S K

令和5年度 外国語 英語

問題冊子

注意事項

1. 監督者の指示があるまで，問題冊子を開かないこと。
2. 問題冊子は，13ページに組んである。
   なお，落丁，乱丁及び印刷不鮮明なものがあれば，すぐに申し出ること。
3. **解答用紙に必ず本学の受験番号，氏名を記入すること。各解答用紙に受験番号欄が2箇所，氏名欄が1箇所ある。**
4. 解答は，解答用紙の指定された解答欄に記入すること。異なる解答用紙・解答欄に記入されたものは採点されない。
5. 記入した解答用紙は，裏返して机上に置くこと。
6. 解答用紙の※欄は記入しないこと。
7. 試験終了後，問題冊子は持ち帰ること。

1 次の英文を読んで，後の設問に答えなさい。＊印のある語句は本文の後に注がある。

According to the World Health Organization (WHO), the world is going hungry. WHO data shows that in 2018, the most recent year for which data is available, 820 million people lacked enough food to eat, an increase of nine million people over the year before.

(1) Hunger kills plenty of people worldwide. It also impacts those who survive, causing serious childhood development issues like stunting, where children are too short for their age, and wasting, where they're too thin for their age.

The explosion in our planet's population is a major factor in there not being enough food to go around. Since 1950, the global population has grown from 2.6 billion people to almost eight billion people in 2021, according to the United Nations. That growth is continuing apace*, with the world's population estimated to increase by another two billion people by 2050.

To solve problems such as explosive population growth, new solutions are required.

Artificial intelligence (AI) is one of those solutions. AI systems — including machine learning and deep learning systems — are increasingly using large datasets and robust* computer science techniques to improve crop yields*, boost farm productivity, and prevent disease (2) destroying crops.

The result is what Ananth Kalyanaraman calls a "revolution" in agriculture. Kalyanaraman is the director of the USDA-NIFA Institute for Agricultural AI for Transforming Workforce and Decision Support at Washington State University, a research institute dedicated to (3) AI to solve tough agricultural problems. Known familiarly as the AgAID Institute, it is one of 11 AI-focused research institutes (4) launched by the National Science

Foundation (NSF) to figure out how AI, machine learning, deep learning, and other next-generation technologies can solve hunger issues worldwide.

The AgAID Institute is funded by the U.S. Department of Agriculture's National Institute of Food and Agriculture. Federal investment in outfits* like AgAID signals that the war on hunger will not be won by people alone; (5) it will be won through a creative combination of human and artificial intelligence.

A key application of AI in agriculture is the use of intelligent and autonomous robots, says George Papakostas, a professor in the Department of Computer and Informatics Engineering of the Eastern Macedonia and Thrace Institute of Technology, Greece, and an (6) acknowledged expert on the use of computer vision in agriculture. "Agrobots" use computer vision to execute agricultural tasks like planting and harvesting without human supervision*. They increase crop yields by working both faster and longer than humans.

"Agrobots are able to make decisions based on the knowledge they have acquired through the training process with big data and to perform tasks seamlessly with precision and speed," says Papakostas.

These robots are not just better at such agricultural jobs than humans; they also do jobs humans don't want. "The lack of experienced and specialized staff [in the agricultural sector] due to urbanization" is a huge problem, says Papakostas, who adds that autonomous robots directed by AI can address this problem by providing a workforce able to plant, weed, and harvest 24 hours a day, seven days a week.

Automation is one area where AI makes agriculture better able to feed the world's hungry people. Prediction is another.

AI is used to detect and predict diseases in crops. AI techniques process the data received from Internet of Things (IoT)*, sensors that monitor climatic, environmental, and visual information from the surface, soil, and microclimate* of crops. This data is then used to train deep learning models that can forecast the likelihood of disease developing in certain types of crops, says Papakostas.

The result? Intelligent crop disease surveillance* systems that make it much easier to predict yields and spot diseases before they wipe out (7) entire crops in which farmers have invested a fortune, says George Kantor, a researcher at the Robotics Institute of Carnegie Mellon University.

"Early disease detection capabilities can feed into* precision spraying equipment for targeted application of the necessary treatment," says Kantor. "This can dramatically reduce chemical inputs used by farmers, which both saves on production costs and reduces environmental impact."

