

INVESTIGATING IN SCIENCE: REPLICATING MODELS TO INVESTIGATE A SCIENTIFIC CONCEPT.

UNDERSTANDING THE ROLE OF OSMOSIS IN KEEPING OUR BODIES HYDRATED.

ESSENTIAL QUESTION:

WHAT DO AN EGG, A LOLLY, MY BODY AND DESIGN THINKING HAVE IN COMMON?

WHAT ARE WE LEARNING?

- Exploring simple models and carrying out appropriate investigations to develop simple explanations.
- Explaining how living things respond to environmental changes both natural and human induced.
- Undertaking functional modelling that takes account of stakeholder feedback.

TRY THIS WITH

- Year 6-8
- Students who have a developing science vocabulary.
- Students who love using design thinking.

find

apply

produce

Replicate

Generalise

Give examples

Show

Trace

Identify

Watch [Diffusion and Osmosis](#) to reinforce the concept for yourself as an educator.

Encourage students to taste test the vinegar, glucose syrup and water with food colouring solutions.

Ask students [how much water](#) they think might be in each solution?

Prepare the class to predict, observe, document and observe changes over at least 3 days.

Day 1: [Place each egg in a glass of white vinegar](#) (eggs bubble almost immediately).

Reinforce the concept of '[osmosis](#)' – [water seeking same same on each side of a membrane](#).

Ask: Where can you see evidence of osmosis occurring?

Day 2: Replace the vinegar with glucose syrup and return the egg to the glass.

Day 3: Ask students to use their osmosis knowledge to explain why the egg has shrunk.

Refine predictions for when the egg is returned to the [water and food colouring solution](#).

Use [photographs from throughout](#) the process to create an osmosis explainer video.

Correlate

Distinguish

Investigate

Isolate

Experiment

Analyse

Ask: [What would happen if we drank no water?](#)

Investigate the [impact of dehydration](#) on the body including observing the [urine indicator chart](#).

Watch '[What do your kidneys do?](#)' to reinforce this concept for you as an educator.

Re-visit concepts of [a fair test](#) and the [scientific method](#).

Remind students that their independent variable will be the solution.

Invent a range of solutions designed to mimic the nature of fluids students might use to hydrate.

Prompt the inclusion of a wide variety of solutions [milk, salt, coke, vinegar, baking soda, water](#) etc.

Set up the [Jelly Bears Experiment](#) making sure that a control is maintained.

Leave [jelly bears in solutions overnight](#) (we suggest an icecube tray or similar)

Photograph and discuss results at 12, 18 and 24 hours.

Ask: Where can you see evidence of water transfer occurring?

What conclusions can students draw from the [dramatic results](#) about which solution hydrates best?

Discuss

Evaluate

Propose

Prioritise

Infer

Validate, Justify

Introduce the concept of a [Rapid Prototyping Task](#).

Introduce the '[Design Problem](#)' – Students often drink irregular amounts of water during the day. Dehydration means student focus and learning is impacted and grumpiness increases. Your team must develop a prototype that keeps student water intake both sufficient and regular over the school day to stay hydrated.

Students must use [design thinking](#) to prototype a solution to keeping a whole class hydrated.

The project has an unlimited budget meaning students can design a low or a high-tech prototype.

Create [Empathy Maps](#) for different student groups: busy, active, don't like water etc.

[Test](#) other solutions: [apps, app-bottle combos, bottle design, gamification](#).

Think about [tracking water usage](#), consumption, [sustainability](#), recycling the same bottle etc.

[Brainstorm solutions](#): an app, a wrist-band, a robot, a transmitting device etc.

Choose a solution and [begin prototyping](#).

Check that your prototype means the WHOLE class stays hydrated.



success criteria

Students can check they have successfully completed the task by:

- Completing all three phases of the 'Egg Experiment' successfully without breaking the egg.
- Replicating the 'Jelly Bears Experiment' and using knowledge of osmosis to make predictions.
- Prototyping a solution to support a whole class of students to remain hydrated during a school day.

PRINCIPLES	VALUES	KEY COMPETENCIES	LEARNING AREAS	WORD BANK	KEY CONCEPTS
Learning to Learn Future Focus	Innovation, inquiry and curiosity Excellence	Participating and contributing Thinking Using language, symbols and texts	Science Technology	Concentration Gradient Equilibrium Passive movement Small intestine	Osmosis Diffusion Problem Solving Hydration

A STORY OF DEHYDRATION

Your classroom is hot, you are tired, grumpy and your teacher's voice sounds like it is at the end of a tunnel.



THIRSTY CELLS

You have not had a drink of water since before you got to school. Every cell in your body is dehydrated.



