# Spring 2025

GRADE 5

# ENGLISH LANGUAGE ARTS/ LITERACY

PTL051_DIR

Today you will read the excerpt from "Shi's Special Seed" and the story "The Wheat on the Chessboard." Then you will answer questions and write a response.

PTL051a

# *from* Shi's Special Seed

*by Christie Chu*

1 "Shi, stop singing to the flowers! You have a visitor," Mui-Mui called. Shi's little sister loved to tease him about his garden.

2 Shi broke off mid-song and whispered an apology to the flowers. Mud squelched between his toes as he hurried toward the house. Sweet-smelling blossoms and green leaves swayed as he passed. Shi's mother stepped out into the garden, followed by a finely dressed stranger. Shi bowed politely.

3 "Greetings, Shi," said the man. "The emperor has heard of your gardening skills. He has sent seeds to one hundred of the best gardeners in China, including some others from your village. Here is yours. Tend it and bring it to the palace in one year. Then the emperor will choose one of you to be the caretaker of his imperial gardens." He dropped a small black seed into Shi's palm. "Care for it well." He bowed and left.

4 "What an honor," Shi's mother said, her eyes wide.

5 Shi planted the special seed in his best pot. He placed it in his garden next to his pink peonies, where it would get lots of sun.

6 "Hello, little one," he murmured. "Ours is not a fine house like the palace, but I hope you like it here."

7 After a month, no green sprout had pushed through the soil.

8 "Little one, what's wrong? Do you miss your home?" The pot of dirt did not answer. Shi sang as he watered it, taking care not to pour too much water.

9 Months later, Mui-Mui stared into the pot. "That seed is defective," she said.

10 Shi took the pot from her. "Don't worry, little one. You take your time," Shi said to it. "Mui-Mui is anxious to meet you, just like I am." He moved the pot to the cool shade and began to sing. Mui-Mui rolled her eyes and stomped away.

11 But the seed did not grow. Shi transferred the seed to a different pot. He tried composts and fertilizers.

12 After more months of waiting, Shi's stomach started to hurt. Then his head began to pound. He ate little. He couldn't sleep and often got up in the night to check on the seed. Every day, he dragged himself outside to water his plants, but he was too tired to sing. His healthy garden began to wilt.

13 One day, Mui-Mui took the water pail from Shi's hands when they began to shake. "I will water the seed while you rest," she said.

14 Shi grabbed the pail back. "It is *my* responsibility."

15 "Shi, take one of your own plants to the emperor. He won't know it didn't come from that seed," Mui-Mui said.

16 "No. Even if he did not know, I would."

17 "This is a ridiculous contest! You are making yourself sick worrying about that seed. You don't even sing anymore." Mui-Mui returned to the house, where their mother stood in the doorway, watching Shi with a furrowed brow.

18 The thought of disappointing the emperor made Shi feel queasy, but he felt worse about seeing his mother and sister distressed.

19 Shi took a deep breath. "It's OK if you are not ready to grow yet, little one," Shi said to the seed, still hidden in the dirt. Then he walked through the rest of the garden, apologizing to his plants. "I am sorry I haven't sung to you lately," Shi said to his favorite peonies. "I have missed you." He began to sing softly.

20 Shi woke the next morning without a stomachache. He ate all the congee his mother gave him. When he handed her back the empty bowl, she smiled and her eyes shone with tears. He kissed her on the cheek and went to greet his garden with a song.

21 Still, the special seed did not grow. Mui-Mui tried one more time to convince Shi to bring one of his plants to the emperor instead.

22 "No, Mui-Mui," he said. "This is the seed he asked me to care for. It is the one I'll bring back to him. I won't win, but at least I'll see the beautiful imperial gardens while I'm there."

23 Shi walked all day to get to the palace. Along the way, he saw other gardeners from his village carrying full, healthy plants.

24 When Shi stood among the one hundred best gardeners in China holding nothing but a pot of dirt, he couldn't enjoy the imperial gardens' beauty. The emperor inspected all the large green plants the other gardeners held. Finally, he approached Shi, who was the only one with an empty pot. Shi bowed, then stared at his feet, dirty from the long walk.

25 “I am sorry, Emperor,” Shi said. His cheeks burned with shame. “I was not able to grow the seed you gave me.”

26 The emperor laughed. “I know you weren’t,” he said. “All of the seeds were boiled. None of them could have grown. You are the only one who brought me back the seed I sent you.”

27 Shi’s head snapped up in surprise.

28 “I already know you are the best gardeners in China,” the emperor said to them all. “My advisors told me of your beautiful gardens. However, I need to trust the people who live and work at the palace. That’s why I had this contest.” The emperor held up Shi’s empty pot. “Shi was honest about his seed. I can trust him to take good care of my beloved gardens.”

