

1 次の英文を読んで、問いに答えよ。

Droughts have been making headlines across the world in recent years, from the California water crisis to Cape Town's severe water shortage. A Research suggests 25 percent of the globe could eventually be left in permanent drought due to climate change. But what if you could simply pull water from the air?

That's the premise of a new technology developed by University of California, Berkeley researchers. It's a water harvester that can extract water from the air, even in extremely dry climates. (1) It uses no energy other than ambient sunlight.

The key to the water harvester is a new class of materials called *metal-organic frameworks* (MOFs). These MOFs are solid but porous materials with enormous surface areas. An MOF the size of a sugar cube can have the internal surface area as big as many football fields. This means that they can absorb gases and liquids, and then release them quickly when heat is added.

"Certain MOFs have an extraordinary ability to suck in water vapor from the atmosphere, but then at the same time do not hold on to the water molecules inside their pores too tightly so that it is easy to get the water out," says Omar Yaghi. He is a professor of chemistry at Berkeley and led the research.

The researchers tested the harvester in Scottsdale, Arizona. (2) It is a desert town with a high of 40 percent humidity at night and 8 percent humidity during the day. The researchers believe that the harvester could ultimately extract about 3 ounces of water per pound of MOF per day.

The harvester itself is a box inside a box. The inner box contains a bed of MOFs. The outer box is a two-foot transparent plastic cube. At night, the researchers left the top off the outer box [air to flow let past] the MOFs. In the day, they put the top back on, so the box would be heated by the sun. The heat would pull the water out of the MOFs, where (3) it would condense on the inner walls of the plastic cube before dripping to the bottom, where it could be collected.

"The most important aspect of this technology is that it is completely energy-passive," says Eugene Kapustin, a Berkeley graduate student who worked on the research. That is to say, it needs no energy besides the sun. This makes it environmentally friendly and accessible to people in places with limited electricity. The results of the trials were published in the journal *Science Advances* (Fathieh, 2018).

B The team needs to conduct more trials on the current models to figure out which factors most affect how much water can be harvested. They also hope to learn more about how specific climate conditions affect water yield. The next trial is planned for late summer in Death Valley, where the nighttime humidity can be as low as 25 percent.

Yaghi has also developed a new aluminum-based MOF. He says (4) it is 150 times cheaper and can capture twice as much water as the current MOFs. He and his team are designing a new water harvester that actively pulls air into the MOFs at high speed. It thus delivers a much larger volume of water.

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注 drought : 干ばつ ambient : 辺りを包み込んでいる porous : 小穴のある water vapor : 水蒸気 pore : 気孔

学力検査問題 [英語] (その2)

(2023 一般 I A)

解答はすべて解答用紙に記入せよ。

- 1 [] 内の下線を施した語を並べかえて英文を完成せよ。
- 2 下線部 A を和訳せよ。
- 3 下線部 B を和訳せよ。
- 4 下線部 (1) ~ (4) の代名詞が指すものを, ア~サから選び, 記号で答えよ。

ア a new aluminum-based MOF イ a water harvester that can extract water from the air
 ウ ambient sunlight エ Arizona オ humidity カ Scottsdale キ the air
 ク the box ケ the current MOF コ the heat サ the water

- 5 本文の内容と合っているものを, ア~ケから 4 つ選び, 記号で答えよ。

ア In Death Valley, the lowest humidity falls to as low as 25 % at night in late summer.
 イ A new harvester, which pulls air out of the MOFs at high speed, is now being designed.
 ウ Certain MOFs can suck in water vapor and hold on to the water molecules inside their pores very tightly.
 エ Three pounds of MOFs could extract one ounce of water every day.
 オ The MOFs are materials that have numerous pores, and because of this, their surface areas are very large.
 カ In recent years, floods in such places as Cape Town and California have been covered in the news.
 キ The original water harvester using the MOFs was developed by the research team led by Omar Yaghi.
 ク The water harvester uses only the heat from the sun to pull water from the air.
 ケ The inner box of the water harvester is transparent plastic.

- 2 次の各文の () 内に入れるべき語句を, ア~エから選び, 記号で答えよ。

- 1 This is () book that I have been looking for.
 ア a very イ very ウ the very エ very rare
- 2 That's () Harry solved that complicated question.
 ア how イ however ウ somehow エ way
- 3 These boys don't say such a thing, () ?
 ア do they イ don't they ウ do these boys エ don't these boys
- 4 I () Mr. Yamada for ten years.
 ア am knowing イ knew ウ was knowing エ have known
- 5 You have come a long way. You () tired and hungry.
 ア cannot be イ must be ウ want to be エ needn't be
- 6 Someone stole my dictionary. I think I must buy () .
 ア it イ one ウ a one エ the one
- 7 Simon is () of the two boys.
 ア tall イ taller ウ the taller エ the tallest
- 8 I have many friends () .
 ア to talk イ to talk to ウ talked エ to be talked
- 9 The door remained () .
 ア lock イ locked ウ locking エ to lock

解答はすべて解答用紙に記入せよ。

3 次の各文の()内に入るものを、ア～セから選び、記号で答えよ。ただし、同じ記号を2回以上使用してはならない。

- 1 Our plane didn't () on time, so we missed the connection.
- 2 Please () me if I'm a little late. I'm coming with you.
- 3 Who will () of your dog while you are away?
- 4 Tom, why can't you () with your sister?
- 5 The old man grasped at the railing to () falling down the steps.
- 6 We () to your next visit to Niigata.
- 7 We decided to () our departure because of the severe rain.
- 8 These old songs () happy memories of my childhood.
- 9 Please () your e-mail address here.

ア bring back	イ stand for	ウ turn around	エ put off	オ keep from
カ point out	キ take care	ク wait for	ケ write down	コ run across
サ take off	シ look forward	ス cut off	セ get along	

4 次の各組の二文がほぼ同じ意味を表すように、(1), (2)に適切な語を入れよ。

- 1 The lady was so kind that she helped me.
The lady was kind (1) to (2) me.
- 2 What brought you here today?
(1) did you (2) here today?
- 3 Who owns this automobile repair shop?
Who (1) the (2) of this automobile repair shop?

5 日本文の意味を表すように、()内の下線を施した語句を並べかえて英文を完成せよ。

- 1 我々はひょっとしたらできたかもしれないことを議論した。
(discussed done what we we have could) .
- 2 彼女は、そのような発言をしたことを否定した。
(such denied made she comments having) .
- 3 姉は、私の3倍のお金を稼ぐ。
My sister (do three as much times money earns as I) .
- 4 その女性は休息をとるために腰掛けた。
(take the lady sat in to a down order rest) .
- 5 消防士たちは燃え盛る建物に駆け込んだ。
(ran the building the firefighters burning into) .

解答用紙 [英語]

2023
般 I A

受 験 番 号	
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1

1										
2										
3										
4	(1)		(2)		(3)		(4)			
5										

2

1	2	3	4	5	6	7	8	9

3

1	2	3	4	5	6	7	8	9

4

1		2		3	
(1)	(2)	(1)	(2)	(1)	(2)

5

1		.
2		.
3	My sister	.
4		.
5		.

