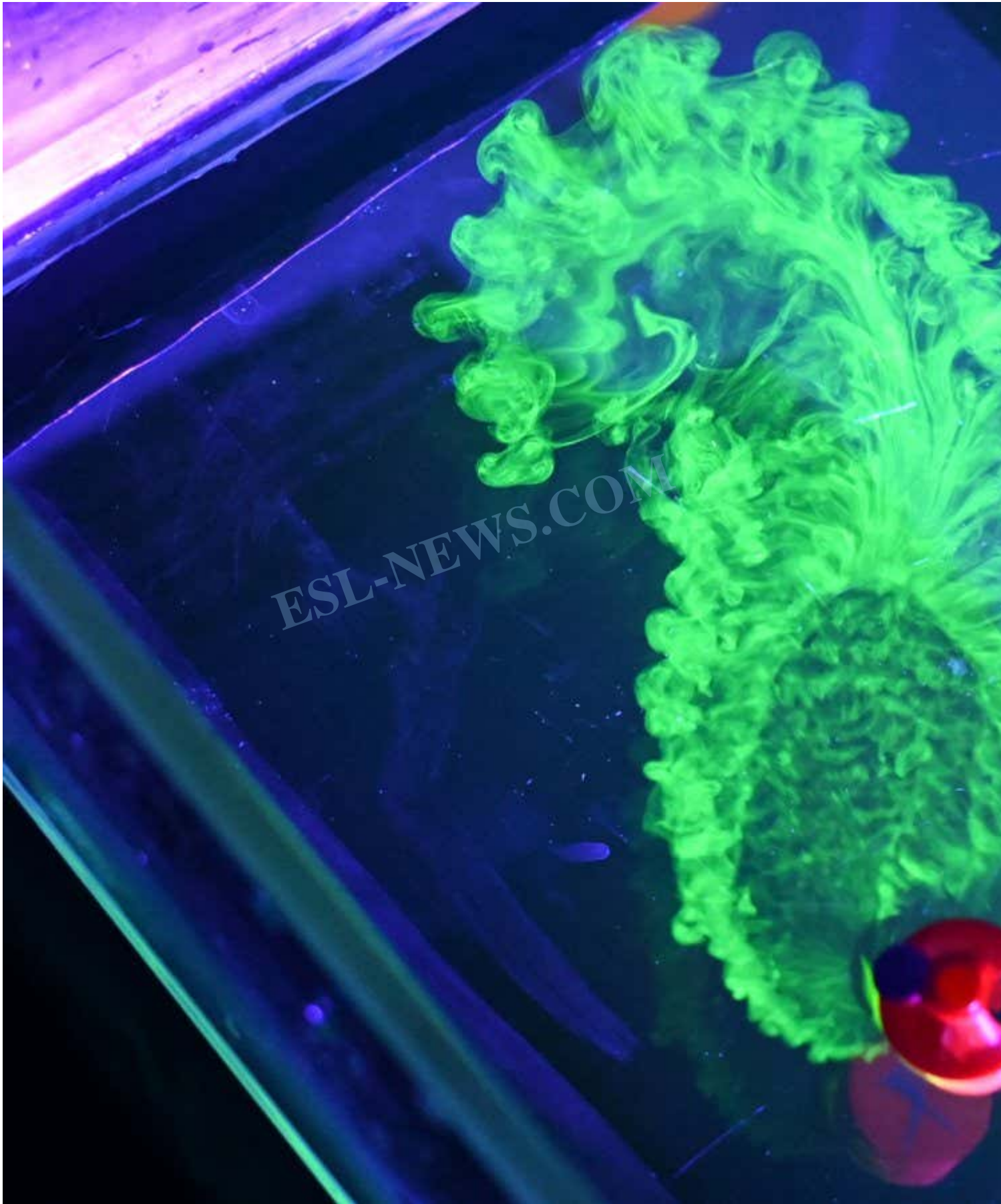




Inspired by Cheerios: New Robot Design Unveiled

Description

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Beetles can float across ponds and Cheerios can stick together in a bowl. Tiny floating robots use a similar effect called the Marangoni effect. It happens when a liquid spreads quickly over another liquid with a different surface tension.

Researchers at Harvard University made small round robots with air inside and fuel made of alcohol. The alcohol leaks out slowly, making the robot move on water.

The robots move faster with stronger alcohol. They can make wide curves or spin when many robots are stuck together. This is similar to how Cheerios stick together in a bowl.

These 3D-printed robots can help students learn surface tension concepts. They can also be used in the environment or industry to spread chemicals evenly without human help.

These robots have interesting uses and behaviors that make them helpful in many fields.

Vocabulary List:

1. **Marangoni** /,mæɹ.ə'gɒʊ.ni/ (noun): A phenomenon where a liquid spreads quickly over another liquid due to differences in surface tension.
2. **Robots** /'rɒʊ.bɔ:tʃ/ (noun): Machines capable of carrying out a complex series of actions automatically.
3. **Surface Tension** /'sɜr.fɪs 'tɛn.jən/ (noun): The characteristic of a liquid surface that makes it behave like a stretched elastic membrane.
4. **Alcohol** /'æɪ.kə.hɔ:l/ (noun): A class of chemical compounds of which ethanol is the most commonly used as a fuel.
5. **Chemicals** /'kɛm.i.kəlz/ (noun): Substances used in or produced by chemical processes.
6. **Curves** /kɜrvz/ (noun): Smooth continuous lines or paths that are not straight.

