

APOLLO

Nucleic acids

HL

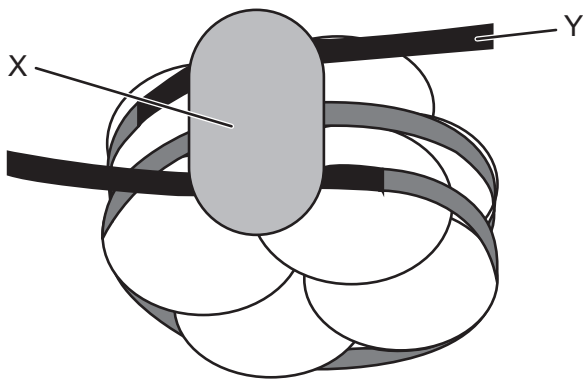
Biology

First assessment 2025

8 questions | questions

- 2.** What is a nucleosome?
- A. DNA wrapped around histone proteins in a eukaryotic cell
 - B. RNA bound to ribosomes in a eukaryotic cell
 - C. A region of the nucleus in a eukaryotic cell
 - D. Genetic material within a viral capsule

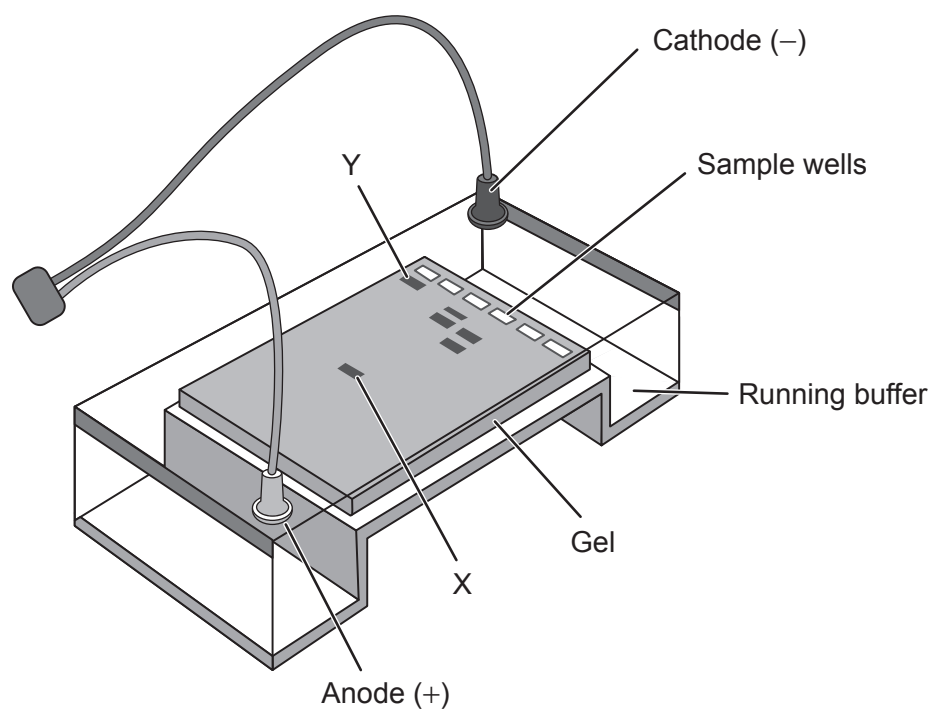
2. The diagram shows a structure found in a eukaryotic nucleus.



What is represented by X and Y?

