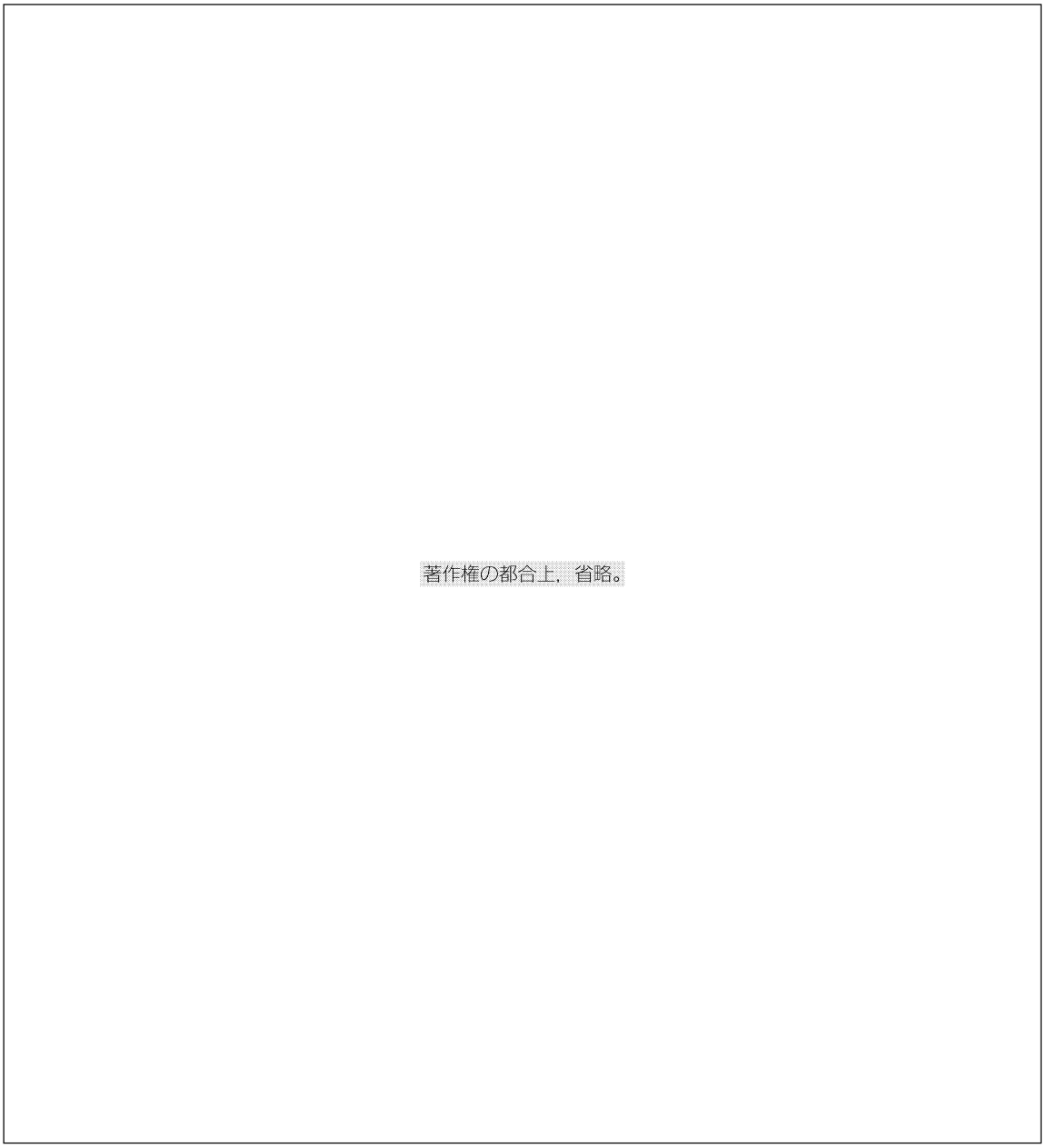
I　以下の英文は，アメリカ合衆国の実業家で慈善活動家でもある Bill Gates が 2015 年にスライドを使用しながら行った講演の記録である。この英文を読み，マーク記入式設問 1 ～ 8 に答えなさい。本文中の丸数字①～⑮は段落番号を表す。



