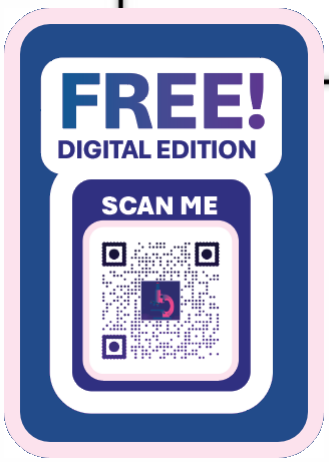
Teacher Resource Pack

December 2025
Season 2: Issue 4



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Biomaterials Investigator

In this activity we will explore different biomaterials and learn how they are used to create medical devices. First, we will sort the materials into their correct groups. Then we will choose one device to investigate in more detail. Finally, we will think about why natural materials from the ocean are so important in modern medicine.

A. Sort & Classify

Sort the items into natural biomaterials or synthetic biomaterials:

Alginate **Stainless-steel stent** **Metal hip joint** **Chitosan**
Ceramic dental implant **Plastic heart valve** **Silk** **Nitinol**

Natural Biomaterials	Synthetic Biomaterials

B. Device Deep Dive

Choose a stent or hydrogel and answer the questions.

1. What material(s) is your device made from?

_____

_____

2. What problem does it solve?

_____

_____

3. How does it work? Describe the steps clearly.

_____

_____

4. What new innovation is mentioned about this device?

_____

_____

5. What is one question you would ask a CÚRAM scientist about your chosen device?

_____

_____

C. Discussion Time

Why are ocean materials useful in medicine? Discuss together

STEM Career Explorer

In this activity we will explore the different STEM roles involved in creating medical devices. We will look at the skills each researcher uses in their work and match them to real examples from CÚRAM's labs. Then we will examine the STEM fields that support this research and think about which skills and school subjects connect to them. Finally, we will discuss which research team we would most like to join and why.

A. Match the Researcher to the Work

Write the correct name beside each statement.

Aert Scheper **Dr Anna Johnston** **Kristine O'Dwyer**

Dr Kevin Ng **Palesa Mphaka**

1. Studies soft discs in the spine to understand inflammation: _____
2. Grows a 3D-printed scaffold to repair the trachea: _____
3. Creates special coatings for stents to stop bacteria sticking: _____
4. Predicts who may develop long-term back pain: _____
5. Uses 3D bioprinting to study cancer cells: _____

B. STEM Skills

Look at the five STEM areas on pages 8–9. Complete the table.

STEM Field	One Skill Needed	School Subject That Helps
Biomedical Engineering		
Materials Science		
Tissue Engineering		
Computational Modelling		
Medical Device Design		

C. Discussion Time

If you could join one researcher's team for a week, whose team would you choose and why?

MS and Diabetes

In this activity we will explore two long-term health conditions – multiple sclerosis (MS) and diabetes – and learn how they affect the body in different ways. We will compare what happens inside the body, the symptoms people may experience and the devices that can help. Then we will answer questions about the science behind these conditions and why support, awareness and good research are so important.

A. Compare and Contrast

Based on pages 10–15 of *STEM Matters*

Topic	Multiple Sclerosis (MS)	Diabetes
What part of the body is affected?	_____	_____
What mistake does the immune system make?	_____	_____
Possible symptoms	_____	_____
Devices that help	_____	_____
Researchers mentioned	_____	_____

B. Question Time

Use your skimming and scanning skills to answer these short questions.

1. Why do scientists grow cells in dishes when studying MS?

_____

2. Why does the body need insulin?

_____

3. How do continuous glucose monitors (CGMs) or insulin pumps help people with diabetes?

_____

4. Why is empathy important when learning about long-term conditions?

_____

5. How does damaged myelin affect the speed of messages travelling through the nervous system?

_____

6. Why is early diagnosis important for people living with MS?

_____

7. What challenges might a person with diabetes need to think about when balancing food, exercise and insulin?

_____

8. Why are devices like closed-loop systems sometimes called an ‘artificial pancreas’?

_____

Design Time

In this activity we will explore different biomaterials and find out how they are used to make medical devices. First, we will look at a range of materials and sort them into their correct groups. Then we will choose one device to investigate in more detail. Finally, we will think about why natural materials from the ocean are important in modern medicine.