PTL051a02_4:2

**1.** This question has two parts.

**Part A**

In the excerpt from "Shi's Special Seed," Shi is determined to grow the seed. How is Mui-Mui's perspective toward the seed different?

**A.** Mui-Mui is careless around the seed.

**B.** Mui-Mui thinks the seed should be left alone.

**C.** Mui-Mui feels she should be the one caring for the seed.

**D.** Mui-Mui is impatient with the seed.

**Part B**

Which sentence from the excerpt **best** supports the answer to Part A?

**A.** " 'Shi, stop singing to the flowers!' " (paragraph 1)

**B.** "Mui-Mui rolled her eyes and stomped away." (paragraph 10)

**C.** "Mui-Mui took the water pail from Shi's hands when they began to shake." (paragraph 13)

**D.** " 'I will water the seed while you rest.' " (paragraph 13)

PTL051b

# The Wheat on the Chessboard

*by Liz Huyck*

1 Long ago in India, there was a wise mathematician called Sessa. He invented a new game to amuse his friend, the king. He called it “chess.” The king loved chess and told Sessa to name anything he liked as his reward. Anything! The king enjoyed boasting of his limitless wealth. But instead of gold, jewels, or elephants, after much thought Sessa told the king that he wished only some grains of wheat.

2 “What?!?” exclaimed the king, greatly astonished.

3 “I am a simple man,” replied Sessa, “and my wants are few. But since you enjoy my chessboard so much, give me a single grain of wheat on the first square, two grains on the second square, four for the third, and so on. For each square double the last, as each day of play doubles our delight. That will mean more to me than all the riches in the world.”

4 “Very well!” said the king, a little irritated, thinking that Sessa was mocking him. “If wheat is all he wants,” he told his treasurer, “give it to him!”

5 The first day, the treasurer presented Sessa with a single grain of wheat, to the huge amusement of the court.

6 The second day, he got two, on a little cushion. The great lords roared with laughter. But Sessa kept his thoughts to himself.

7 On the ninth day, Sessa received 256 grains, enough to make a small handful. But the very next day, he had two handfuls. It took Sessa 16 days to get enough wheat to fill a large bag. But only one more day to get two bags. The day after, he had four bags.

8 The courtiers stopped laughing and started whispering.

9 By the end of the month, wagons filled with grain were rumbling toward Sessa’s house, and the treasurer began to look worried. Quaking in his boots, he went to see the king.

10 “Highness!” he trembled. “Please look over my calculations, but I don’t think they are in error. By his simple doubling, Sessa has now collected nearly all our stores of wheat! What shall we do? If we continue at this rate the treasury will soon be empty, and I doubt there is enough wheat in the *entire world* to pay him!”

11 “Impossible!” said the king. But he checked and double-checked the sums, and there was no doubt. In horror, he saw that by square 64, he would owe Sessa a total of 18,446,744,073,709,551,615 grains of wheat!

12 He could not even imagine so many grains—they would make a pile of wheat larger than the tallest mountain. That much wheat could not be gathered in all of India for the next 2,000 years!

13 There was nothing for the king to do but call Sessa, and take back his boasts of *limitless* wealth.

14 “Sire!” Sessa replied. “Say no more. I am happy with what I have already—I forgive you the second half of the chessboard.”

15 With that, the king and Sessa remained the best of friends and enjoyed many games of chess together. And the clever Sessa got the real reward he had wanted all along—a wiser and more mathematical king.

PTL051b03_4:4

**2.** This question has two parts.

**Part A**

In the story "The Wheat on the Chessboard," Sessa's actions influence the king by —

**A.** causing him to question his love of chess

**B.** showing him the true value of wealth

**C.** making him neglect what is best for the kingdom

**D.** teaching him to be a wiser man

**Part B**

Which evidence from the story **best** supports the answer to Part A?

**A.** "But instead of gold, jewels, or elephants, after much thought Sessa told the king that he wished only some grains of wheat." (paragraph 1)

**B.** "He invented a new game to amuse his friend, the king." (paragraph 1)

**C.** " 'Please look over my calculations, but I don't think they are in error.' " (paragraph 10)

**D.** " 'Impossible!' said the king. But he checked and double-checked the sums, and there was no doubt." (paragraph 11)

PTL051b04_3:1

**3.** This question has two parts.

**Part A**

What is a central theme of the story "The Wheat on the Chessboard"?

**A.** Selfishness can have negative effects on wealth.

**B.** It is important to have a large supply of resources.

**C.** Humility and learning can be as valuable as wealth.

**D.** There are benefits to spending time with close friends.

**Part B**

Which sentence from the story **best** supports the answer to Part A?