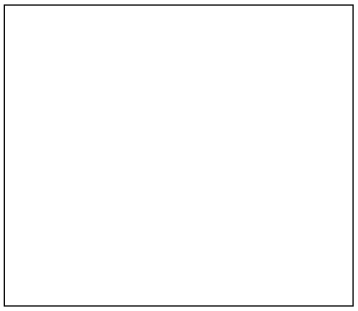
［Adapted from Gates, B. (2015, March). Bill Gates: The next outbreak? We're not ready ［Video］. Retrieved from https://www.ted.com/talks/bill_gates_the_next_outbreak_we_re_not_ready］

注 *hunker down = かがむ　*microbe = 病原菌　* deterrent = 抑止力
*epidemic = 伝染病　*eradication = 撲滅
*Médecins Sans Frontières = 国境なき医師団（民間の非政府組織）
*orchestrate = ～を編成する　*diagnostics = 診断
*plasma = 血しょう; 血液の液状成分　*devastating = 壊滅的な
*contagious = 伝染しやすい　*pathogen = 病原体　*deploy = 配置につく

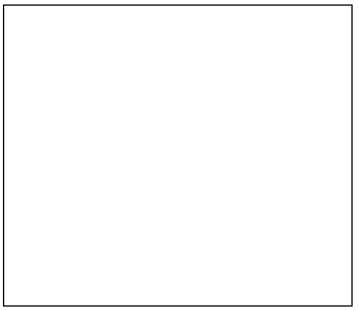
*logistics = 物流　　*germ = 細菌　　*hoard = 買いだめする

マーク記入式設問

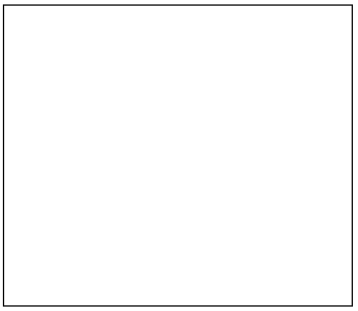
1．本文中の下線部(1-A)（本文①段落目），(1-B)～(1-C)（それぞれ本文②段落目），(1-D)（本文⑥段落目），(1-E)（本文⑨段落目）を説明する際に用いるスライドとして最も適切なものを，それぞれ次のａ～ｉの中から１つ選びマークしなさい。



