



Completion Type Questions - Exercise -2: Deadly spider sews industrial strength silk strands

27 minutes left

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PASSAGE

Deadly Spider Sews Industrial-Strength Silk Strands

Most of us try to avoid brown recluse spiders, given their potent venom, but a team of scientists recently dared to study the arachnids up close and were amazed by what they saw: spiders in deep concentration crafting an industrial strength material for their webs with a sewing-like motion. If the spider's unique silk and technique are applied to synthetic materials, the researchers believe that the results could benefit space travel, lead to better parachutes, allow for more impressive Hollywood movie stunts and more. The findings are published in the journal Materials Horizons.

The spider uses its silk-producing organs, called spinnerets, to sew the strands. The large spinnerets form a loop of silk thread before the smaller spinnerets close the loop with a speedy clamp-and-release action. "The motion is similar to how one might roll up an extension cord: by drawing out a length of cord, clamping it into a loop and bundling the looped portion with the prior loops," said Hannes Schniepp, an associate professor in the department of applied science at William & Mary College and the study's lead author. The resulting material, as seen by Schniepp and his colleagues under high magnification, consists of multiple micro-loops that boost silk's strength. Sean Koebley, a graduate student who co-authored the study, said that even a single loop "significantly enhances the toughness" of the material.

The brown recluse's silk is the only known spider silk to be thin and flat instead of round. Schniepp likened the sticky silk to a piece of Scotch tape, but 2000 times thinner. "Its thinness makes it very floppy, very sticky and a lot of other really unique things in the materials world," he added. "It is the thinness that makes the self-adhesive loops possible in the first place."

The spider's distinctive silk and web-crafting technique evolved to catch prey. The brown recluse is a ground-dwelling spider, which makes the requirements for its web very different from those of a spider that catches flying insects. The reclusive spider's web, with its tiny threaded loops, functions as a death trap. Its stickiness is like fly paper, but the loops make the web more flexible and prevent it from collapsing onto itself. "Have you ever tried to wrap a Christmas present with an extremely long piece of Scotch tape?" Schniepp asked. "When I do that, I end up in a huge mess that can never be sorted out again; the tape ends up being all crumpled up and in wrinkles. Through the loops, the recluse spider is able to avoid all of these problems."

Other research teams in the past have attempted to strengthen synthetic filaments with tiny loops built into the material, but they failed because the fibers would easily break. Observation of the recluse spider offers a breakthrough solution, which is to use thin and flat nano-scale ribbon-shaped fibers to create the many loops.

The scientists have not yet created a man-made version of the material, but efforts are underway. They have developed mathematical models to describe the web's structure and properties in detail and have already submitted a patent application to produce a spider-inspired synthetic product. They imagine the material could be used in space travel. "By weight, spider silk is already five times stronger than steel," Schniepp explained. "Adding the loops makes it even better. In space, there are micrometeorites or space junk that can do enormous damage. We envision protective webs around space structures and vehicles to protect from this kind of incident." Another application, he said, could be in the production of lightweight bungee cords that could absorb enormous amounts of energy, "say, if James Bond needs to jump down from a very high building or bridge." Yet another use could be in manufacturing more effective cords to hold up parachutes since they need to absorb a lot of energy when the parachute opens. These are some of the more remarkable possibilities, but much more exist.

The loopy material could potentially improve upon any existing man-made fabric or cord where strength, weight, flexibility, and lightness are needed. "It's great to get this kind of inspiration from nature to develop the next generation of high-performance material," Schniepp said. "Spiders do this in such an incredibly benign way; all they need is to eat a cricket every now and then, and they can produce this amazing material."

Questions

**\*\*Questions 1- 5\*\*** Select the correct choices from the options 1-8. Any grammatical errors or errors in spelling will be marked wrong

Q.1 Brown recluse spiders are usually avoided by humans because of their \_\_\_\_\_.

multiple micro-loops

Q.2 A team of daring scientists who studied the brown spiders was amazed to see it making a web using a \_\_\_\_\_.

thinness

Q.3 Scientist Hannes Schniepp drew parallels of the spider’s clamp-and-release action of its spinnerets to\_\_\_\_\_.

thinness

Q.4

The brown spider’s web is very floppy and very sticky because of its \_\_\_\_\_.

thinness

Q.5 The brown recluse's silk is the only known spider silk to be thin and flat instead of \_\_\_\_\_.

thinness

Questions

**\*\*Questions 6 – 10\*\*** Choose **\*\*NOT MORE THAN TWO WORDS\*\*** from the passage for each answer. Write your answers in the blank given below. The brown recluse spider uses a clamp-and-release action to make multiple micro-loops that boost the (6) \_\_\_\_\_. The brown recluse is a ground-dwelling spider and thus it needs a different web-crafting technique to (7) \_\_\_\_\_. Efforts to create a spider-inspired synthetic product are being made by scientists, who have developed (8) \_\_\_\_\_ describing the web’s structure and properties. Scientists foresee the usage of the product in space structures & vehicles that can shield it from micro-meteorites or (9) \_\_\_\_\_. The new synthetic material could potentially improve upon any existing (10) \_\_\_\_\_ .

Q.6

The brown recluse spider uses a clamp-and-release action to make multiple micro-loops that boost the \_\_\_\_\_ .

Q.7 The brown recluse is a ground-dwelling spider and thus it needs a different web-crafting technique to \_\_\_\_\_.

Q.8 Efforts to create a spider-inspired synthetic product are being made by scientists, who have developed \_\_\_\_\_

Q.9 describing the web’s structure and properties. Scientists foresee the usage of the product in space structures & vehicles that can shield it from micro-meteorites or \_\_\_\_\_.

Q.10 The new synthetic material could potentially improve upon any existing \_\_\_\_\_ .

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