**A.** "But instead of gold, jewels, or elephants, after much thought Sessa told the king that he wished only some grains of wheat." (paragraph 1)

**B.** "It took Sessa 16 days to get enough wheat to fill a large bag." (paragraph 7)

**C.** "He could not even imagine so many grains—they would make a pile of wheat larger than the tallest mountain." (paragraph 12)

**D.** "With that, the king and Sessa remained the best of friends and enjoyed many games of chess together." (paragraph 15)

PTL051b05_P_1:3

**4.** This question has two parts.

**Part A**

Read paragraph 9 of the story "The Wheat on the Chessboard."

> By the end of the month, wagons filled with grain were rumbling toward Sessa's house, and the treasurer began to look worried. Quaking in his boots, he went to see the king.

What does the phrase Quaking in his boots mean in this paragraph?

**A.** Very scared

**B.** Walking quickly

**C.** Running late for an event

**D.** Carrying something heavy

**Part B**

Which phrase from paragraph 9 **best** supports the answer to Part A?

**A.** "end of the month"

**B.** "wagons filled with grain"

**C.** "began to look worried"

**D.** "went to see the king"

PTL051x06_2:3,5

**5.** This question has two parts.

**Part A**

In the excerpt from "Shi's Special Seed" and the story "The Wheat on the Chessboard," the narrators' points of view influence how the events are described because **both** narrators —

**A.** share their own opinions of the lesson being taught

**B.** wait until the end to reveal main details of the lesson being taught

**C.** explain the main characters' thoughts about earning their reward

**D.** describe how the main characters feel after they have won their reward

**Part B**

Which evidence from the excerpt and the story **best** supports the answer to Part A? Select one answer from **each** passage for a total of **two** correct answers.

**A.** " 'The emperor has heard of your gardening skills.' " (paragraph 3, "Shi's Special Seed")

**B.** "he walked through the rest of the garden, apologizing to his plants" (paragraph 19, "Shi's Special Seed")

**C.** " 'All of the seeds were boiled.' " (paragraph 26, "Shi's Special Seed")

**D.** "The great lords roared with laughter." (paragraph 6, "The Wheat on the Chessboard")

**E.** "he would owe Sessa a total of 18,446,744,073,709,551,615 grains of wheat" (paragraph 11, "The Wheat on the Chessboard")

PTL051x07_P_4:3

**6.** This question has two parts.

**Part A**

Which character trait is shown by **both** Shi in the excerpt from "Shi's Special Seed" and Sessa in the story "The Wheat on the Chessboard"?

**A.** Working hard to achieve a goal

**B.** Showing pride in achievements

**C.** Using skills to invent something new

**D.** Caring about something more than personal gain

**Part B**

Which evidence from the excerpt from "Shi's Special Seed" **best** supports the answer to Part A?

**A.** "Shi planted the special seed in his best pot." (paragraph 5)

**B.** "Shi transferred the seed to a different pot. He tried composts and fertilizers." (paragraph 11)

**C.** " 'This is the seed he asked me to care for. It is the one I'll bring back to him.' " (paragraph 22)

**D.** " 'My advisors told me of your beautiful gardens.' " (paragraph 28)

PTL051x08

**7.** You have now read two folktales: “Shi’s Special Seed” and “The Wheat on the Chessboard.” In both passages, the main character receives a reward.

Write an essay in which you explain how each character earns and then reacts to his reward and what this shows about what is most important to him. Use details from **both** passages to support your essay.

P19_A017_DIR

Read “A Robotic Fish Could Help Mangroves Grow” and answer the questions.

P19_A017

# A Robotic Fish Could Help Mangroves Grow

*by Bethany Brookshire*

1 Mangrove forests are important ecosystems. Their tangled roots hold land in place, preventing the sea from washing it away. Those roots also shelter young fish and other animals as they grow. But the mangrove forests of Thailand have come under threat. People have cut many of them down to build fish farms and expand cities. Some efforts to regrow mangrove forests have been successful; others, not so much. Naphat Cheenchamrat, 18, and Pattharaphol Chainiwattana, 16, wanted to figure out why. For mangroves, mud matters. And to find out if mud is thick enough to plant new mangroves, the pair have just what everyone needs: a fish robot.

2 Naphat is a senior and Pattharaphol a junior at Bangkok Christian College in Thailand. The two brought their muddy results here, to the Intel International Science and Engineering Fair (ISEF). They joined nearly 1,800 students from 81 countries in presenting their winning science fair projects. This fair was created, and is run, by Society for Science & the Public. [In 2018, it was] sponsored by Intel.

