

1 Answer the questions about the passage below. Choose the most appropriate answers based on what is stated or implied in the passage. Choose ONE answer unless other instructions are given.

Scientists are studying honey produced by stingless bees, searching for consumer benefits. These could include reduced damage to the teeth and less sudden rises in blood sugar levels. Stingless bees produce a healthier honey that is uniquely rich in a rare sugar called *trehalose*, which may have benefits ranging from ranking low on the ^{*1}glycemic index (GI) to displaying the properties of an ^{*2}antioxidant, researchers from the University of Queensland have shown. This discovery could support the growth of stingless bee honey markets and ultimately enable healthier sweet treats of all types, the scientists argue.

<1>Similar to the familiar European honeybee, stingless bees form colonies consisting of one queen cared for by multiple worker bees that make and store honey from the nectar (a sugar-rich liquid produced by plants) they gather. More than 600 stingless bee species are known across tropical and subtropical regions of the world. The native peoples of these regions have often considered stingless bee honey to have healing properties. Although stingless bees are typically less productive than honeybees, their honey is an <2>established food in many regions, including Malaysia.

"We had a visiting researcher from Malaysia, Norhasnida Zawawi, who was interested in analyzing the sugars in stingless bee honey," says Dr. Natasha Hungerford, a <3>senior research fellow and organic chemist at the University of Queensland, who led the analysis. The team, including Hungerford and Zawawi, collected honey samples from two species of stingless bees from Malaysia, two from Australia, and one from Brazil. "When we characterized the sugars the honey contained, we got a surprise—we found a large amount of a certain ^{*3}disaccharide that did not match any of the usual standards for sugars in food," Dr. Hungerford says.

The mystery compound was determined to be the <4>dominant disaccharide in each honey sampled. After isolating the sugar and running further tests, the team identified it as trehalose. "It's an exciting finding because this sugar is not the major component of any other food," Hungerford adds.

Chemical cousins

Despite being a close chemical cousin to table sugar (^{*4}sucrose), trehalose has very different health effects due to its slower breakdown into ^{*5}glucose and fructose in the human body, leading to a steadier rise in blood sugar levels. As well as being low-GI and a potential antioxidant, trehalose likely does not harm the health of your teeth, yet still has a sweet taste. Dr. Hungerford described the taste of Australian stingless bee honey—known as *sugarbag*—as a pleasant "acid-sweet flavor."

Currently, stingless bee honey cannot be officially sold as honey in many regions of the world, including Australia, because its distinct sugar composition does not meet the definition of honey according to international food standards. "Following our work, the Australian Native Bee Association applied to Food Standards Australia and New Zealand to modify the standard to include stingless bee honey," Dr. Hungerford says. A decision is expected sometime next year.

If the stingless bee honey food standard is approved in Australia and other regions, the honey could increasingly be adopted as a healthier sugar source on kitchen counters and breakfast tables around the world. However, the implications for the food industry could go beyond offering healthier toppings for cereals, toast, or pancakes, Dr. Hungerford adds.

In experiments exploring how stingless bees make trehalose, the team supplied the bees with different sugar sources and found that trehalose is made very selectively from sucrose. "We are now working, with funding from Sugar Research Australia, to identify any genes and enzymes that the bee uses to produce trehalose," Dr. Hungerford says. "Hopefully, that discovery could inspire a way to manufacture pure trehalose, which could be used in many products as a low-GI sweetener. That's the long-term goal." Trehalose could provide a healthier alternative to regular sugar for people looking to reduce their intake of high-GI foods. Researchers believe this breakthrough could benefit such individuals as well as the food and health industries.

*1glycemic index = グリセミック・インデックス（食後血糖値の上昇度を示す指数）

*2antioxidant = 抗酸化物質

*3disaccharide = 二糖類

*4sucrose = スクロース（ショ糖）

*5glucose and fructose = グルコースとフルクトース（ブドウ糖と果糖）

1. 1 For the underlined sentence <1>, find the MAIN VERB of the sentence.

