

How we know HL

60 minutes • A1.2.14, A1.2.15 • Chapters 11, 12

The evidence: Hershey and Chase's film and results, and Chargaff's data against the tetranucleotide hypothesis

BY THE END, STUDENTS CAN

- ☐ Explain how Hershey and Chase's results support the conclusion that DNA, not protein, is the genetic material A1.2.14
- ☐ Use Chargaff's data to falsify the tetranucleotide hypothesis, and explain why one result can falsify what many cannot prove A1.2.15

TIMING

0-5	5 min	Do now	
5-17	12 min	Predict, then watch the film	
17-25	8 min	Error hunt	
25-40	15 min	Chargaff's table	
40-55	15 min	Stop-motion Hershey and Chase	
55-60	5 min	Exit	
	60 min	One lesson	

STARTER

- 5 min** **Do now**
- "It is 1950. Would you bet on protein or DNA as the genetic material?" Vote, with one reason. Then: what did Hershey and Chase need that nobody had before 1946?

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.

11 Hershey and Chase: which one carries the genes?

CHAPTER 11 IN THE SLIDES

Play the animation, Hershey and Chase: the film. It loops; pause it on each moment below and ask what is happening (in the lesson slides it is a video).

1. Sulfur is in protein, not DNA, so it labels the **protein coat**. Phosphorus is in DNA, so it labels the **DNA**.
2. It **injects** its DNA into the bacterium. The empty protein coat stays outside.
3. A few minutes later, a **blender** shakes the coats off the bacteria.
4. The heavy bacteria sink into a **pellet**. The light coats stay in the liquid above, the **supernatant**.
5. **Where is the radioactivity?** Predict before the results.

Predict box: After blending and spinning, where will most of the radioactivity be in each batch? Hands up or mini whiteboards first.

Answer C: Sulfur-35 in the liquid, phosphorus-32 in the pellet

12 Chargaff's numbers: one result can falsify

CHAPTER 12 IN THE SLIDES

Switch the figure through Bases, Ratios, The hypothesis and Add a virus, and have the class say what will change before each.

Predict box: The tetranucleotide hypothesis says every DNA molecule is 25% of each base. Which result would be enough, on its own, to falsify it? Hands up or mini whiteboards first.

Answer B: One species whose DNA is reliably measured as 30% adenine

THE LESSON

12

min

Predict, then watch the film

Chapter 11's predict box first, by vote, then [chapter 11](#)'s film of the method. It stops on "Where is the radioactivity?" until the prediction is in (in the slides, pause the video on that title card); then play the results and the new phages.

8

min

Error hunt

Find and fix the five mistakes in the short answer (activity below).

15

min

Chargaff's table

The data task below, ending on the discussion of induction against falsification.

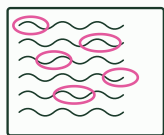
15

min

Stop-motion Hershey and Chase

Storyboard and first frames (activity below). Finish for homework.

ACTIVITIES

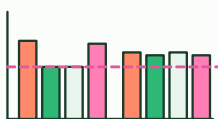


WRITING · HL

Error hunt: Hershey and Chase

Students find and fix the mistakes in this answer: "Hershey and Chase wanted to find out whether RNA or protein was the genetic material. They grew phages with radioactive phosphorus to label the protein and radioactive sulfur to label the DNA. After infection they found the sulfur inside the bacteria, which proved that DNA is the genetic material of all living things." There are five: RNA for DNA; the labels swapped; the wrong result; "proved"; "all living things".

Needs: the answer printed or on the board.

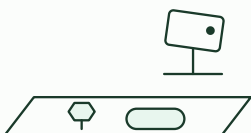


DATA · HL

Chargaff's table

From [chapter 12](#)'s data (printed, or on screen), work out A/T, G/C and $(A + G)/(C + T)$ for each organism. Say what the tetranucleotide hypothesis predicts, then find the one sample that breaks $A = T$ and explain it. End on the discussion: why does one 30% result outweigh a thousand that agree?

Needs: the table, calculators.



FILM · HL

Stop-motion Hershey and Chase

Groups make a 30-second film of the method and conclusion with paper cut-outs on a phone: labelled phages, injection, blender, centrifuge, counters, conclusion. Mark each step on whether it and its reason are right.

Needs: phones, paper, scissors, sticky tack, a stand or a pile of books.

5

min

Exit

"S stays out, P passes in" (the teacher's mnemonic below), then one sentence: why does one 30% result outweigh a thousand that agree?

WHAT STUDENTS GET WRONG

Sulfur labelled the DNA. Sulfur is in protein, phosphorus in DNA.

Hershey and Chase proved it. They gave strong evidence, for T2.

A + T = G + C. No: A = T and G = C.

STRETCH AND SUPPORT

Stretch: a single-stranded DNA virus has 25% A and 33% T. What can you say about its partner strand inside an infected cell, once it is copied?

IN THE GUIDE

- 11** [Hershey and Chase: which one carries the genes?](#)
- 12** [Chargaff's numbers: one result can falsify](#)
- 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 A1.2, built from its key terms and ready to print
- A [pub quiz](#) with rounds on A1.2, to present or run with no projector
- An [escape room built from the question bank](#) on A1.2

ALREADY ON THE SITE FOR A1.2

- Lesson: [Nucleic Acids](#)
- Quiz: [Nucleic Acids \(HL\)](#)
- Quiz: [Nucleic Acids](#)
- Revision map: [A1.2 Nucleic acids](#), to fill in
- Exam questions: [A1.2 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.
- [A1.2 Nucleic Acids](#)

**EXAM PRACTICE****Check yourself**

Set it for homework: a fresh paper of exam-bank questions on A1.2 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=A1.2&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.