	X	Y
A.	Ribosome	mRNA
B.	Histone	Linker DNA
C.	Nucleosome	mRNA
D.	RNA polymerase	Linker DNA

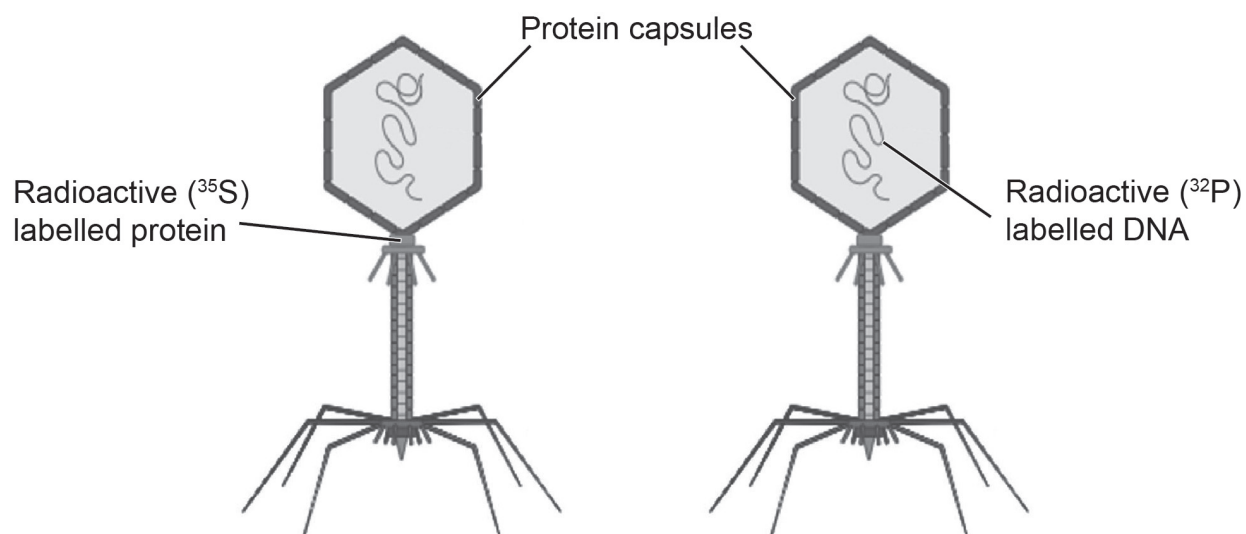
9. The diagram shows a gel electrophoresis apparatus.



What can be deduced from the diagram?

- A. X is the smallest fragment.
- B. Y is positively charged.
- C. X is moving towards the cathode.
- D. Y travels at the greatest rate.

2. Hershey and Chase used bacteriophages to investigate the chemical nature of genes. The phosphorus in the DNA and the sulphur in the protein of the bacteriophages were radioactively labelled.



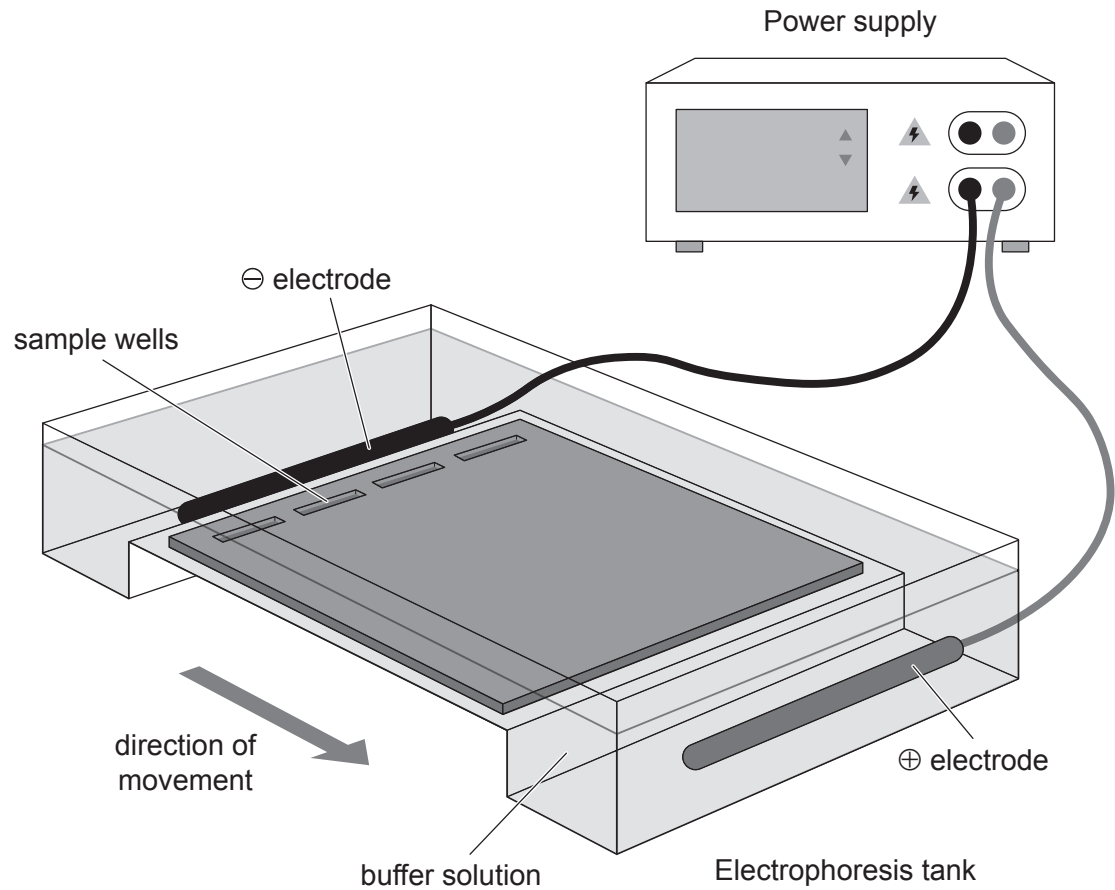
The data obtained after the infection and then centrifugation of bacterial cells is shown in the table.