① familiar ② form ③ colonies ④ consisting ⑤ cared
 ⑥ multiple ⑦ make ⑧ store ⑨ produced ⑩ gather

2. Choose the answer that is closest in meaning.

<input type="checkbox"/> 2	<2>established	① traditional	② genuine	③ installed	④ indicated	⑤ evaluated
<input type="checkbox"/> 3	<3>senior	① higher-ranking	② full-time	③ expert	④ up-to-date	⑤ retired

3. Identify the most stressed vowel and then choose the word that has the same vowel pronunciation.

4 <4>dominant

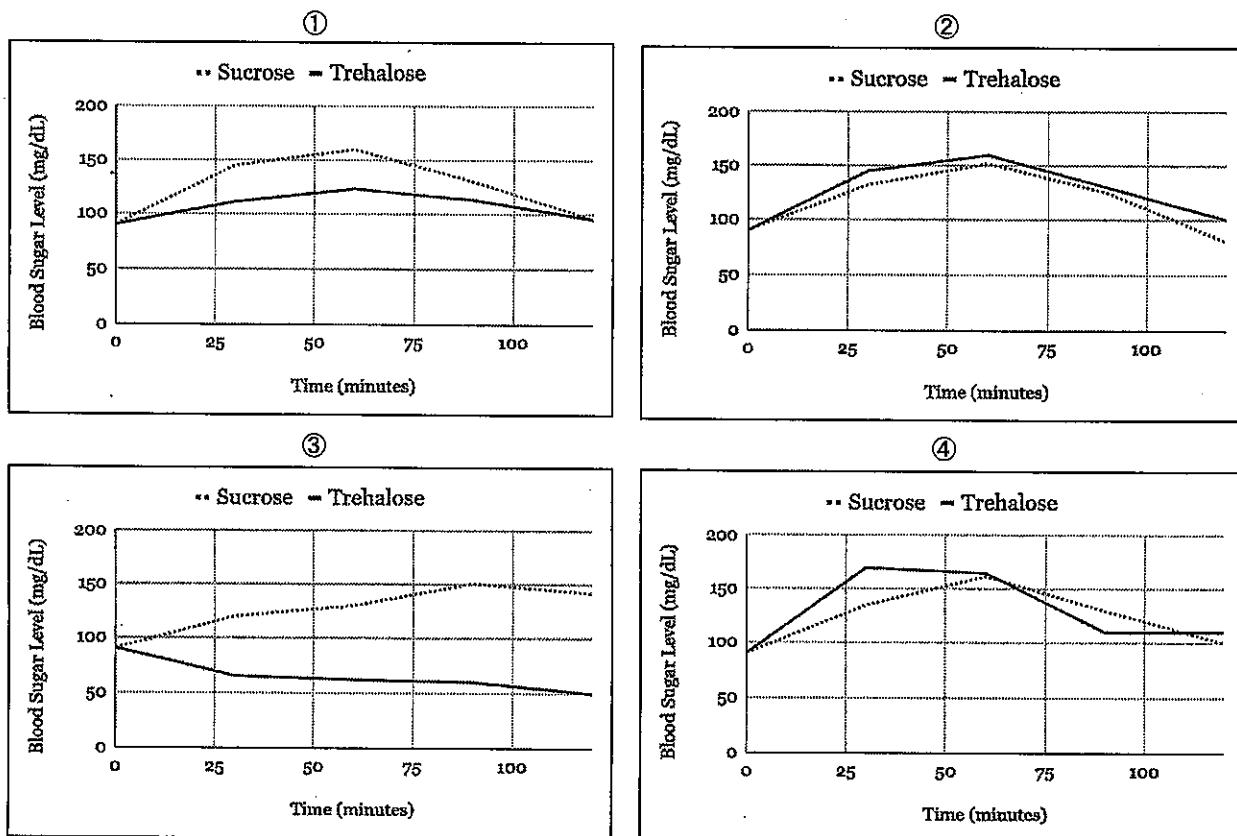
① firm ② head ③ son ④ not ⑤ nose ⑥ tooth ⑦ cook ⑧ bite ⑨ hit ⑩ heat ⑪ hate ⑫ hat

4. 5 What was the main finding of the study conducted by researchers from the University of Queensland?