AI also (8) [(ア) further (イ) go (ウ) it (エ) makes (オ) one step (カ) possible (キ) to] in disease prevention: we no longer need to grow certain crops to predict what could affect them, says James Schnable, an associate professor and Dr. Charles O. Gardner Professor of Agronomy in the Department of Agronomy & Horticulture at the University of Nebraska-Lincoln. "I'm most excited about the development and deployment of digital twins (9): virtual counterparts of real-world plants that allow us to experiment and predict how plants will respond in different environments," he says.

Schnable's work on digital twins also is funded by the NSF. These virtual creations allow farmers to game out* the outcomes of different crop management decisions, such as when to apply fertilizer* or how much irrigation* water to use. Digital twins help farmers both increase current crop efficiency and anticipate (10) future growing conditions before they become a problem.

This is important because today's plant breeders* are producing tomorrow's crops.

"A plant breeder working today is developing new varieties for farmers to grow in 2030," says Schnable. "Yet, we don't have access to the environments of Nebraska in 2030, or Rwanda in 2030. In order to overcome this challenge, we need to be able to predict how crop varieties will perform in environments that won't exist for another 10 to 15 years. That's where artificial intelligence and machine learning come in."

Despite general crop yield gains, says Schnable, field tests are still needed to determine which crops will grow best using which methods in certain areas.

"Field tests conducted in Missouri won't predict which crop varieties have the potential to be the most resilient* or produce the most yield in Nebraska," he says. "Field tests conducted in Kenya won't predict which crop varieties have the potential to be the most resilient or produce the most yield in Rwanda."

AI and machine learning models are critical to simulating different conditions at scale*.

One application of this principle may be seen in work being done by Timothy Smith and Zhenong Jin at the University of Minnesota. In their most recent paper, the two researchers built a series of machine learning prediction models regarding the Corn Belt of the U.S., the premier corn-producing area of the country. The predictions simulated sustainability conditions across farms, (11) farmers to identify problem areas that reduce crop health, output, and yields.

(注)

apace：急速に　robust：頑健な　yields：生産高　outfits：組織

supervision：監督

Internet of Things (IoT)：あらゆる物をインターネットに接続する技術

microclimate：微気象　surveillance：監視　feed into：影響を与える

game out：シミュレーションをする　fertilizer：肥料　irrigation：灌漑

plant breeders：植物の品種改良をする人々　resilient：耐性のある

at scale：大規模に

出典：Kugler, Logan, "Artificial Intelligence, Machine Learning, and the Fight Against World Hunger," *Communications of the ACM*, Vol. 65, No. 2, 2022.（一部改変）

1. 下線部(1), (4), (6), (7), (10)の語句の本文中での意味にもっとも近いものを，それぞれ(ア)～(エ)から１つ選び，記号で答えなさい。

(1) Hunger

(ア) Drought

(イ) Epidemic

(ウ) Plague

(エ) Starvation

(4) launched

(ア) allowed

(イ) funded

(ウ) purchased

(エ) started

(6) acknowledged

(ア) despised

(イ) famous

(ウ) kind

(エ) visiting

(7) wipe out

(ア) cut in

(イ) destroy

(ウ) dry off

(エ) reap

(10) anticipate

(ア) expect

(イ) make

(ウ) participate

(エ) store

2. 空所(2), (3), (11)に入る語句としてもっとも適切なものを，(ア)～(エ)からそれぞれ1つ選び，記号で答えなさい。

(2)

(ア) by

(イ) from

(ウ) in

(エ) to

(3)

(ア) develop

(イ) developed

(ウ) developing

(エ) have developed

(11)

(ア) allow

(イ) allowed

(ウ) allowing

(エ) allows

3. 本文によれば，2050年までに世界の人口は何人に到達すると推定されると述べられているか。以下のうちでもっとも近い数字を(ア)～(オ)から1つ選び，記号で答えなさい。

(ア) 10億人 (イ) 20億人 (ウ) 26億人 (エ) 80億人 (オ) 100億人

4. 下線部(5)を，it が指すものを明らかにして日本語に訳しなさい。

5. 下線部(8)の語句を文意が通じるように並べかえ，文を完成させなさい。解答は，2番目と5番目にくる語句を選び，(ア)～(キ)の記号で答えなさい。

6. 下線部(9)を含む段落において，digital twins により我々は何ができると Schnable 氏が述べているか。句読点を含めて 40 字以内の日本語で説明しなさい。

7. 本文の内容に合致するものを，次の(ア)~(カ)から 2 つ選び，記号で答えなさい。

(ア) Due to significant advances in virtual plants, or digital twins, AI can predict which crops grow best, making field tests unnecessary now.

