

Variation, species and names

60 minutes • A3.1.1 to A3.1.5 • Chapters 1, 2, 3

Variation, the morphological and biological species concepts, and binomial names

BY THE END, STUDENTS CAN

- ☐ Explain why variation between organisms is a defining feature of life, and how Linnaeus used shared traits to define a species A3.1.1, A3.1.2
- ☐ Name an organism with a binomial name written to the rules, and say what two species of one genus share A3.1.3
- ☐ State the biological species concept, give challenges to it, and explain why gradual speciation makes the line between populations and species arbitrary A3.1.4, A3.1.5

TIMING

0-8	8 min	Do now: sort the cards your own way	
8-20	12 min	No two alike	
20-32	12 min	A name with two parts	
32-52	20 min	Can they breed?	
52-60	8 min	Exit: two tests for a species	
	60 min	One lesson	

STARTER

8 min Do now: sort the cards your own way

Give each pair the eight beetle cards from [chapter 1](#)'s figure, printed and cut up. They sort them into groups however they like, then write one yes or no question that splits their cards into two groups. Pairs compare with the pair beside them: did anyone sort the same way? Leave the groups on the desks and come back to them in a few minutes.

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.

01 No two beetles are alike, and we sort them anyway

CHAPTER 01 IN THE SLIDES

Switch the figure through Shuffled, By colour and By body shape, and have the class say what will change before each.

Predict box: Identical twins share all their DNA. Are they identical in every trait? Hands up or mini whiteboards first.

Answer B: No: fingerprints, scars and tans differ even so

02 A name with two parts

CHAPTER 02 IN THE SLIDES

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 **binomial** name has two words, written in italics.
2. The first word is the **genus**, with a capital letter. The second names the **species**, in lower case.
3. Species in one genus have **similar traits**: lion, tiger and leopard share the genus *Panthera*.
4. After the first full use you may shorten the genus to its **initial**: *P. leo*.

Predict box: Two animals are named *Panthera tigris* and *Panthera onca*. What can you say about them? Hands up or mini whiteboards first.

Answer C: Two species in one genus, so they share similar traits

Remember it: Green Sloths Inch Along (Genus first, Species second, Italics, Abbreviate).

03 Can they breed?

CHAPTER 03 IN THE SLIDES

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 breeding test: two beetles from the **same group**, and a pair with **one from each** (imagined beetles).
2. Both pairs have **young**. Mating alone does not decide it.
3. Only the first pair's young are **fertile**. The mixed pair's young cannot have young of their own.
4. By the biological species concept, A and B are **separate species**.

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

1. **One population:** any two can meet and mate, so genes flow across the valley.
2. **Different selection** each side: coats match the ground, displays drift apart.
3. Hybrids are rare, weak and often sterile, so the two never merge: **two species**.

Predict box: Two kinds of snail live on islands 500 km apart, and none has ever crossed the sea. Can the biological species concept say whether they are one species? Hands up or mini whiteboards first.

Answer C: Not directly: they have never met, so other evidence is needed

THE LESSON

12

min

No two alike

Chapter 1's figure on the board: shuffle, then sort by colour, then by body shape. Ask which sort puts like with like, and why. Take chapter 1's predict box on identical twins before the answer opens. Land on two ideas: no two individuals are identical, and Linnaeus sorted by the traits a group shares. A species concept is a working definition, not a fact of nature.

12

min

A name with two parts

Chapter 2's figure, one step at a time. Students write six names on mini whiteboards from your spoken descriptions (the human, the lion, the common chimpanzee, then two shortened ones) and show them at once. Turn over chapter 2's Remember it tiles. Then chapter 2's predict box on *Panthera tigris* and *Panthera onca*.

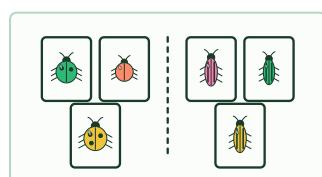
20

min

Can they breed?

Chapter 3's figure on the board, then the species concept clinic below: groups rule on six case cards. Take chapter 3's two predict boxes, the islands and the million years. Run the splitting film once and ask on which day one species became two: the answer is none, so where the line falls is a judgement.

ACTIVITIES



CARD SORT

Sort the cards your own way

Pairs sort eight beetle cards into groups of their own choosing, then split them with one yes or no question each time. They compare groupings with another pair: different people choose different traits, and some traits keep the cards of one kind together while others do not. The lesson takes the point from there.

Needs: chapter 1's figure printed and cut into eight cards per pair; scrap paper.



CARD SORT

The species concept clinic

Six case cards, one per group: a horse and a donkey; two populations on mountains far apart; a fossil species; two oak species that make fertile hybrids where they overlap; a chain of populations in which neighbours breed but the two ends do not; a very large and a very small dog breed that could not physically mate. For each card the group decides whether the biological test gives a clear answer, and if not, what evidence they would use instead.

Needs: six case cards per group; A3 paper.

PLENARY

8

min

Exit: two tests for a species

Two sentences on a slip: say how the morphological and the biological species concepts each decide whether two organisms are one species, and give one problem with the biological one. Collect them on the way out.

WHAT STUDENTS GET WRONG

Species members are identical. They are similar, never identical. Variation within a species is normal and is what natural selection acts on.

Binomial names written any which way. Genus with a capital, species in lower case, both in italics or underlined. The species name never stands alone.

The biological test is whether they do breed. It is whether they *could* produce fertile offspring. Never having met does not make two populations separate species.

A species concept is a fact about nature. It is a working definition, and a different one suits different organisms. That is why the guide says "competing definitions exist".

STRETCH AND SUPPORT

Support: give the captions of each figure as a cut-up storyboard to put in order, and use the key terms (tap the dotted words) as a glossary.

Support: the three Remember it sets (Green Sloths Inch Along; Five Apes Hug Grumpy Aunts Happily; Cats Eat Any Sausage, Mostly) as a starter or an exit.

Support: for the species concept clinic, give a frame: "The biological test says... but the problem is... so I would use..."

Stretch: is there a species concept that works for both horses and bacteria? What would it have to ignore?

IN THE GUIDE

- 1 [No two beetles are alike, and we sort them anyway](#)
- 2 [A name with two parts](#)
- 3 [Can they breed?](#)
- 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 A3.1, built from its key terms and ready to print
- A [pub quiz](#) with rounds on A3.1, to present or run with no projector
- An [escape room](#) built from the [question bank](#) on A3.1

ALREADY ON THE SITE FOR A3.1

- Quiz: [Diversity of Organisms](#)
- Revision map: [A3.1 Diversity of organisms](#), to fill in
- Exam questions: [A3.1 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.
- [A3.1 Diversity of Organisms](#)

EXAM PRACTICE

Check yourself

Set it for homework: a fresh paper of exam-bank questions on A3.1 at standard level each time, marked as students go and saved to their Exam practice when they are signed in.

biologybybradford.com/exam-maker/sit?topics=A3.1&level=SL&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.