Sample source	Supernatant	Pellet
Concentration of radioactive sulphur	high	low
Concentration of radioactive phosphorus	low	high

What did Hershey and Chase conclude from their experiment?

- A. Viral DNA was found within the bacterial cells.
- B. Viruses infect bacterial cells with proteins.
- C. DNA was mainly outside the bacterial cells.
- D. Neither protein nor DNA were chemicals making up genes in viruses.

9. Samples of DNA can be separated by gel electrophoresis.



Which fragments of DNA would travel the furthest on the gel?

	Fragment size / kB	Fragment charge
A.	4	negative
B.	10	negative
C.	10	positive
D.	2	positive

1. Which of the following describes the molecular structure of DNA?
- I. Complementary base pairing occurs within the molecule
 - II. Contains deoxyribose
 - III. Contains thymine
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

20. What is a function of histones?

- A. Supercoiling of DNA during binary fission in prokaryotes
- B. Synthesis of proteins
- C. Formation of microtubules during mitosis
- D. Condensation of DNA

4. Before the structure of DNA was known, researchers analysed the ratios of the DNA bases found in cells of different species. The tetranucleotide hypothesis, formulated in 1910, proposed that DNA was made up of equal amounts of adenine, guanine, cytosine and thymine.

This hypothesis was revised following the publication of Chargaff’s paper in 1951, from which data is shown in the table.

Source	Ratios				
	A:G	T:C	A:T	G:C	purines:pyrimidines
Ox	1.29	1.43	1.04	1.00	1.10
Human	1.56	1.75	1.00	1.00	1.00
Chicken	1.45	1.29	1.06	0.91	0.99
Salmon	1.43	1.43	1.02	1.02	1.02
Wheat	1.22	1.18	1.00	0.97	0.99
Yeast	1.67	1.92	1.03	1.20	1.00

(a) State **one** example of a purine. [1]

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(b) Explain how these results falsify the tetranucleotide hypothesis. [2]

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(c) Using these data, evaluate the hypothesis that the ratio of purines to pyrimidines in DNA in all organisms is 1.00. [1]

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(Question 4 continued)

- (d) Discuss how these results are consistent with the existence of a last universal common ancestor (LUCA). [2]

- (e) Discuss the evidence of the relationship between genome size and the complexity of organisms. [4]



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4. Chargaff, E., 1951. Structure and function of nucleic acids as cell constituents. *Federation proceedings*, 10(3), pp.654–659.



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