NAME _____ CLASS _____ DATE _____

IB BIOLOGY · A2.3

Viruses

Notes to fill in alongside the guide. Each numbered block matches a chapter of the guide, and of the lesson slides. Write in the gaps, answer the cues, annotate the figures, and sum up each section in your own words.

BY THE END YOU CAN

- [ ] List the features all viruses share: small fixed size, DNA or RNA, a protein capsid, no cytoplasm and few or no enzymes A2.3.1
- [ ] Describe the diversity of viruses, using phage lambda, coronaviruses and HIV A2.3.2
- [ ] Outline the phases of the lytic cycle of phage lambda, and what the virus takes from its host A2.3.3
- [ ] Outline the lysogenic cycle of phage lambda A2.3.4
- [ ] Discuss the evidence that viruses arose several times from other organisms A2.3.5
- [ ] Explain why some viruses evolve rapidly, with influenza and HIV, and the consequences for treatment A2.3.6

01 Genes in a box

A2.3.1 HL

CUES

Predict: Why can a virus not be grown in a dish of sterile nutrient broth, as bacteria can?

What is meant by capsid?

What is meant by obligate parasite?

NOTES

1 Each has a _____, a coat of protein round its nucleic acid, built from many copies of a few protein units.

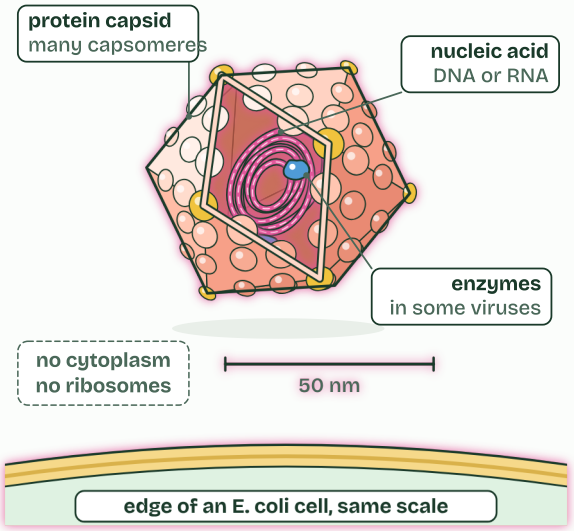
2 For all of that it depends on a host cell: it is an _____, reproduced only by the cell it infects.

3 DNA or RNA as genes, inside a protein _____.

Your own notes

ANNOTATE THE FIGURE

Label each part and say what it does: nucleic acid, enzymes, capsid, small, fixed size.



SPOT THE MISTAKE

What do students often get wrong about structural features common to viruses? Write the mistake, then put it right.

The mistake

Put it right

SUMMARY

Sum up section 01 in two or three sentences of your own.

02 No two alike

A2.3.2 HL

CUES

Predict: Soap breaks up lipid membranes. Which of the three viruses would soap affect least?

NOTES

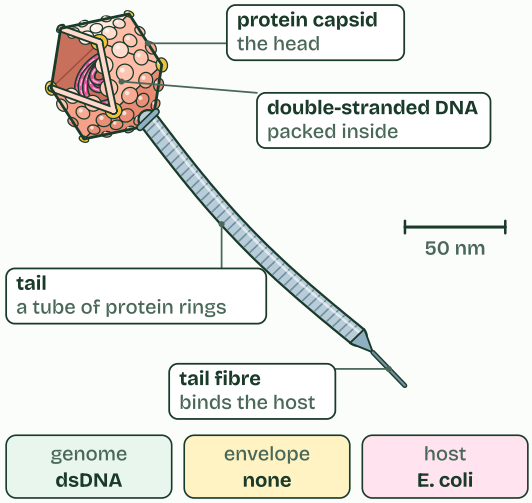
1 Some have only a capsid; others are _____, wrapped in a layer of membrane taken from the last host cell as they left it, studded with the virus's own proteins.

2 Three examples show the range. _____ infects the bacterium *E. coli*: double-stranded DNA in a many-sided capsid, a long tail, and no envelope. _____, including the one that causes COVID-19, have single-stranded RNA and an envelope bristling with spike proteins, which bind to receptors on the host's cells. _____ is enveloped too, with two copies of a single-stranded RNA genome in a cone-shaped capsid and the enzyme reverse transcriptase, which copies its RNA into DNA once it is inside a helper T cell.

Your own notes

ANNOTATE THE FIGURE

The figure shows it as Phage lambda, Coronavirus and HIV. Note what changes each time.



SPOT THE MISTAKE

What do students often get wrong about diversity of structure in viruses? Write the mistake, then put it right.

The mistake

Put it right

SUMMARY

Sum up section 02 in two or three sentences of your own.

03 Take over, burst out

A2.3.3 HL

CUES

Predict: A drug stops bacterial ribosomes working. What happens to phage lambda in a treated cell?

What is meant by lytic cycle?

