

Water from space, and life beyond Earth HL

60 minutes • A1.1.7, A1.1.8 • Chapters 7, 8

Where Earth's water came from and why it stayed, and the Goldilocks zone in the search for life

BY THE END, STUDENTS CAN

- ☐ Outline how asteroids may have brought Earth's water, and why gravity and cool temperatures kept it A1.1.7
- ☐ Explain why the search for life elsewhere looks for liquid water in a star's Goldilocks zone A1.1.8

TIMING

0-5	5 min	Do now	
5-20	15 min	Where it came from	
20-30	10 min	Goldilocks	
30-45	15 min	The street light effect	
45-60	15 min	Exam question, timed	
	60 min	One lesson	

STARTER

- 5 min** **Do now**
- Why is there liquid water on Earth, but not on the Moon, Mars or Venus? Collect ideas without correcting them.

ON THE BOARD, FROM THE GUIDE

Open the guide on the projector at each chapter (the links work in this PDF). Every figure plays from its own buttons, and the lesson's slides have the same figures, step by step, in the order of this plan.

07 Water from space, kept by gravity

CHAPTER 07 IN THE SLIDES

Step through the figure (5 steps, the arrow keys on a projector). Stop on each caption and ask what changed before you go on.

- The young Earth, about 4.5 billion years ago, is hot, with no oceans.
- Asteroids** crash into it. Some carry water locked inside their minerals, and they bring it to the planet.
- The water turns to vapour and fills the air. Earth's **gravity** holds it, and the rest of the atmosphere, in.
- Earth cools until the temperature is low enough for the vapour to **condense**. It rains, and oceans form.
- The Moon, at the same distance from the Sun, has too little gravity to hold water, and stays dry. Earth's oceans have lasted about four billion years.

Predict box: Venus is almost the same size and mass as Earth, but closer to the Sun. Why are there no oceans on Venus? Hands up or mini whiteboards first.

Answer A: It is too hot for water vapour to condense into liquid, so any water stayed in the air as vapour

Remember it: Grip Chill (Gravity, Cool enough to condense).

Step through the figure (4 steps, the arrow keys on a projector). Stop on each caption and ask what changed before you go on.

1. A star warms the planets round it. The pale band is its **Goldilocks zone**: the distances at which a planet's surface could keep liquid water.
2. Venus is closer than the zone's inner edge. It is **too hot**: water would boil away as vapour.
3. Mars is beyond the outer edge, and small. It is **too cold**: its water is frozen and its air is thin.
4. Earth is inside the zone: **just right** for liquid oceans.

Play the animation, Watch it happen: finding the zone. It loops; pause it on each moment below and ask what is happening (in the lesson slides it is a video).

1. **Too close**, and water boils away.
2. **Too far**, and it freezes.
3. In between, in the **Goldilocks zone**, water can stay liquid.

Predict box: A star gives out much less energy than the Sun. Where would its Goldilocks zone be? Hands up or mini whiteboards first.

Answer C: Much closer to the star, so that a planet there still receives enough energy to keep water liquid

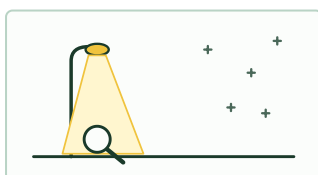
THE LESSON

15 min **Where it came from**
Chapter 7's figure, then the evidence card task. Then the Venus predict box and the Grip and Chill tiles.

10 min **Goldilocks**
Read the porridge line of the story, then [chapter 8](#)'s figure and the dim star predict box. Pairs work the Goldilocks scene: move the planet, change the star, shrink the planet.

15 min **The street light effect**
Pairs argue for and against focusing the search on the Goldilocks zone, with Europa and Enceladus as test cases. Finish with a class vote.

ACTIVITIES



DISCUSSION · HL

Goldilocks and the street light

Start with the porridge line, then the zone. Then argue for and against searching only the zone, with Europa and Enceladus as test cases.

Needs: [chapter 8](#) on screen.



EVIDENCE · HL

Where did the water come from?

Six cards to put in order as an argument: a hot young Earth; asteroids carrying water in their minerals; the matching heavy hydrogen ratio; the Moon too small to keep water; Venus too hot; oceans for four billion years.

Needs: printed cards.

PLENARY

15 min **Exam question, timed**
A higher level written question on A1.1.7 or A1.1.8 from the A1.1 exam maker (in Practise and revise, below), set at HL, then peer-marked. For homework, [the Check step](#) at HL.

WHAT STUDENTS GET WRONG

Every star's zone is where Earth is. It moves with the star.

In the zone means life. It means liquid water could exist.

STRETCH AND SUPPORT

Support: use the Remember it tiles as a starter in each lesson.

Stretch: Europa and Enceladus lie far outside the Sun's Goldilocks zone. What does that say about the zone as a model?

IN THE GUIDE

7 [Water from space, kept by gravity](#)

8 [Not too hot, not too cold: the Goldilocks zone](#)

A11 [The whole guide, with the figures that play](#)

PPTX [This lesson's slides, in the order of this plan](#)

PRACTISE AND REVISE

BUILD FOR YOUR CLASS

- [Tarsia puzzle, dominoes and picture reveal](#) on A1.1, built from its key terms and ready to print
- A [pub quiz](#) with rounds on A1.1, to present or run with no projector
- An [escape room built from the question bank](#) on A1.1

ALREADY ON THE SITE FOR A1.1

- Lesson: [Water](#)
- Summary doodle: [Water](#)
- Quiz: [Water](#)
- Revision map: [A1.1 Water](#), to fill in
- Exam questions: [A1.1 in the exam maker](#), a paper with its markscheme

CARD SETS ON SPLYCR

Open a set to host it as a class game, or make a copy to edit.

- [A1.1 Water](#)

EXAM PRACTICE

Check yourself

Set it for homework: a fresh paper of exam-bank questions on A1.1 at higher level each time, marked as students go and saved to their Exam practice when they are signed in.

biologybybradford.com/exam-maker/sit?topics=A1.1&level=HL&paper=quiz&marks=15&src=ep



How this was made. The course structure, the activities and the teaching choices come from my own classroom, my presentations and my years of teaching IB and AP Biology. I use Claude, an AI, to help write and build the interactive guides, lesson plans, slides and practice questions, and to draw the diagrams and code the interactives. I direct the work and review it against the IB and AP specifications before it goes live.