3 “Nowadays, there are a lot of campaigns to regrow mangrove forests,” Naphat explains. But some of the reforested areas just don’t seem to do very well. Naphat and Pattharaphol began to notice one big difference between healthy, natural mangrove forests and the reforested, weak-looking ones. Mudskippers.

4 Mudskippers are fish. But they stick to the fishy lifestyle only part of the time. These creatures move back and forth between land and water. They live in mud burrows and breathe air through their skin. They hop along the mud, their stiff front fins making a rowing motion. They can even jump and climb on the exposed roots in the mangrove forests they call home.

5 In natural mangrove forests, Naphat and Pattharaphol noticed there were plenty of mudskippers. But in the reforested areas, the mudskipper population was very thin. Since mudskippers need mud for their burrows, the teens wondered if thick mud could be what mudskippers—and mangroves—needed.

6 This is where the robotic fish comes in. “We used a robot because [we] didn’t want to disturb the real mudskippers,” Naphat explains. And hey, it’s always

fun to build a robot. The students created a fish-sized robot. It skipped forward using rowing motions from its fins—similar to the motions of a real mudskipper.

7 Then, the teens collected mud from natural and reforested mangrove forests. They placed their robot on the different surfaces and measured how fast it could move. In the mud of a natural mangrove forest, the robot skipped along at around 8 centimeters (3 inches) per second. But in the mud of a reforested mangrove forest, the robot struggled. It crept at only 3 centimeters (1.1 inches) per second.

8 Those measurements allowed Naphat and Pattharaphol to calculate the viscosity of the mud in which the robot traveled. Viscosity is a measure of how thick a fluid is. Thick mud allows mudskippers to travel quickly over the muddy surface and build strong burrows below. Thinner mud leaves the mudskippers (or the mudskipper robot) wallowing in the mess.

9 The natural mangrove forests had that thick, viscous mud, the students showed. Reforested mangrove forests, in contrast, are often full of thinner mud. Unfortunately, reforestation efforts focus on planting on thinner mud because it's mud that people don't want to build on. "They are planting where the mud isn't good enough," Naphat says. "In mud with lower viscosity, the mangrove trees don't survive." After presenting their work at ISEF, the American Statistical Association awarded the pair an honorable mention.

10 Naphat and Pattharaphol want to use their mud studies and robot to help pinpoint the best spots to plant mangroves. They have already begun testing their robot in different muddy areas to show which ones are best for mangrove trees—and the real mudskippers.

"A Robotic Fish Could Help Mangroves Grow" by Bethany Brookshire, from SCIENCE NEWS FOR STUDENTS, June 6, 2018.

PTS05301_2:4

**8.** This question has two parts.

**Part A**

What does wallowing mean as it is used in paragraph 8?

**A.** Making uncomfortable

**B.** Becoming helpless

**C.** Acting playful

**D.** Getting upset

**Part B**

Which detail from the article **best** supports the answer to Part A?

**A.** “need mud for their burrows” (paragraph 5)

**B.** “ ‘didn’t want to disturb’ ” (paragraph 6)

**C.** “skipped forward” (paragraph 6)

**D.** “the robot struggled” (paragraph 7)

PTS05302_3:4

**9.** This question has two parts.

**Part A**

Naphat's words in paragraph 9 **best** help the reader understand why —

**A.** the research on mangroves was worthy of an award

**B.** the future of the forests is in danger

**C.** mangrove regrowth efforts are failing

**D.** people should plant more trees

**Part B**

Which sentence from the article **best** supports the answer to Part A?

**A.** "Those roots also shelter young fish and other animals as they grow." (paragraph 1)

**B.** "But the mangrove forests of Thailand have come under threat." (paragraph 1)

**C.** "This fair was created, and is run, by Society for Science & the Public." (paragraph 2)

**D.** "But some of the reforested areas just don't seem to do very well." (paragraph 3)

PTS05303_3:3,5

**10.** This question has two parts.

**Part A**

Based on the article, which action would increase the success of efforts to regrow mangrove forests?

**A.** Getting more teenagers involved

**B.** Reducing the number of fish farms

**C.** Choosing better locations

**D.** Obtaining more support from other scientists

**Part B**

Which details from the article **best** support the answer to Part A? Select **two** correct answers.