WATER ENTERS THE BODY

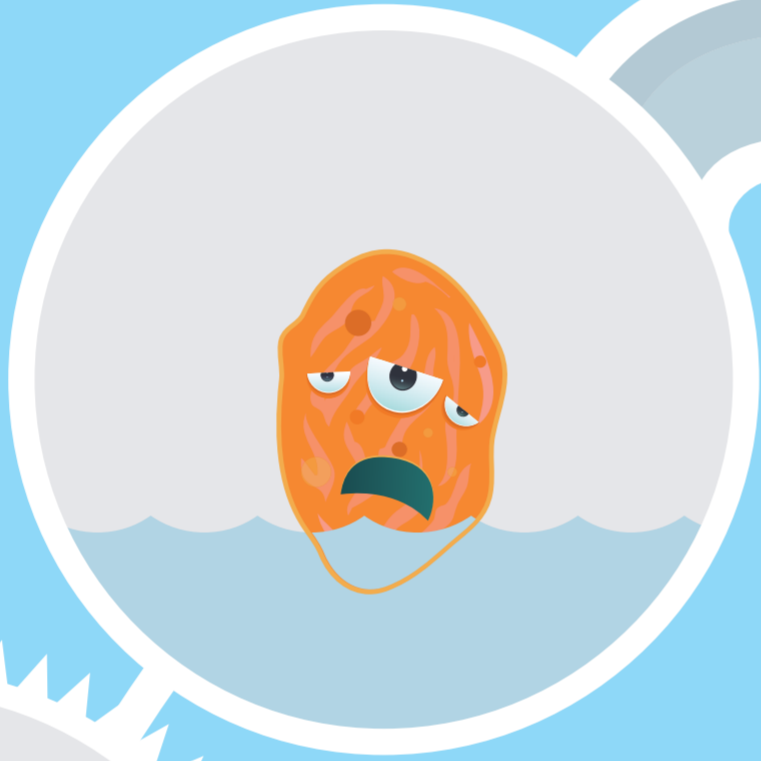
You drink a whole bottle of water really fast. The water travels down your throat to your stomach and small intestine.

HYDRATION

DEHYDRATED

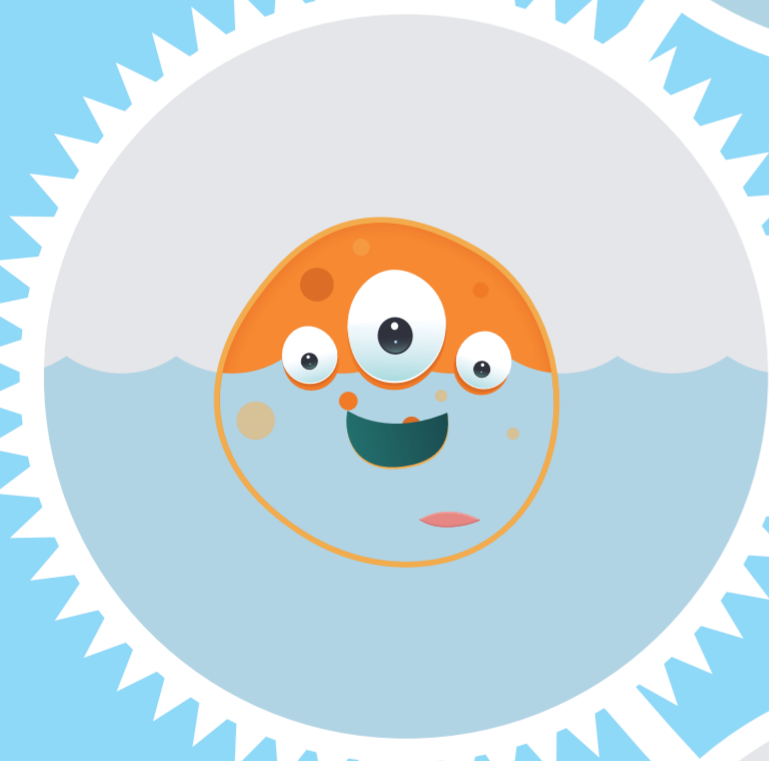
BALANCE

Water is taken from your gut to your thirsty cells by your blood.



OSMOSIS

Your body uses OSMOSIS to transfer the water to your dehydrated cells. OSMOSIS moves the same amount of water inside your cells as outside the cells.