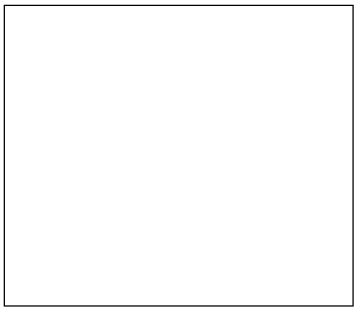
ａ．



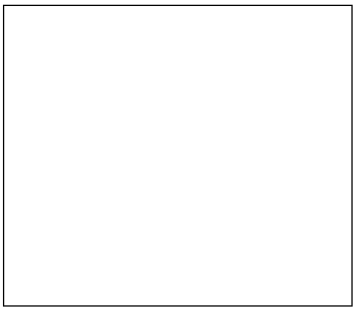
ｂ．



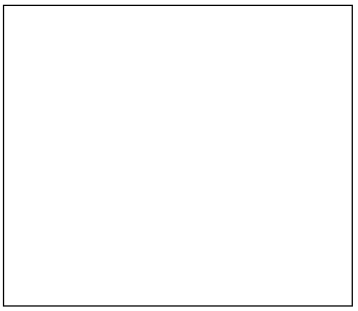
ｃ．



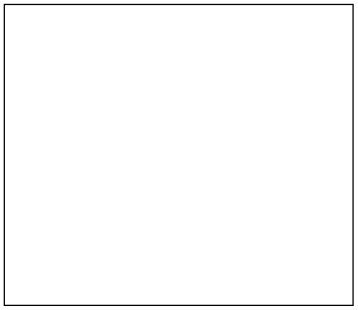
ｄ．



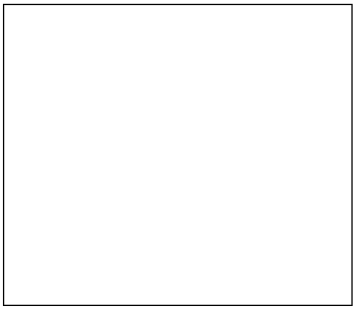
ｅ．



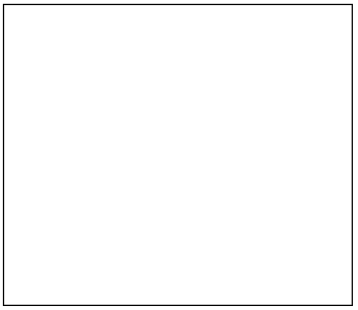
ｆ．



ｇ．



ｈ．



ｉ．

スライドの写真は著作権の都合上，省略。

2．本文中の下線部(2)（本文④段落目）の空所に入れるべき最も適切な語句を，次のａ～ｄから選びなさい。

ａ．went　　ｂ．have gone　　ｃ．had gone　　ｄ．would have gone

3．本文中の空所下線部(3-A)（本文④段落目）および(3-B)（本文⑥段落目）について，以下に示す語句を並べ替えて文を完成させたい。並べ替えた後に５番目に配置される語句の記号をそれぞれ次のａ～ｇの中から１つ選びマークしなさい。ただし，文の先頭の語も小文字で示されている。

(3-A)　a．before　b．was　c．put online　d．delayed
　　e．they　f．very　g．were

(3-B)　a．they're　b．are　c．bedridden　d．sick
　　e．so　f．most people　g．that

4．本文中の空所下線部(4-A)（本文④段落目），(4-B)（本文⑥段落目），(4-C)（本文⑦段落目），(4-D)（本文⑧段落目），(4-E)（本文⑩段落目），(4-F)（本文⑫段落目）に入れるべき最も適切な単語を，それぞれ次のａ～ｆの中から１つ選びマークしなさい。ただし，文の先頭の語も小文字で示されていて，各選択肢は一度しか使えない。

a．from　b．for　c．over　d．as　e．with　f．like

5．本文中の下線部(5)（本文⑤段落目）の <u>save the day</u> の訳として最も適切なものを，次のａ～ｄの中から１つ選びマークしなさい。

a．一日中仕事をする　b．時間を節約する
c．問題を解決する　d．歓迎される

6．本文中の空所下線部(6-A)（本文⑧段落目），(6-B)（本文⑨段落目），(6-C)（本文⑬段落目）に入れる最も適切な語句を，それぞれ次のａ～ｃの中から１つ選びマークしなさい。ただし，各選択肢は一度しか使えない。

a．concerned　b．a priority　c．the benefits

7．本文中の空所下線部(7)（本文⑪段落目）に入れるべき最も適切な単語を，次のａ～ｄの中から１つ選びマークしなさい。

a．get　b．bear　c．give　d．have

8．本文の内容と一致するものを次のａ～ｆの中から２つ選び，１つの解答欄に１つずつマークしなさい。解答欄にマークする正答の順序は問わないが，１つの解答欄に２つ以上マークすると減点の対象となる。

ａ．Ebola can be transmitted through the air.

ｂ．Ebola quickly spread all around the globe in 2014.

ｃ．Spanish Flu cases decreased thanks to advanced tools.

ｄ．Simulation is effective in preventing infections.

ｅ．A good health system will enable early detection of an epidemic.

ｆ．We should store food and water in preparation for the next pandemic.

Ⅱ　以下の英文は，AI（人工知能）を訓練することがひいては気候にリスクを与えてしまうことについての解説である。この英文を読み，マーク記入式設問１～５と記述式設問Ⅱ-1～Ⅱ-3に答えなさい。本文中の丸数字①～⑯は段落番号を表す。

Training AI to be really smart poses risks to climate

① Artificial intelligence — or AI — is the computer code that allows a machine to do something that normally requires a human brain. On TikTok, for instance, AI sorts the (1)posts so that the first ones you see are likely to be those you'd prefer. AI serves up the useful results of every Google search. When you ask Siri to play Taylor Swift, AI turns your speech (2-A)(_____) a command to start her songs. But before an AI can do (3)any of that, developers must train it. And that training *devours energy. A lot of it. In fact, that training's appetite for energy could soon become a huge problem, researchers now worry.