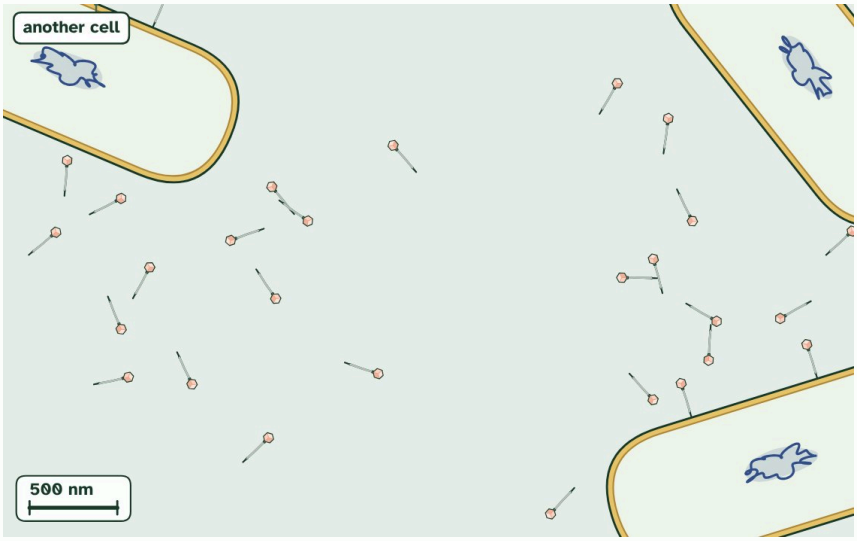
NOTES

1. It _____ by its tail to specific receptor proteins on the wall of an *E. coli* cell, then _____ its DNA, leaving the empty capsid outside.
2. In the _____, the cell does all the work.
3. The host's enzymes and nucleotides _____ the phage DNA many times, using the host's ATP.
4. The host's ribosomes read the phage genes and _____: capsid units, tails and the enzymes the phage needs.
5. The parts _____ into new phages, each head packed with a copy of the DNA.
6. Finally a phage enzyme breaks down the cell wall, the cell bursts, which is _____, and about a hundred new phages are _____ to infect other cells.

Your own notes

ANNOTATE THE FIGURE

Annotate this still from the animation (Phage lambda: lytic or lysogenic): what is happening, and why?



SPOT THE MISTAKE

What do students often get wrong about lytic cycle of a virus? Write the mistake, then put it right.

The mistake

Put it right

SUMMARY

Sum up section 03 in two or three sentences of your own.

04 Lying low

A2.3.4 HL

CUES

Predict: A culture of bacteria carrying the lambda prophage is exposed to UV light. What would be seen in the next hour?

What is meant by lysogenic cycle?

What is meant by prophage?

NOTES

1 After its DNA has formed a circle, it can instead enter the _____.

2 The inserted phage DNA is now a _____.

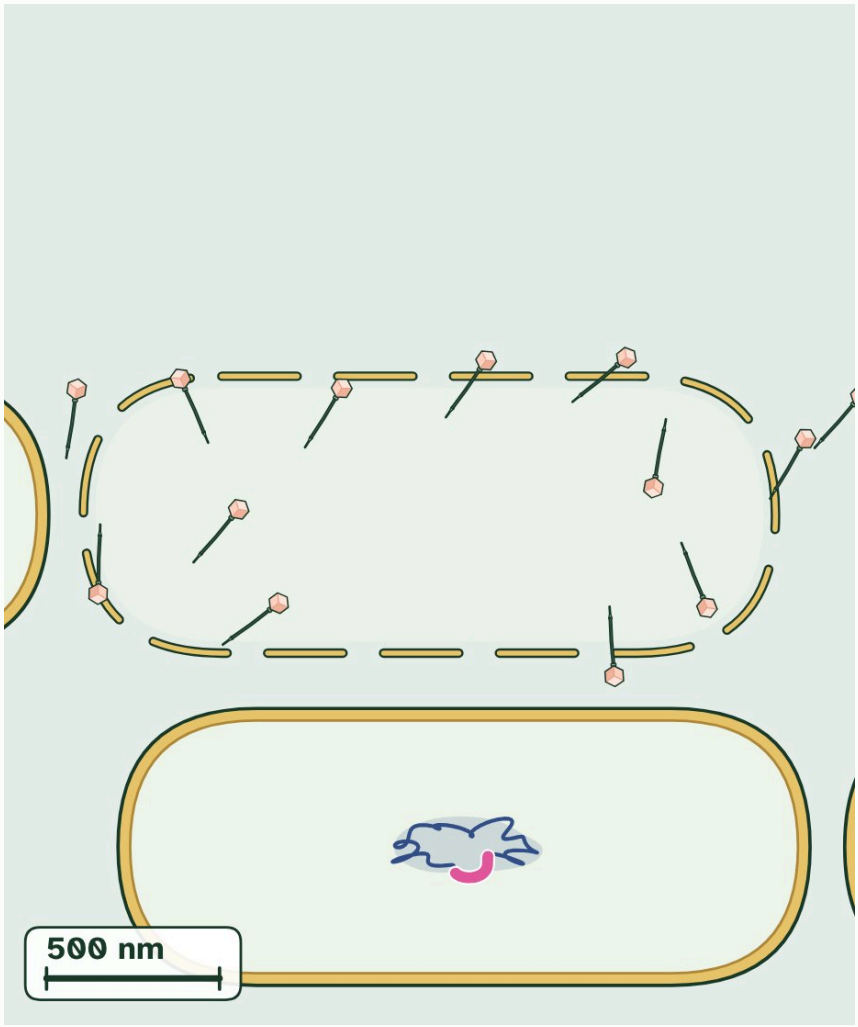
3 Phage DNA inserted into the host chromosome: a _____.