① Stingless bees have been found to produce honey more slowly than regular honeybees.
 ② Stingless bee honey contains trehalose, a rare sugar with potential health benefits.
 ③ More than 600 species of stingless bees have been identified across the world.
 ④ Honey from stingless bees tastes bitter and is unsuitable for commercial production.
 ⑤ Stingless bees are native to tropical regions of Australia, Malaysia, and Brazil.

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5. 6 Which graph shows the relationship between sucrose and trehalose in terms of their effects on blood sugar levels?



6. 7 Why is stingless bee honey not officially sold as honey in many regions?

- ① It is considered unsafe for humans to consume on a regular basis.
- ② It is not produced or harvested in the same way as standard honeybee honey.
- ③ Its sweetness and color differ significantly from that of regular honey.
- ④ Its healing properties prevent it from being classified as a food product.
- ⑤ Its sugar composition does not match international food standards for honey.

7. 8 What is the most likely long-term impact of the research into trehalose production?

- ① Consumer demand for sweet products may gradually decrease.
- ② The price of standard honey will significantly increase worldwide.
- ③ Scientists may develop a method to produce trehalose for use as a sweetener.
- ④ Stingless bee populations will rise in warm areas thanks to new practices.
- ⑤ New laws may be created to promote the production and use of rare kinds of honey.

8. 9 - 13 Complete the summary of the passage. Boxes () in the summary indicate missing information. Use each answer once.

Researchers from the University of Queensland are studying honey produced by stingless bees, aiming to identify 9. Stingless bee honey is found to be 10 called *trehalose*, which may have advantages such as having a low glycemic index (GI) and the properties of an antioxidant. Trehalose, a close chemical cousin to sucrose, breaks down more slowly, resulting in a steadier rise in blood sugar levels. The discovery could lead to the 11, offering a healthier alternative for sweet treats. The Australian Native Bee Association has applied to modify 12, with a decision expected sometime next year. The researchers are also exploring the 13 pure trehalose for broader use as a low-GI sweetener. They believe trehalose may serve as a healthier sugar alternative, benefiting people as well as the food and health industries.

- ① healthier and tastier fruits rich in nectar
- ② food standards to include stingless bee honey
- ③ possible benefits for consumers
- ④ gain approval from the Australian Native Bee Association
- ⑤ possibility of manufacturing
- ⑥ growth of markets for stingless bee honey
- ⑦ complex sugars found in artificial sweeteners
- ⑧ uniquely rich in a rare sugar

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- 14 - 19 Choose the most appropriate answer. Use each answer once.
① in other words ② because ③ where ④ before ⑤ in comparison ⑥ since
⑦ as well as ⑧ in spite ⑨ nor ⑩ because of ⑪ also ⑫ such as
- 20 What does their refer to?
① the Great Plains ② the Rockies ③ Tibetan plateau ④ flat environments
⑤ Vaals Mountain and Iron Mountain ⑥ criteria ⑦ mountains ⑧ people
- 21 For the underlined sentence <2>, find the MAIN VERB.
① chosen ② place ③ be defined ④ were ⑤ had to ⑥ vary ⑦ least ⑧ over
4. Identify the most stressed vowel and then choose the word that has the same vowel pronunciation.
22 <3>surface
① wood ② poor ③ stool ④ dog ⑤ sun ⑥ heart ⑦ firm ⑧ ate ⑨ hour ⑩ toy ⑪ fight ⑫ map

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5. **23** What is the most likely reason some people in Scotland say that their country has no mountains?

- ① Scotland is 500 meters above sea level.
- ② Their use of the word “mountain” is different.
- ③ Small hills are very common in Scotland.
- ④ Not many people live in the Highlands.
- ⑤ There is no word for “mountain” in Scotland.