② The energy to develop AI comes out of the electrical grid. And in most parts of the world, making electricity *spews carbon dioxide (CO_2) and other *greenhouse gases into the air. To compare how different activities affect the climate, researchers often combine the impacts of all greenhouse gases into what they call CO_2 *equivalents. In 2019, researchers at the University of Massachusetts Amherst calculated the impact of developing an AI model named Transformer. It released a *whopping 626,000 pounds of CO_2 equivalents. That's equal to the greenhouse gases that would be spewed by five American cars from when they were made (2-B)(_____) when they were junked.

③ Only the largest, most complex models use that much energy. But AI models are rapidly growing ever larger and power hungry. Some AI experts have sounded an alarm about the threat these *energy hogs pose.

Deep learning

④ Transformer can analyze text, then translate or summarize it. This AI model uses a type of machine learning that has *skyrocketed in popularity. Called deep learning, it produces AI that *excels at finding and matching patterns. But first, the system has to practice, a process known as training.

⑤ To translate between English and Chinese, for example, an AI model may *churn through millions or even billions of translated books and articles. In this way, it learns which words and phrases match. Later, when given new text, it can suggest its own translation.

⑥ Thanks to deep learning, computers can *sift through mountains of data to make quick, useful, smart decisions. Engineers have built AI that can direct self-driving cars or recognize emotions in human faces. Other models find cancer in medical images or help researchers discover new drugs. This technology is changing the world. It comes at a cost, however.

⑦ The best deep-learning models are the *behemoths of the AI world. Training them requires huge amounts of computer processing. They train on a type of computer hardware called graphics processing units(GPUs). They're the same things that run the graphics for a realistic video game. (4)(_____), explains Lasse F. Wolff Anthony. He's a student in Switzerland at *ETH Zurich, a technical university. "The longer [the GPUs] run," he adds, "the more energy they use."

⑧ Today, most AI development happens at data centers. These computer-filled buildings account for only some 2 percent U.S. electricity use and 1 percent of global energy use. And AI development takes (2-C)(_____) only a tiny share of any data center's workload. But AI's energy impact already is "big enough that 【記述式設問Ⅱ-1】it's worth stopping and thinking about it," argues Emily M. Bender. She's a *computational linguist. She works at the University of Washington in Seattle.

⑨ One common measure of the size of a deep-learning model is how many parameters it has. These are what get *tweaked during training. Those parameters allow a model to recognize patterns. Models that find patterns in language, such as Transformer, tend to have 【記述式設問Ⅱ-2】the most. Transformer contains 213 million parameters. One of the world's biggest language models of 2019, GPT-2, has 1.5 billion parameters. The 2020 version, GPT-3, contains 175 billion parameters. Language models also train on huge amounts of data, such as all the books and articles and web pages written in English on the internet. And, keep (2-D)(_____) mind, those data available for training grow month by month, year by year. Bigger models and larger sets of training data usually make a model

better at recognizing patterns. But there's a downside. As models and datasets grow, they tend to need more GPUs or longer training times. So they also devour more electricity.

Sounding the alarm

⑩ Bender had been watching this trend (2-E)(_____) concern. Eventually, she got together with a group of experts from Google to say something about it. This team wrote a March 2021 paper that argues AI language models are getting too big. Instead of creating ever larger models, the paper says researchers should ask themselves: Is this necessary? If it is, could we make it more efficient? The paper also pointed out that rich groups benefit the most from AI language models. In contrast, people living in poverty suffer most of the harm from climate-change-related disasters. Many of these people speak languages other than English and there may be no large AI models focusing on their languages. "Is this fair?" asks Bender.

⑪ Even before it was published, her group's new paper sparked a controversy. Google asked its employees to remove their names from it. One of those people, Timnit Gebru, *co-led Google's AI ethics team. Ethics is the study of what is right or wrong. When she wouldn't take her name off, Google fired her, she reported on Twitter. Meanwhile, the company kept (2-F)(_____) its work on the biggest language model yet. In January 2021, it announced this model had a whopping 1.6 trillion parameters.