**A.** “roots also shelter young fish and other animals as they grow” (paragraph 1)

**B.** “joined nearly 1,800 students from 81 countries” (paragraph 2)

**C.** “ ‘are planting where the mud isn’t good enough’ ” (paragraph 9)

**D.** “the American Statistical Association awarded the pair an honorable mention” (paragraph 9)

**E.** “have already begun testing their robot in different muddy areas to show which ones are best” (paragraph 10)

PTS05304_P_1:4

**11.** This question has two parts.

**Part A**

Based on the article, Naphat and Pattharaphol's project is important because it —

**A.** proves that the ground where trees are planted affects the health of the trees and the mudskippers

**B.** aims to increase the population of mudskippers for commercial fishing and other industries

**C.** seeks to develop a new type of robotic fish for the fishing industry

**D.** studies the effects of urban population growth on mangrove forests

**Part B**

Which detail from the article **best** supports the answer to Part A?

**A.** "cut many of them down to build fish farms and expand cities" (paragraph 1)

**B.** "noticed there were plenty of mudskippers" (paragraph 5)

**C.** "using rowing motions from its fins" (paragraph 6)

**D.** "natural mangrove forests had that thick, viscous mud" (paragraph 9)

PTI051_DIR_P

Today you will read excerpts from “Real Talk with Dr. Maya” and “Morgan Goodall—Sweet Science Comes Baked In” and the adaptation of the transcript of the video “Surprisingly STEM: Space Food Scientist.” As you review these sources, you will gather information and answer questions so that you can write a response.

PTI051a

# *from* Real Talk with Dr. Maya

*by Brian S. McGrath*

1 Maya Warren is an ice-cream scientist and a consultant. . . . Her job has taken her all over the world to discover new flavors of ice cream. Warren graduated from Carleton College, in Minnesota, and earned a PhD in food science from the University of Wisconsin, Madison. She spoke to [us] about the sweet life.

**What does an ice-cream scientist do?**

2 I would say I provide happiness in ways that people didn’t even know could exist. And I do that through ice cream. For me, ice cream is about possibilities. It’s about opportunities. It has allowed me to travel the world and to see the world in ways in which I never would have ever imagined. I’ve gone to Pakistan to make ice cream. I’ve gone through the backroads of Nairobi, Kenya, making ice cream. Not just making it, but also teaching people there how to make it. And in return, I see that happiness, that inspiration that comes when people say, “Wow, like, I didn’t even know that I could do this!” Ice cream is my way to communicate.

**You were the head of research and development. . . . What was a day at work like?**

3 I created ice-cream flavors. I did a lot of computer work. I’d start with a formula on a spreadsheet: These are the ingredients I have, this is how much milk fat comes from this substance, whether it’s milk fat or cream or whole milk, and so on. The temperature at which the ice cream is going to start to freeze is determined by that equation: how much water you have, how much solids, how much sugar and fat.

4 Then, in a test kitchen, I’d make a mix. It could be a white mix, like a sweet cream, or a chocolate mix. I’d taste it, and I might think, “Okay, this is a beautiful-tasting mix,” or, “You know what? I don’t really like this. I shouldn’t have used this ingredient. Let me start over.” It was a lot of back-and-forth, figuring out what I wanted. But when I got a mix I really loved, I froze it. Then I had actual ice cream.

**Were you doing all this chemistry yourself? Or did you have a team that helped you?**

5 It depends. I traveled a lot, working in dairies all around the world. I tended to depend on technicians at these plants in other countries to help me scale it all up [create large amounts of mix]. I passed on my formulas to them, and they scaled it up. And the next day, we'd come back and flavor it, then turn that liquid mix into the solid, liquid, and gas product we know as ice cream.

**There must be tremendous ice-cream freezers at these dairies.**

6 They're really big. . . . If you make ice cream at home, it could take 30 to 40 minutes to freeze it. But when you're using a continuous freezer, which continuously feeds in ice-cream mix that comes out as ice cream, it takes 15 to 30 seconds.

**Were you planning to become an ice-cream scientist when you went to graduate school for a PhD?**

7 I had no clue where it would take me. I followed my heart and did something that truly made me happy. I followed my curiosity, too. I thought, "What is going to intrigue me so much mentally that I can do it every day?" It's very much a passion. But it's also a desire for knowledge. The quest for knowledge about food is so incredibly intriguing that I could research the ins and outs of ice cream all day.

**What was your first job in ice cream?**

8 My first job out of graduate school was . . . the head of research and development on the international side. That took me to places like India, Taiwan, Brazil, and Egypt. I would go to other countries and help design dairies so they could start making ice-cream mix and turn it into ice cream. Or I would teach existing dairies how to manufacture mix using local ingredients. There were lots of tea flavors in Taiwan and Japan, and flavors ranging from squid ink to wasabi. Creating ice-cream flavors is not just a science, it's also an art, the art of using that blank canvas. There are endless possibilities. . . .