4 Stress such as UV switches it on: _____.

Your own notes

ANNOTATE THE FIGURE

Annotate this still from the animation (Phage lambda: the lysogenic cycle): what is happening, and why?



SPOT THE MISTAKE

What do students often get wrong about lysogenic cycle of a virus? Write the mistake, then put it right.

The mistake

Put it right

SUMMARY

Sum up section 04 in two or three sentences of your own.

05 Many beginnings

A2.3.5 HL

CUES

Predict: Why does the shared genetic code support viruses having come from cells?

NOTES

1 Genes that could already move about within a cell may have _____ and gained a protein coat.

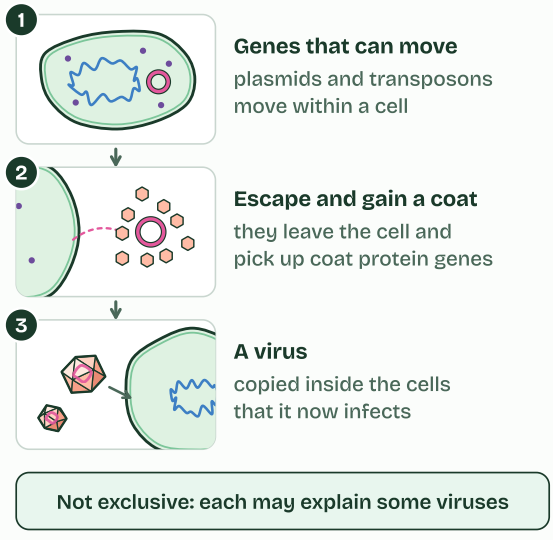
2 Small cells living as parasites inside other cells may have _____ part after part that the host supplied, until only genes and a coat were left.

3 Or virus-like replicators may have existed _____ and gone on as their parasites.

Your own notes

ANNOTATE THE FIGURE

The figure shows it as Escaped genes, Reduced cells and Virus first. Note what changes each time.



SPOT THE MISTAKE

What do students often get wrong about evidence for several origins of viruses from other organisms? Write the mistake, then put it right.

The mistake

Put it right

SUMMARY

Sum up section 05 in two or three sentences of your own.

06 A moving target

A2.3.6 HL

CUES

Predict: Why does a combination of three anti-HIV drugs work better than one drug used on its own?

NOTES

1 _____ changes in two ways.

2 Small mutations in the genes for its surface proteins accumulate year by year, _____, so antibodies from last year's infection or vaccine fit less well; that is why the flu vaccine is remade every year.

3 Its genome is in eight separate RNA segments, and if two strains infect one cell, such as a bird strain and a human strain in a pig, they can swap whole segments, _____, making a new subtype that nobody is immune to and that can cause a pandemic. _____ mutates so fast that many variants arise in a single patient.

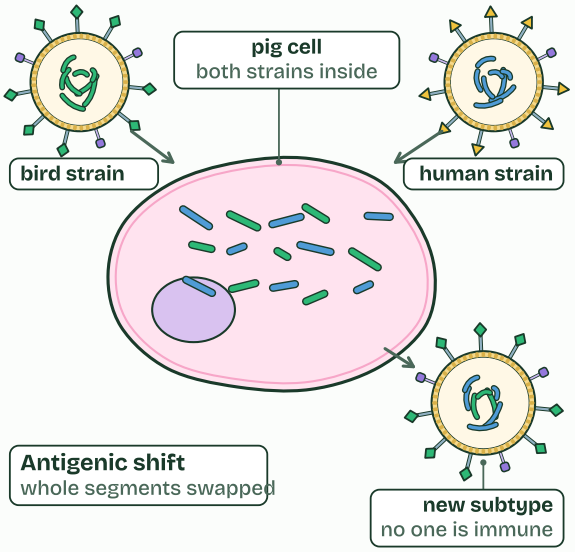
4 Influenza: _____.

5 HIV: _____.

Your own notes

ANNOTATE THE FIGURE

Number the 3 steps on the figure and note what happens at each.



SPOT THE MISTAKE

What do students often get wrong about rapid evolution in viruses? Write the mistake, then put it right.

The mistake

Put it right

SUMMARY

Sum up section 06 in two or three sentences of your own.

Check yourself

The check for this guide is online: a fresh paper of past-paper style questions from the exam bank on A2.3 each time, marked as you go, and saved to your Exam practice progress when you are signed in. Scan the code, or type the link.

biologybybradford.com/exam-maker/sit?topics=A2.3&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.