Leaner and greener

⑫ The new paper by Bender and Gebru's team raises "a very important discussion," says Roy Schwartz. He's a computer scientist at The Hebrew University in Jerusalem, Israel. The climate impact of AI training is not huge. 【記述式設問Ⅱ-3】At least not yet. But, he adds, "I'm seeing a troubling trend." Emissions from the training and use of AI models will grow ever larger — and soon, he suspects. Sasha Luccioni agrees. This researcher at MILA, an AI institute in Montreal, Canada, also finds the rapid growth of these models as "worrying." Usually, Schwartz says, AI developers report only how well their models work. They compete on their accuracy in completing tasks. How much energy they use is all but ignored. Schwartz calls this Red AI.

⑬ In contrast, green AI focuses on boosting a model's efficiency, he explains. That means getting the same or better results using less computing power or energy. You don't necessarily have to shrink your model to do this. Since computer processing is complex, engineers can find ways to use less computing power without cutting the number of parameters. And some types of computer hardware can provide that power while sipping much less electricity than others.

⑭ Right now, few developers share their model's efficiency or energy-use data. Schwartz has called (2-G)(_____) AI developers to disclose them. And he's not alone in asking for this. A new annual workshop for AI developers *convened for the first time in 2020. Its goal: to encourage simpler, more efficient AI language models.

⑮ Wolff Anthony teamed up with Benjamin Kanding, a student at the University of Copenhagen in Denmark, to create one new tool. It helps AI developers estimate the environmental impacts of their AI — such as energy or CO_2 use — before they train them. Luccioni created a different tool. It tracks the CO_2 emissions as a model goes through training.

⑯ Another way to make models greener is to carefully select the data center where a model trains. "If you train in Sweden," says Kanding, "most of the energy comes from sustainable sources." By that, he means wind, solar or wood-burning. Timing matters, too. At night, more electricity is available as most human users sleep. Some utilities charge less for that off-peak energy, too, or can use cleaner sources to produce it. Deep learning is an incredible and powerful technology. But it will offer the most benefits when used wisely, fairly and efficiently.

[Adapted from "Training AI to be really smart poses risks to climate", *Science News for Students,* Kathryn Hulick, https://www.sciencenewsforstudents.org/article/training-ai-energy-emissions-climate-risk, Retrieved on June 25th, 2021.]

注 *devour = むさぼり食う　*spew = 大量に吐き出す
*greenhouse gas = 温室効果ガス　*equivalent = 換算
*whopping = とてつもなく多い　*energy hog = エネルギーを大量消費するもの
*skyrocket = 急上昇する　*excel = 秀でる

*churn through ～ = ～を処理する　　*sift = ふるいにかける

*behemoth = 巨大で強力なもの　　*ETH Zurich = チューリッヒ工科大学

*computational linguist = 計算言語学者　　*tweak = 微調整する

*co-led =（co-lead の過去形）共同で率いた　　*convene = 開催される

マーク記入式設問

1．下線部(1)'posts'（本文①段落目）と同じ意味で用いられている post または posts を，次の a ～ e の中から 1 つ選びマークしなさい。

a．Large gate posts are lined up along this street.

b．She got a teaching post at this school a few years ago.

c．I'll put a letter in the post at the corner.

d．The Internet newgroup is very active, with over 50 posts per day.

e．The police officer is not allowed to leave his posts.

2．下線部(2-A)（本文①段落目），(2-B)（本文②段落目），(2-C)（本文⑧段落目），(2-D)（本文⑨段落目），(2-E)（本文⑩段落目），(2-F)（本文⑪段落目），(2-G)（本文⑭段落目）の空所に入れるべき最も適切なものを，それぞれ次の a ～ d の中から 1 つ選びマークしなさい。

(2-A)	a．at	b．for	c．into	d．on
(2-B)	a．by	b．to	c．then	d．with
(2-C)	a．in	b．on	c．up	d．with
(2-D)	a．for	b．in	c．of	d．on
(2-E)	a．at	b．for	c．in	d．with
(2-F)	a．at	b．by	c．in	d．on
(2-G)	a．at	b．in	c．on	d．to