Comprehension Questions

Multiple Choice

1. What is the name of the effect that tiny floating robots use to move on water?

Option: Marangoni effect

Option: Buoyancy effect

Option: Capillary action

Option: Surface tension effect



2. What type of fuel do the small round robots have?

- Option: Gasoline
- Option: Alcohol
- Option: Electricity
- Option: Biofuel

3. What helps the robots move faster?

- Option: Air inside them
- Option: Stronger alcohol
- Option: Buoyant force
- Option: Electric propulsion

4. How can multiple robots spin?

- Option: By releasing air bubbles
- Option: By magnetic force
- Option: By sticking together
- Option: By changing shape

5. What can these 3D-printed robots be used for in education?

- Option: Learning about gravity
- Option: Understanding buoyancy
- Option: Exploring aerodynamics
- Option: Teaching surface tension concepts

6. In which fields can these robots be helpful?

- Option: Space exploration only
- Option: Medical industry only
- Option: Many fields
- Option: Entertainment industry

True-False

7. Beetles can float across ponds and Cheerios can stick together in a bowl.

8. The alcohol leaks out slowly, causing the robots to move on water.

9. The robots can only move in straight lines on water.



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10. These robots are not useful in educational settings.
 11. The Marangoni effect occurs when liquids with different surface tensions interact.
 12. These robots cannot spread chemicals evenly in industrial applications.

Gap-Fill

13. Tiny floating robots use a similar effect called the _____ effect.
14. The robots move faster with _____ alcohol.
15. These 3D-printed robots can help students learn _____ concepts.
16. The robots can also be used in the environment or industry to spread chemicals evenly without human _____.
17. The robots have interesting uses and behaviors that make them helpful in _____ fields.
18. The researchers at Harvard University made small round robots with _____ inside and fuel made of alcohol.

Answer

Multiple Choice: 1. Marangoni effect 2. Alcohol 3. Stronger alcohol 4. By sticking together 5. Teaching surface tension concepts 6. Many fields

True-False: 7. True 8. True 9. False 10. False 11. True 12. False

Gap-Fill: 13. Marangoni 14. stronger 15. surface tension 16. help 17. many 18. air

Vocabulary quizzes

Multiple Choice (Select the Correct answer for each question.)

1. What technology is commonly used to detect changes in the environment?



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- Option: A. Sensors
Option: B. Robots
Option: C. Subscription
Option: D. Competition
2. Who are the individuals receiving medical care or treatment?
Option: A. Subscription
Option: B. Patients
Option: C. Pollution
Option: D. Consumers
3. What is the act of allocating money or resources in the expectation of benefit in the future?
Option: A. Investment
Option: B. Sensors
Option: C. Proposal
Option: D. Treaty
4. What term refers to the quality of being coherent and intelligible?
Option: A. Robots
Option: B. Clarity
Option: C. Extinction
Option: D. Marangoni
5. Who are the people who purchase goods and services for personal use?
Option: A. Emissions
Option: B. Investment
Option: C. Consumers
Option: D. Track
6. What refers to the introduction of harmful substances into the environment?
Option: A. Pollution
Option: B. Track
Option: C. Sensors
Option: D. Commission
7. What quality denotes the degree of conformity of a measured or calculated quantity to its actual value?
Option: A. Competition
Option: B. Harmful
Option: C. Accuracy
Option: D. Identify
8. What category do substances utilized in chemical processes belong to?
Option: A. Treaty



- Option: B. Chemicals
- Option: C. Sensors
- Option: D. Subscription

9. What term denotes the state or process of a species family or larger group being or becoming extinct?

- Option: A. Subscription
- Option: B. Accuracy
- Option: C. Extinction
- Option: D. Sensors

10. What physical property of liquids causes them to minimize their surface area?

- Option: A. Robots
- Option: B. Marangoni
- Option: C. Surface Tension
- Option: D. Identify

Gap-Fill (Fill in the blanks with the correct word from the vocabulary list.)

11. Continuous _____ of the patient's vital signs is essential in critical care.
12. You can enjoy ad-free music by getting a premium _____ to the streaming service.
13. Before the project can begin the team needs to submit a detailed _____ for approval.
14. The success of the experiment relied on the _____ of the measurements taken.
15. Making a smart _____ in your education can lead to better career opportunities.
16. It is important to segregate waste so that materials can be _____ and reused.
17. Exposure to certain substances can have _____ effects on human health.
18. Forensic scientists use various techniques to _____ unknown substances found at crime scenes.
19. The GPS system allows you to _____ the location of your delivery in real-time.
20. The artist received a _____ for a sculpture to be placed in the city park.



Matching Sentences (Match each definition to the correct word from the vocabulary list.)

21. Organizations strive to outperform rivals in a market with similar products or services.
22. Individuals or households that use goods or services generated within an economy.
23. Phenomenon where surface tension gradients drive flow between two fluid regions.
24. Automated machines designed to carry out tasks typically performed by humans.
25. Formal agreement between multiple states to regulate various aspects of their relationships.
26. Release of pollutants or gases into the atmosphere typically from vehicles or industrial processes.
27. Regular payment made to access services or content over a period of time.
28. A formal suggestion or plan submitted for consideration or discussion.
29. To establish or recognize the nature of someone or something.
30. To observe and check the progress or quality of something over a period of time.

Answer

Multiple Choice: 1. A. Sensors 2. B. Patients 3. A. Investment 4. B. Clarity 5. C. Consumers 6. A. Pollution
7. C. Accuracy 8. B. Chemicals 9. C. Extinction 10. C. Surface Tension

Gap-Fill: 11. monitoring 12. subscription 13. proposal 14. accuracy 15. investment 16. recycled 17. harmful
18. identify 19. track 20. commission

Matching sentence: 1. Competition 2. Consumers 3. Marangoni 4. Robots 5. Treaty 6. Emissions 7.
Subscription 8. Proposal 9. Identify 10. Monitor

CATEGORY

1. Sci/Tech - LEVEL2

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