(イ) Kenya and Rwanda are famous for producing corn.

(ウ) Intelligent and autonomous robots not only work faster and longer than humans but also do jobs that humans are reluctant to do.

(エ) The AgAID institute claims that AI can solve the problem of world hunger without the help of humans.

(オ) The combination of AI and IoT can predict the probability of disease in certain types of crops.

(カ) The two main areas where AI makes agriculture better are breeding and genetic engineering.

2 次の英文を読んで，後の設問に答えなさい。＊印のある語句は本文の後に注がある。

It is almost impossible for most of us to imagine growing up without language — (1) <u>which develops in our minds so effortlessly in early childhood and plays such a central role in defining us as human</u>. Nevertheless, being deprived of language (2) <u>occasionally</u> happens in some exceptional circumstances. In recent centuries children have been found living in the wild, reportedly raised by wolves or other animals and deprived of human contact. One of the most famous cases is that of Victor, the 'wild boy of Aveyron*', immortalized* in a film by Francois Truffaut called *The Wild Child* (*L'Enfant Sauvage*)*.

It is hard to know the real stories behind these cases, but they are all strikingly similar (3) <u>with respect to</u> language. The pattern from all these cases is that only those rescued *early* in childhood developed any fluency or grammar. Those found after about nine years of age learned only a few words or failed to learn language at all.

We also know cases in which children grew up in social or linguistic isolation because of tragic family circumstances. One of the best-known of these is the case of Genie, whose childhood was one of extreme neglect, deprivation, and abuse. For over twelve years, her father shut her away in a small bedroom, tied with a harness* to an infant potty* seat. When her blind mother finally escaped with Genie in the early 1970s and applied for welfare, the police (4) <u>intervened</u>, and Genie was put in the rehabilitation ward* of a children's hospital. She was thirteen and a half years old and knew no language.

Genie was studied by linguists and other professionals for almost a decade. She was of normal intelligence; she rapidly learned words within a few months after her discovery, and soon began to combine them. However, she failed to use grammatical elements like tense or agreement markers, articles, pronouns, or question words — the pieces of English that turn a string of words into grammatical speech. Most of her linguistic development consisted of learning more words and stringing them together into longer, semantically* coherent (5) utterances. In context, she could make herself understood. However, her speech did not adhere to standard English subject-verb-object word order. She appeared to comprehend more than she could produce, but even after many years, she developed little knowledge of grammar (6). Interestingly, Genie was a powerful non-verbal communicator, providing strong evidence that language is not the same as communication.

In contrast, (7) [(ア) are (イ) as (ウ) as (エ) children without hearing (オ) handicapped (カ) not] Genie. They can develop language and relate normally to others through signing — as long as language development starts early. There are a number of studies that show that the sooner a deaf child is exposed to a natural sign language, such as American Sign Language, the more proficient (8) a signer he or she will become. As in other cases of linguistic isolation, the ability of deaf people to learn new words is not affected by the age at which they are exposed to language. But their ability to learn grammar is dramatically affected. Studies of deaf children first exposed to sign language after the pre-school years show that there is a critical window for grammatical development (9), which ends, perhaps, in the early school-age years.

Exciting evidence that a child brings something unique and necessary to language development comes from the creation of a new sign language in Nicaragua. After the Sandinista* movement came to power there in 1979, for the first time deaf teenagers and adults had the opportunity to form a Deaf community (Deaf with a capital 'D' indicates the connection to Deaf culture and identity; deaf with a small 'd' refers to hearing loss not connected to Deaf identity).