Build a Medical Device with Biomaterials

Materials Needed

- Printed hand template
- Scissors
- String
- Sellotape
- Straws
- Household materials you could use as a tendon (e.g. toothpicks, paperclips, thread, yarn, ice-lolly sticks, elastic bands, pipe cleaners)

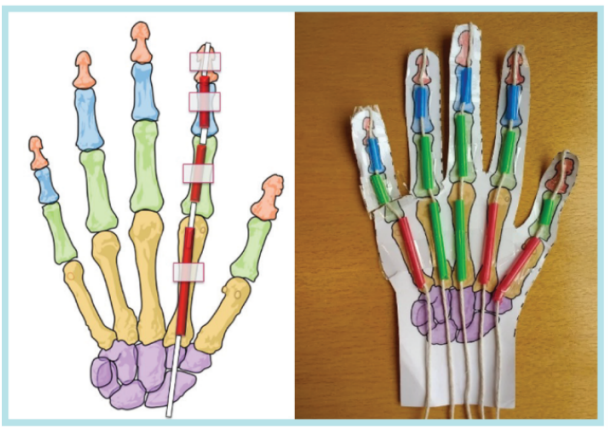
Part I: Making the Model Hand

1. Cut out the hand following the dashed lines on the printed template.
2. Cut up a straw into three pieces. Tape the three pieces onto the bones of the finger on the template.
   Note: Leave space between each straw piece.
3. Tape the three pieces of cut-up straw to the remaining finger bones.
4. Tape the end of a piece of string to the pink bone at the tip of the finger.
5. Thread the string through the three pieces of cut-up straw.
6. Bend the paper between the straws to allow the finger to move easily.
7. Repeat these steps for the other fingers.

Part II: Fixing the Tendon

Once the hand is finished, use scissors to cut the string between two straws on a chosen finger. Note: Cutting the string imitates cutting a tendon.

Using materials you gathered from home, build a replacement tendon to support the finger.
Note: Your new 'tendon' should let the finger move and bend freely again.



Assessment Questions

1. What materials did you use?

   _____

2. What did this activity teach you about designing biomedical devices?

   _____

3. Did your results vary depending on the materials you used?

   _____

4. If you were fixing the tendon again, what would you do differently?

   _____

5. What materials worked well? Which did not?

   _____

Experiment Time

In this activity we will explore how hydrogels work by making a simple biomaterial (slime!) of our own. We will investigate how polymers change when a crosslinker is added and see how this links to real biomaterials used in medicine. After creating the slime, we will test different ideas to find out how and why its properties change.

Make Your Own Hydrogel Slime

Materials Needed

- 120 ml of PVA glue
- 1 teaspoon of bread soda
- 1 teaspoon of teaspoon of eye wash containing boric acid
- Medium-sized cup
- Spoon
- Paper towel for clean-up

What You Learn

PVA glue is a polymer. A polymer is made of repeating parts, like Lego bricks joined together. When you add a chemical called a crosslinker (the boric acid in the eye wash), these chains stick together and form a hydrogel.

This is the same principle scientists use to make real biomaterial hydrogels for wound healing.

Process

1. Add the PVA glue to the cup.
2. Add the bread soda to the glue and stir.
3. Add the eye wash and mix everything together.

Your mixture will thicken, become stretchy and transform into a simple hydrogel.

Further Investigation

Answer the questions below after making your slime:

1. What could you add to make thicker or runnier slime?

_____

2. How does temperature affect the slime's viscosity (thickness)?

_____

3. What does the crosslinker do?

_____

4. Would your slime behave differently if you used more glue or more eye wash?

_____

5. Can you design coloured, scented or glitter slime?

_____

6. Does vinegar break down your slime? Why or why not?

_____

7. How is a hydrogel similar to the slime you made? How is it different?

_____

Answers

Biomaterials Investigator

Natural:
Alginate,
Chitosan, Silk

Synthetic:
Stainless-steel stent, Metal hip joint, Ceramic implant, Plastic valve, Nitinol

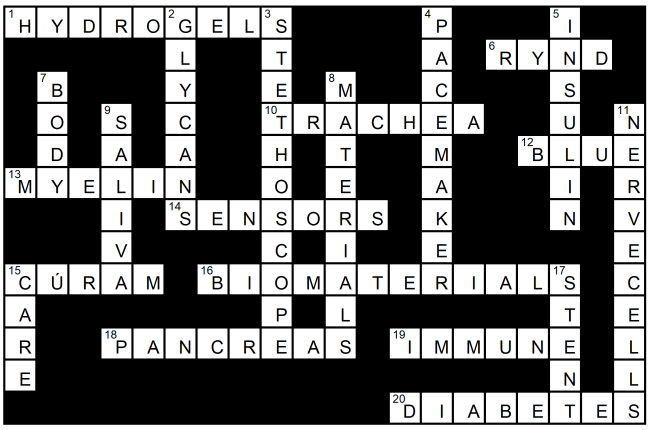
MS & Diabetes

1. To watch how the cells behave.
2. To help glucose enter cells for energy.
3. They help keep glucose levels steady.
4. It helps us understand what others are going through.
5. It makes messages travel more slowly.
6. Treatment can start sooner.
7. Checking glucose, food, exercise and insulin.
8. They automatically control insulin like a pancreas.