3．下線部(3)'any of that'（本文①段落目）が指す事柄で，本文の内容に合う最も適切なものを，次の a ～ e の中から 1 つ選びマークしなさい。

a．多くの学習用データを集めること

b．GPU をたくさん使うこと

c．予測した結果を提示すること

d．高性能なコンピュータを作ること

e．たくさんのエネルギーを使うこと

4．下線部(4)（本文⑦段落目）の空欄には「1つの AI モデルを1回訓練するのに，数週間または数か月間稼動する数百の GPU を必要とするかもしれない」という内容の英文が入る。この英文を It で始まるように作成するとき，It を除いて4番目と8番目に来るものを，次のａ～ｋの中から1つずつ選びマークしなさい。

a．for	b．of GPUs	c．hundreds	d．may
e．one AI model	f．one time	g．running	h．take
i．to	j．train	k．weeks or months	

5．本文の内容と合うものを次のａ～ｆの中から2つ選びマークしなさい。

a．AI モデルは，5台の米国産車の製造から廃車までの CO_2 排出量を予測できる。

b．Google 社は自社に都合の悪い論文を発表した社員を解雇した。

c．AI 研究者は，さらに強力な Red AI を開発するべきである。

d．言語を翻訳する AI モデルは，世界的な見地から公平ではないかもしれない。

e．AI で使われる GPU はグラフィック処理用のものと明らかに異なる。

f．AI が気候に変動を与える心配はないということは明白である。

記述式設問

Ⅱ-1．下線部【記述式設問Ⅱ-1】'it's worth stopping and thinking about it,'（本文⑧段落目）の和訳を記述式解答欄Ⅱ-1に日本語で記入しなさい。

Ⅱ-2．下線部【記述式設問Ⅱ-2】'the most'（本文⑨段落目）は何を指して most と言っているか，本文からその単語を抜き出して記述式解答欄Ⅱ-2に記入しなさい。

Ⅱ-3．下線部【記述式設問Ⅱ-3】'At least not yet.'（本文⑫段落目）の意味を，本文の内容に合わせて適切な言葉を補って下記のように訳したい。空欄に当てはまる言葉を記述式解答欄Ⅱ-3に日本語で記入しなさい。

少なくとも今はまだ［　　］ない。

Ⅲ 以下の英文を読んで，記述式設問１～２に答えなさい。

When I was a small child, my family lived near São Paulo. It was a big city in those days. Not as big as today, but very big. We weren't rich. My father had no work, no money, no house. We had nothing. Then Brazil had a new plan. People made big roads into the forest. They wanted to move the poor people from the cities into the forest.

They said, "You can go into the forest and start farms there. The soil of the forest is rich, and it's free. You can have a square kilometer of ground next to a road. You don't have to pay for the ground, and you can have money for six months. We'll give you seeds and you can plant coffee or fruits. You can sell these in the cities." It cost the country $65,000 for each family.

My family and hundreds and hundreds of other people went into the forest. We worked night and day. We cut down the forest trees and made small farms. We built small houses of wood. We planted coffee and sugar and fruit. It was wonderful. My father and mother were very happy. We had work, we had a house. We felt rich.

The first year, everything was fine. But there was a problem—a big problem. The soil was not rich, and there was not much of it. The rain washed it away. The third year we were hungry. We couldn't sell anything. The fourth year was the worst. The plants died and we had no food. So we moved to a new place in the forest, and we started again. But it was <u>the same story</u>. We had no future. So we went back to the cities and looked for work there. My family came to Manaus. My father got a job in the port, and now I'm a taxi driver.

[Adapted from *The Amazon Rain Forest*, Bernard Smith, Penguin Readers, Pearson Education Limited, 2008]

１．タクシードライバー（私）が幼かった時代，ブラジル政府が新たに打ち出した政策は誰を対象としたどのようなものだったか。解答欄に簡潔な日本語でまとめなさい。

２．下線部はどういう story か。解答欄に簡潔な日本語でまとめなさい。

Ⅳ 以下はそれぞれある英単語の意味を英語で説明したものである。それぞれの空欄に示された最初の1文字で始まる英単語を記入し，単語の説明文1～4を完成しなさい。解答欄に示された最初の1文字は改めて書かなくてよい。

1．(b　　) = to take air into your lungs and send it out again

2．(c　　) = the inner surface of the top part of a room

3．(r　　) = a piece of electrical equipment in which food is kept cold so that it stays fresh

4．(s　　) = able to continue without causing damage to the environment. The United Nations adopted 17 global development goals of this type in 2015.