This first generation created a rudimentary (10) system of gestures for communication. But when young children, under the age of ten, joined this community, they transformed this system into a real language, embodying the structural elements and characteristics that define all human grammars. Over a very few years, that language has become increasingly rich and complex grammatically.

Like other cases of linguistic isolation after early childhood is the case of Chelsea, a deaf woman from a loving, *hearing* family who used no signs. Chelsea was first exposed to language (signed and spoken English) in her thirties. She is normal psycho-socially, reflecting her loving family, but despite decades of teaching and exposure, she learned only (11) and never developed any (12) at all.

Provocatively*, grammar acquisition may be crucial for triggering normal organization of higher cognition* in the brain. Genie, Chelsea, and other late learners of a first language failed to develop a normal pattern of neural* organization for language and other mental faculties, suggesting a crucial role for grammar, perhaps *the* trigger for the way the brain organizes cognition in humans.

(注)

Aveyron：フランスのアヴェロン県　immortalized：名が後世に伝えられた
The Wild Child (*L'Enfant Sauvage*)：『野性の少年』
harness：安全ベルト　potty：幼児用便器　ward：病棟
semantically：意味的に　Sandinista：ニカラグアの革命家集団
provocatively：興味をそそることに　cognition：認知　neural：神経の

出典：Curtiss, Susan, "What Happens If You Are Raised Without Language?" *The Five-Minute Linguist: Bite-Sized Essays on Language and Languages*, Third Edition, ed. by Myrick Caroline and Walt Wolfram, 65–67, Equinox, 2019. (一部改変)

1. 下線部(1)を，which が指すものを明らかにして日本語に訳しなさい。

2. 下線部(2)，(3)，(4)，(5)，(8)，(10)の語句の本文中での意味にもっとも近いものを，それぞれ(ア)～(エ)から 1 つ選び，記号で答えなさい。

(2) occasionally

(ア) always

(イ) never

(ウ) seldom

(エ) sometimes

(3) with respect to

(ア) against

(イ) beyond

(ウ) concerning

(エ) toward

(4) intervened

(ア) came out

(イ) dropped by

(ウ) passed away

(エ) stepped in

(5) coherent

(ア) average

(イ) clear

(ウ) empty

(エ) similar

(8) proficient

(ア) active

(イ) passive

(ウ) poor

(エ) skilled

(10) rudimentary

(ア) basic

(イ) complex

(ウ) possible

(エ) verbal

3. 下線部(6)のような結果になった理由は何か。句読点を含めて 40 字程度の日本語で説明しなさい。

4. 下線部(7)の語句を文意が通じるように並べかえ，文を完成させなさい。解答は，3 番目と 5 番目にくる語句を選び，(ア)〜(カ)の記号で答えなさい。

5. 下線部(9)によって筆者が意図していることにもっとも近いものを，次の(ア)〜(エ)から 1 つ選び，記号で答えなさい。

(ア) a considerable amount of experience which has a negative effect on children's grammatical development

(イ) a crucial period of time in which children can acquire the grammar of a language, after which further grammatical development becomes much more difficult

(ウ) a limit to the number of grammatical concepts that children can acquire at a certain period of their development

(エ) an important stage when children feel worried about correct grammatical usage

6. 空所(11), (12)に入る語の組み合わせとして, もっとも適切なものを, (ア)〜(エ)から1つ選び, 記号で答えなさい。

	(11)	(12)
(ア)	grammar	intelligence
(イ)	intelligence	vocabulary
(ウ)	vocabulary	grammar
(エ)	vocabulary	intelligence

7. 本文の内容に合致するものを, 次の(ア)〜(キ)から3つ選び, 記号で答えなさい。

(ア) Chelsea did not start learning language until her thirties.

(イ) Genie's knowledge of subject-verb-object word order became that of a mature native speaker.

(ウ) Genie spent her days physically restrained but exposed to language.

(エ) Late learners of a first language have the same neural organization for language as those who acquire the language at a normal age.

(オ) Like people who are raised without language, deaf people can learn new words regardless of the age at which they are exposed to language.

(カ) The ability to learn grammar is affected by intelligence.

(キ) Young deaf people who had begun learning a sign language in a Deaf community managed to develop it into a grammatically rich language.