black blood vessels can be seen through the skin within about 24 to 48 hours of death. Eventually, the bloat collapses, and in a process known as black putrefaction, the body's organs and tissues soften, and life forms such as insects and microbes eat the remaining soft tissues, leaving the skeletal remains.

【 う 】

Decomposition significantly slows down at this skeletal stage, and it takes years or decades for the skeletal remains to disintegrate.

To delay decay, embalmers can drain the blood and other fluids from a corpse and replace it with embalming fluids they inject into the veins. These chemicals, which act as preservatives, stop the bacterial

activity that breaks down the body. Although embalming is a common practice, some religions forbid it because it is considered a desecration of the body. “If they’re embalmed, it can really change things,” Wescott said.

【 え 】

For those who are embalmed and buried in a coffin, five to 10 years is a more typical decomposition timeline, he said. At that point, the tissue is gone and only bones remain.

The quality of the embalming job also plays a role, Wescott said. When he exhumed an embalmed body buried 15 years before exhumation, he discovered that it had skeletonized in part because the coffin had broken down. Another embalmed body he exhumed had been buried only a year, and “she looked like she just died, but had some mold growing on her,” he recalled.

Location can have an impact, too. If a coffin is buried in acidic soil, it will erode faster, exposing the body to the elements, including insects, which aid the decomposition process.

【 お 】

There are a few other factors most people don’t think about, Wescott said. In an outdoor setting, obese people initially decompose more rapidly in the beginning, but slow down compared with others later in the process because maggots prefer muscle tissue over fat. Chemotherapy and antibiotics used prior to death also can have a huge impact on decay, because both kill off some of the bacteria involved in the process.

【 か 】

As odd as it sounds, the coffin’s liner might also have an influence on the pace of decomposition, Wescott said. Some materials wick fluid away from the body and could cause it to dry out, and even mummify more quickly. If the material holds moisture, the body could become soaked in its own fluids and decompose more quickly.

<https://www.livescience.com/how-long-bodies-take-to-decompose> (改変あり)

How long does it take for a body to decompose?: Future Publishing Ltd

注 decompose: ～を分解する

enzyme: 酵素

abdomen: 腹部

disintegrate: ボロボロになる

desecration: 冒瀆

maggot: 蛆

liner: 内張り

ambient: 周囲の

putrefaction: 腐敗

bloat: 膨れる、膨れ上がったもの

embalm: ～を防腐処理する

exhume: ～を発掘する

chemotherapy: 化学療法

wick: ～を吸い出す

coffin: 棺

fungi: fungus (菌類)の複数

corpse: 死体

obese: 肥満の

antibiotic: 抗生物質

問 1. 以下は、白骨化に至るまでに死体に生じる変化をまとめたものである。本文の内容に即し、空欄を日本語で埋めなさい。

- ・ 細胞が自身の放出した酵素により分解される。
↓
- ・ 、同時に
↓
- ・ 発生したガスにより、
それとともに、
↓
- ・
↓
- ・ 残った軟部組織が昆虫や微生物に食べられる。
↓
- ・ 骨だけが残る。

問 2. 防腐処理を施す場合、どのようなことが行われるか、本文の内容に即して日本語で答えなさい。

問 3. 死体の分解にかかる時間に影響する要因にはどのようなものがあるか、本文の内容に即し、解答欄の 3 つの例に続けて日本語で全て挙げなさい。

問 4. 次の段落は本文のどの位置に置くのが最も適切か、【あ】～【か】の記号で答えなさい。

As an example, he pointed to the case of slain civil rights leader Medgar Evers, who was buried in 1963 after being embalmed. When his body was exhumed for evidence in a 1991 murder trial, Wescott said, “his body was so well preserved that they let his son in to see him.”

注 slain: slay (～を殺害する)の過去分詞

embalm: ～を防腐処理する

exhume: ～を発掘する

第6問 次の英文を読み、下線部(1)～(3)の日本語の内容を英語にきなさい。

Guinea worm disease, an infection caused by the Guinea worm and associated with severe pain, is now one step away from being eradicated. The disease mainly affects remote parts of Africa, with the number of annual human cases hitting 3.5 million in the 1980s. (1)しかし、アメリカのある NGO が中心となってその病気を撲滅しようとしてきたおかげで、今年はその数が 8 月現在でわずか 6 例にまで減少している。

Yu Fujita, 47, an Osaka-based doctor who has worked in Togo in West Africa as a member of that NGO, said the disease, a symbol of poverty, must be swiftly and completely eliminated.

Fujita worked on Guinea worm disease eradication efforts in Togo as a member of the Carter Center from 2003 to 2004. She remembers when, not yet a licensed doctor, she helped treat a woman infected with Guinea worm disease in a village in northern Togo. Fujita said the woman screamed from the severe pain in her leg, and yelled, “It hurts more than giving birth!” Fujita held her down for treatment as she rolled about in pain.

Guinea worm is a parasite that lives mainly in sub-Saharan Africa. People become infected with Guinea worms by drinking unfiltered water from ponds and other stagnant water where the worms parasitize copepods, or “water fleas.”

The worm grows inside humans, causing a blister to develop on the skin. The blister gradually increases in size, causing a burning pain. It can eventually rupture, exposing the worm.

There are no drugs to kill the worm or vaccinations to prevent infection. The only cure is to remove the worm from the wound.

(2)その病気による死亡率は低い、激しい痛みが長期間続き、感染者は仕事や家事ができなくなってしまう。

The infected person might put the affected body part in pond water to ease the symptoms. On contact with water, the worm discharges larvae into the water, spreading the infection.

“It was a cause of greater poverty for them,” Fujita said.

The infection can be prevented by not drinking water that carries the worms, and efforts have been made to build safe wells and distribute filters to remove water fleas.

But it is not easy to change the lifestyles of locals. (3)井戸が作られた後も、多くの住民は飲み慣れている池の水のほうがおいしいと言って、それを使用しなかった。 In some cases, they continued to use filters after they were broken.

The Carter Center, founded by former U.S. President Jimmy Carter, has been leading eradication efforts since 1986, focusing on providing residents with easy-to-understand information about Guinea worm disease and how to prevent it.

Fujita and others explained the effects of filters in a narrative style through plays and picture-based storytelling. They also asked reliable villagers to be local leaders and to report infections as soon as they found them.

Thanks to such efforts, the number of infections has dropped dramatically.

注 stagnant: よどんだ
blister: 水疱

copepod: カイアシ類
rupture: 破裂する

water flea: ミジンコ
larva: 幼虫