**What do you love most about your job?**

9 Being able to inspire the world. I love being able to speak to a 5-year-old or an 85-year-old about ice cream and see their eyes light up. I feel like ice cream found me. I didn't find it. And if I never were to make ice cream again, if I never were to eat ice cream again, I would still love it because of the joy it brings others.

PTI0501a01_P_4:5,2

**12.** This question has two parts.

**Part A**

Based on the excerpt from "Real Talk with Dr. Maya," the reader can infer that Dr. Maya —

**A.** believes her biggest challenge is the testing of new formulas

**B.** understands why any child would want to work with ice cream one day

**C.** feels that her favorite part of her job is studying the science behind food

**D.** appreciates the new experiences her career has provided

**Part B**

Which details from the passage **best** support the answer to Part A? Select **two** correct answers.

**A.** "And I do that through ice cream." (paragraph 2)

**B.** "to see the world in ways in which I never would have ever imagined" (paragraph 2)

**C.** "The temperature at which the ice cream is going to start to freeze is determined by that equation." (paragraph 3)

**D.** "turn that liquid mix into the solid, liquid, and gas product we know as ice cream" (paragraph 5)

**E.** "I had no clue where it would take me." (paragraph 7)

PTI0501a02_1:2

**13.** This question has two parts.

**Part A**

What is the main idea of the excerpt from "Real Talk with Dr. Maya"?

**A.** Making good ice cream requires research and hard work.

**B.** Dr. Maya went to other countries to taste different types of ice cream.

**C.** Dr. Maya uses computer programs to do her research on ice cream.

**D.** Using large freezers speeds up the process of making ice cream.

**Part B**

Which detail from the passage **best** supports the answer to Part A?

**A.** "I'd start with a formula on a spreadsheet." (paragraph 3)

**B.** "It was a lot of back-and-forth, figuring out what I wanted." (paragraph 4)

**C.** "takes 15 to 30 seconds" (paragraph 6)

**D.** "flavors ranging from squid ink to wasabi" (paragraph 8)

PTI051b

# *from* Morgan Goodall—Sweet Science Comes Baked In

*by Dan Risch*

1 Some students dream that one day their picture will appear on boxes of breakfast cereal, because they are a star athlete or a celebrity. As a middle school student, Morgan Goodall dreamed of inventing the food filling those boxes. This spring, Morgan will take a giant step toward making her dream real. In May, Purdue University will award a Master's of Science degree to Morgan, in food science.

2 Morgan grew up surrounded by delicious food, like warm oatmeal cookies tucked full of raisins. Her great-grandfather was a baker. Her grandfather, David, ran a storefront bakery for 40 years. He then invented frozen bagel dough and built a production plant to make it. Even Morgan's father is a foodie. He sells specialized food ingredients to food makers around the country.

3 "When I was 10," recalls Morgan, "I'd go into the back of my grandfather's bakery and play with the dough. My favorite thing was the maraschino cherries. I'd stick my hand into a tub and take home as many cherries as I wanted."

4 Over time, much more than cherry juice stained Morgan's fingers. A zest to learn about food colored her ambitions.

5 "Learning about, and working with, food is absolutely fun," Morgan says with enthusiasm. "Every food acts different, looks different, and tastes different. People have differing opinions about food, and you make food choices based on more than just basic need. For me, who always wants to work on, and learn about, different things, food [as a career] is perfect."

6 Morgan saw a career in food science as a way to link everything she had learned from her family. It would also allow her to make her own unique contribution to the family's history. As a food scientist, she says, "I could shine as an individual."

7 Purdue University put the polish on Morgan's dream. But as she started the four-year food science program, she had to confront a fear faced by many students. "When I first went into the program," Morgan admits, "I was apprehensive about the science I had to take. It's definitely science heavy—chemistry, biology, and microbiology. In those three [areas], you take basic-level courses and then food-specific classes."

8 "You study food from a biological standpoint, food microbiology, and food chemistry. You take sensory science. You learn how consumers react to how

food tastes and feels, and you learn how to create a food product from an idea."

9 "BUT," Morgan stresses, "the fact that you're majoring in food science gives you an edge because you learn everything in the context of FOOD. I'm the type of person that needs to see it and feel it to understand it. So, to put chemistry in terms of food, I go into my kitchen and try something to understand the basic chemistry. That helps me."

PTI0501b04_1:4

**14.** This question has two parts.

**Part A**

In the excerpt from "Morgan Goodall—Sweet Science Comes Baked In," Goodall claims that she learns about food best by —

**A.** using her senses

**B.** attending classes

**C.** practicing traditional recipes

**D.** listening to the opinions of others

**Part B**

Which detail from the passage **best** supports the answer to Part A?