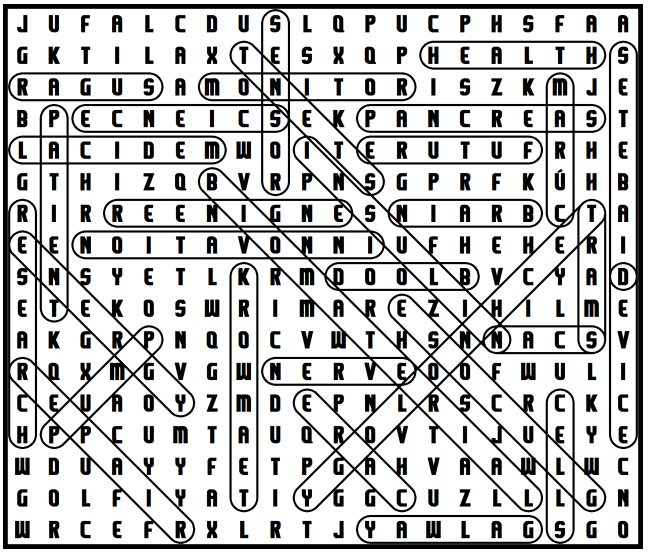
STEM Career Explorer

Aert Scheper – spine discs
Dr Anna Johnston – trachea scaffold
Kristine O'Dwyer – stent coatings
Dr Kevin Ng – predicting back pain
Palesa Mphaka – cancer bioprinting

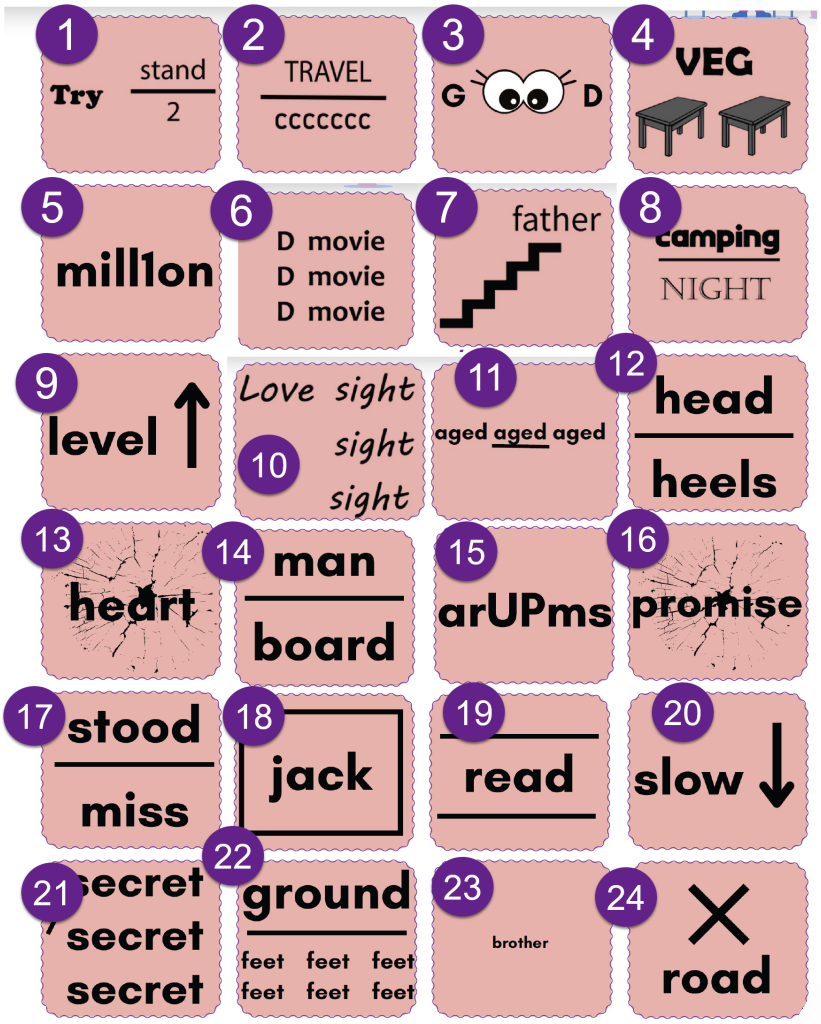
Crossword



Word Search



Answers



1. Try to understand
2. Travel overseas
3. Good looking
4. Vegetables
5. One in a million
6. Three-D movies
7. Stepfather
8. Camping overnight
9. Level up
10. Love at first sight
11. Middle aged
12. Head over heels
13. Broken heart
14. Man overboard
15. Up in Arms
16. Broken promise
17. Misunderstood
18. Jack in the box
19. Read Between the Lines
20. Slow down
21. Top secret
22. 6 Feet Underground
23. Little brother
24. Crossroad