HYDRATED

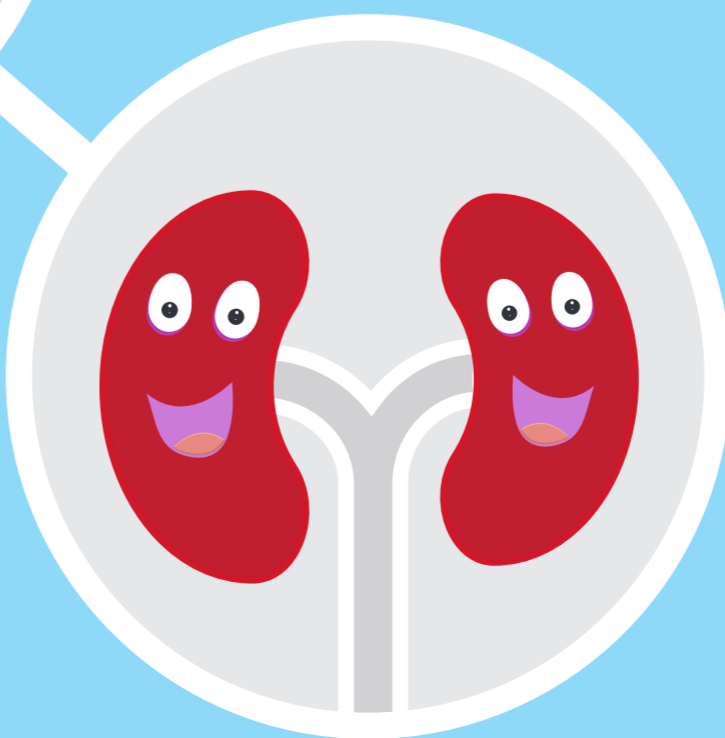
TOO MUCH WATER

Your cells are rehydrated and while you can hear your teacher and think more clearly there is now too much water in your blood.



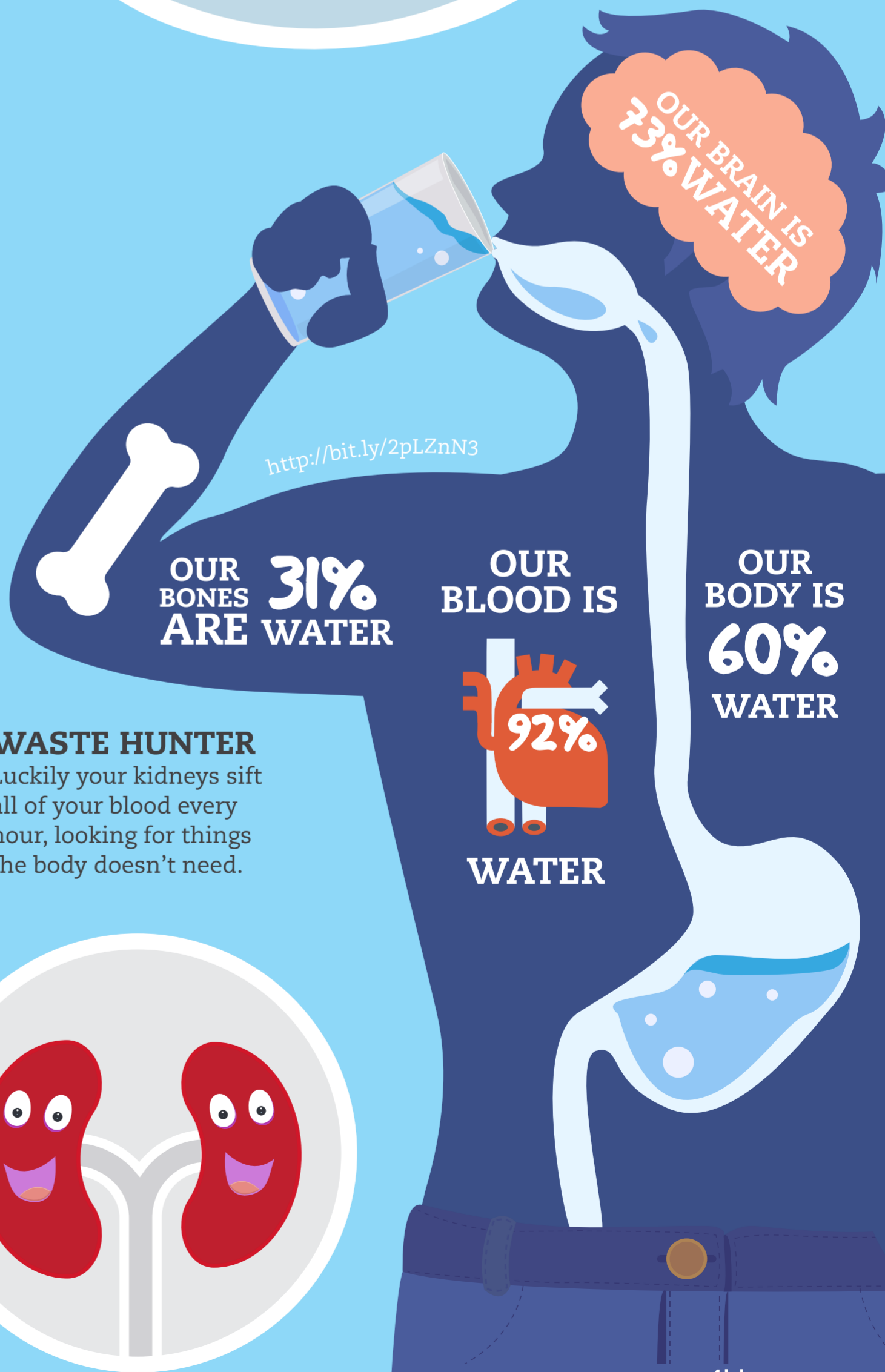
WATER & WASTE

Your kidneys find 1.8 litres of extra water and waste that needs to be turned into urine and sends it to your bladder.



WASTE HUNTER

Luckily your kidneys sift all of your blood every hour, looking for things the body doesn't need.



ARE YOU DEHYDRATED?

Check the colour of your urine to see how dehydrated you are.