**A.** "then invented frozen bagel dough" (paragraph 2)

**B.** " 'make food choices based on more than just basic need' " (paragraph 5)

**C.** " 'study food from a biological standpoint' " (paragraph 8)

**D.** " 'the type of person that needs to see it and feel it to understand it' " (paragraph 9)

PTI051cp

# *Adapted from* Surprisingly STEM: Space Food Scientist

*This transcript is adapted from a video about the food available to astronauts in the International Space Station.*

1 On the International Space Station standard menu, there are over 200 different food and beverage items that we supply. We provide food training sessions to crew members. Once they are assigned to a flight, they will come in to try all the food that we provide on the standard menu.

2 We're trying to make this easy for crew members, so we break the menu into ten different categories.

3 In those categories, we have breakfast, where they can find scrambled eggs, where they can find granola and blueberries, and where they can find their own cereal.

4 For lunch and dinner, we break the menu down into vegetable and soup, meat and fish, and side dishes.

5 Then we also have snacks and desserts for crew members to choose as a well.

6 Among the space food we send to the International Space Station, there are several major types.

7 The first type is in these green pouches. The pouches thermally stabilize the food, just like the canned foods you can find in the grocery store. This type of food utilizes high heat to make the product sterile so that it does not require refrigeration or freezing. They can heat the food up or eat it as is by just opening the pouch.

8 The other type of food we send up is a freeze-dried product. Freeze-drying is a process to remove most of the water out of the food. The weight of the food becomes super light, and once the crew member adds the water back before consumption, it will reconstitute and represent the texture of this product again.

9 The food we provide right now to our astronauts is considered ready to eat, which means that all the crew members need to do is either put the pouch inside of the food warmer to heat it up if they prefer it warm, or add water. If it's a freeze-dried product, they will need to add water first, and then they can heat it up or let it hydrate for 10 to 15 minutes before they open it up and eat it.

10 In the microgravity environment, water is supercritical. Water acts like a glue, bonding the food together. The surface tension of water allows the crew

members to open the pouch carefully and use a spoon to scoop the food and deliver that into their mouths.

11 Definitely a lot of consideration goes into what recipes to create.

12 First of all, we want the food to taste good. If the food does not taste good, then no crew member would want to eat it.

13 Secondly, we also want to bring nutritional benefits to crew members, so we're looking at what's already available in the current food system and what's lacking.

14 My favorite part of this job is really to serve a larger purpose—that I'm part of the effort to support human space exploration, so that one day we can go back to the moon and have a presence on Mars.

15 As we're preparing for those longer exploration missions, we're in the process of evaluating shelf life, because for the longer exploration missions, the food needs a longer shelf life. Right now, for the International Space Station, we're targeting a three-year shelf life. For the Mars mission, we're targeting a five-to-seven-year shelf life. So our food scientists are working to see what approach we can use to ensure the food will still be good and nutritious five to seven years later.

16 Microgravity creates its own unique challenges. For example, at home, salt and pepper is just sitting on our table in shakers, but these are also crumbs, which could just float in space. On earth, they just fall on the table or the ground. In microgravity, they can get into the equipment and mess with it. Therefore, we have to dissolve the salt in water and send this as a liquid salt to be used in the microgravity environment.

Adapted from "Surprisingly STEM: Space Food Scientist"—Public Domain/NASA

PTI0501c05_P_2:3

**15.** This question has two parts.

**Part A**

In paragraph 9 of the transcript of "Surprisingly STEM: Space Food Scientist," what does the word hydrate mean?

**A.** Cool

**B.** Soak

**C.** Drain

**D.** Thaw

**Part B**

Which phrase from paragraph 9 **best** supports the answer to Part A?

**A.** "to heat it up"

**B.** "a freeze-dried product"

**C.** "to add water first"

**D.** "before they open it up"

PTI0501c06_P_1:3

**16.** This question has two parts.

**Part A**

In the transcript of "Surprisingly STEM: Space Food Scientist," the speaker claims that water is —

**A.** essential for astronauts to be able to eat in space

**B.** available in most foods used in space

**C.** difficult for astronauts to use in space

**D.** needed to increase how long foods stay fresh in space

**Part B**

Which detail from the transcript **best** supports the answer to Part A?

**A.** "heat the food up or eat it as is by just opening the pouch" (paragraph 7)

**B.** "weight of the food becomes super light" (paragraph 8)

**C.** "acts like a glue, bonding the food together" (paragraph 10)

**D.** "targeting a three-year shelf life" (paragraph 15)

PTI0501x07_P_1:6,2

**17.** This question has two parts.

**Part A**

In the excerpts from "Real Talk with Dr. Maya" and from "Morgan Goodall—Sweet Science Comes Baked In," how are Dr. Maya Warren's and Morgan Goodall's points of view different?