6. **24** What did the US Geological Survey do in the 1990s?

- ① It analyzed survey results from scientists to find the highest slopes.
- ② It organized debates on local perceptions of mountains.
- ③ It made a database to record the various heights of the Earth's surface.
- ④ It evaluated the opinions of policy-makers and mountaineers.
- ⑤ It compared mountains that are above and below sea level.

7. **25** Choose the TWO most significant outcomes of having created an accurate definition of a mountain.

- ① We know that older and lower mountain systems are very important.
- ② We know how much of the Earth's surface is covered with mountains.
- ③ We know the location and age of all the tallest mountains in the world.
- ④ We know how mountains are created by changes in landforms.
- ⑤ We know how many people live in and around the mountains of the world.
- ⑥ We know that there are also very large mountains under the sea.

8. **26** This passage is mostly about _____.
① the development of the definition of a mountain
② the most impressive mountains around the world
③ mountain geographers and their survey methods
④ the difference between a mountain and a plain
⑤ how to research the global history of mountains

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1. Which is the most stressed syllable in the following word?

27 <1>Artificial Artificial
①②③④

2. Choose the most appropriate answer.

28	① vast	② further	③ demanding	④ potential	⑤ universal
29	① as long as	② since	③ contrary to	④ providing that	⑤ although
30	① to	② from	③ in	④ at	⑤ against
31	① Whether	② In addition to	③ For better or worse,	④ Moreover,	⑤ Nonetheless,
32	① joining	② picking	③ keeping	④ setting	⑤ putting
33	① resisting	② to resist	③ be resisted	④ to be resisted	⑤ for resisting

3. 34 What does <2>them refer to?

① reasons ② demands ③ evidence ④ new tools ⑤ patients' safety
⑥ data ⑦ regulation ⑧ incentives ⑨ lessons ⑩ other fields

4. Choose the answer that is closest in meaning.

35 <3>get in the way ① step aside ② place an emphasis ③ lose control
④ be unreliable ⑤ be an obstacle

5. 36 Based on paragraph 4, why is using healthcare data to train AI systems challenging?

- ① There is still not enough health data available for AI to be effective.
- ② Software issues occur when AI systems access large volumes of data.
- ③ Health data is significantly fragmented and subject to strict privacy rules.
- ④ Patients often refuse to share sensitive medical issues with doctors.
- ⑤ Poor medical decision-making can result in unreliable information.

6. 37 What solution does the author suggest for managing and regulating AI in healthcare?

- ① speeding up the review and approval process of AI tools to avoid delays
- ② equipping regulators with advanced software to monitor the use of AI
- ③ using algorithms to ensure that healthcare data remains private
- ④ building international cooperation and developing global standards
- ⑤ banning the use of AI tools that are not secure or fully transparent

7. 38 The following sentence was taken from paragraph 8. Which location indicated by [①]-[⑤] was it taken from?

[A final problem involves institutions and incentives.]

8. 39 Based on the last paragraph, how are countries like America, Britain, and Canada working to address AI in healthcare?

- ① by restricting the use of AI systems that share health data
- ② by focusing on reducing costs by limiting visits and procedures
- ③ by delaying research into AI due to regulatory challenges
- ④ by promoting the use of AI for monitoring treatment outcomes
- ⑤ by dedicating resources to test and use new AI technologies

9. 40 What is the main idea of the passage?

- ① The rapid progress and use of AI in healthcare is a concern for doctors.
- ② AI offers significant potential in healthcare but faces multiple challenges.
- ③ Governments are successfully taking steps to regulate AI in healthcare.
- ④ AI in healthcare is primarily used to reduce costs and increase efficiency.
- ⑤ Patients play a critical role in regulating the use of AI tools in healthcare.

出典

① Honey from stingless bees may offer sweet perks without the tooth decay (c) The University of Queensland. Used with permission.