**A.** Dr. Maya Warren enjoys teaching others the process of creating new recipes, while Morgan Goodall values the challenges of her academic training.

**B.** Dr. Maya Warren prefers working alone, while Morgan Goodall prefers working with her family.

**C.** Dr. Maya Warren credits others for inspiring her career, while Morgan Goodall chose her career on her own.

**D.** Dr. Maya Warren thinks she might choose a different career, while Morgan Goodall wants to take over the family business.

**Part B**

Which details from the passages **best** support the answer to Part A? Select one answer from **each** passage for a total of **two** correct answers.

**A.** "could research the ins and outs of ice cream all day" (paragraph 7, "Real Talk with Dr. Maya")

**B.** "would go to other countries and help design dairies" (paragraph 8, "Real Talk with Dr. Maya")

**C.** "still love it because of the joy it brings others" (paragraph 9, "Real Talk with Dr. Maya")

**D.** "grew up surrounded by delicious food" (paragraph 2, "Morgan Goodall—Sweet Science Comes Baked In")

**E.** " 'have differing opinions about food' " (paragraph 5, "Morgan Goodall—Sweet Science Comes Baked In")

**F.** " 'that you're majoring in food science gives you an edge' " (paragraph 9, "Morgan Goodall—Sweet Science Comes Baked In")

PTI0501x08_P_4:6,2

**18.** This question has two parts.

**Part A**

Both the excerpt from "Morgan Goodall—Sweet Science Comes Baked In" and the transcript of "Surprisingly STEM: Space Food Scientist" explain —

**A.** the amount of education required to become a food scientist

**B.** that nutrition is an important aspect of food science

**C.** the in-depth scientific steps required to create food

**D.** that food scientists value the work they do

**Part B**

Which details from the passages **best** support the answer to Part A? Select one answer from **each** passage for a total of **two** correct answers.

**A.** " 'go into the back of my grandfather's bakery and play with the dough' " (paragraph 3, "Morgan Goodall—Sweet Science Comes Baked In")

**B.** "zest to learn about food colored her ambitions" (paragraph 4, "Morgan Goodall—Sweet Science Comes Baked In")

**C.** " 'take basic-level courses and then food-specific classes' " (paragraph 7, "Morgan Goodall—Sweet Science Comes Baked In")

**D.** "a process to remove most of the water out of the food" (paragraph 8, "Surprisingly STEM: Space Food Scientist")

**E.** "then no crew member would want to eat it" (paragraph 12, "Surprisingly STEM: Space Food Scientist")

**F.** "favorite part of this job is really to serve a larger purpose" (paragraph 14, "Surprisingly STEM: Space Food Scientist")

PTI0501x09_P_3:1,6

**19.** This item has two parts.

**Part A**

How are the **main** structures of the excerpt from "Morgan Goodall—Sweet Science Comes Baked In" and the transcript of "Surprisingly STEM: Space Food Scientist" similar or different?

**A.** Both passages explain the steps in a process.

**B.** Both passages describe a cause and its effect.

**C.** "Morgan Goodall—Sweet Science Comes Baked In" describes events in chronological order, while "Surprisingly STEM: Space Food Scientist" explains solutions to problems.

**D.** "Morgan Goodall—Sweet Science Comes Baked In" provides a comparison, while "Surprisingly STEM: Space Food Scientist" lists events in sequential order.

**Part B**

Which phrases from the passages **best** support the answer to Part A? Select one answer from **each** passage for a total of **two** correct answers.

**A.** Over time (paragraph 4, "Morgan Goodall—Sweet Science Comes Baked In")

**B.** with enthusiasm (paragraph 5, "Morgan Goodall—Sweet Science Comes Baked In")

**C.** to link everything (paragraph 6, "Morgan Goodall—Sweet Science Comes Baked In")

**D.** Secondly (paragraph 13, "Surprisingly STEM: Space Food Scientist")

**E.** Right now (paragraph 15, "Surprisingly STEM: Space Food Scientist")

**F.** unique challenges (paragraph 16, "Surprisingly STEM: Space Food Scientist")

PTI0501x10_P

**20.** You have reviewed three sources about food scientists: the excerpt from "Real Talk with Dr. Maya," the excerpt from "Morgan Goodall—Sweet Science Comes Baked In," and the adapted transcript of the video "Surprisingly STEM: Space Food Scientist."

Write an essay in which you explain how food scientists use their research to solve problems in their jobs. Use details from all **three** sources to support your essay.



STOP


**Please let your teacher know that you have completed your test.**



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