Name:		Index Number:		Class:	

DUNMAN HIGH SCHOOL
Promotional Examination
Year 5

H2 BIOLOGY

9744/01

Paper 1 Multiple Choice Questions

26 September 2023

Additional Materials: Multiple Choice Answer Sheet

30 minutes

READ THESE INSTRUCTIONS FIRST:

Write your class, index number and name at the top of this page.

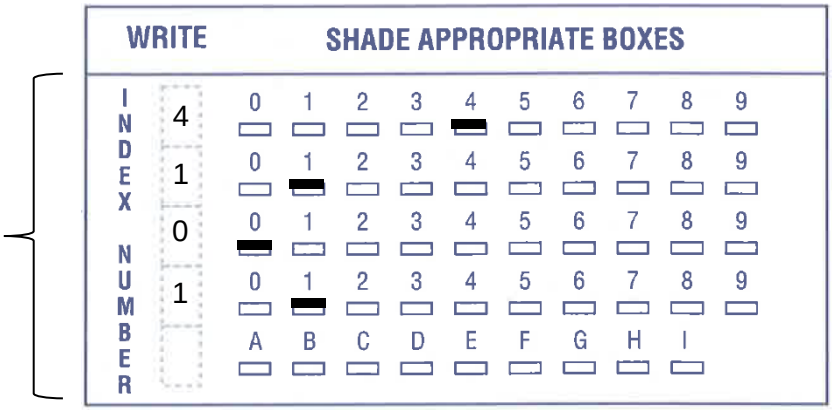
There are **fifteen** questions in this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
The use of an approved scientific calculator is expected, where appropriate.

Write your name and class on the Multiple Choice Answer Sheet. Write and shade the Index Number as follows.

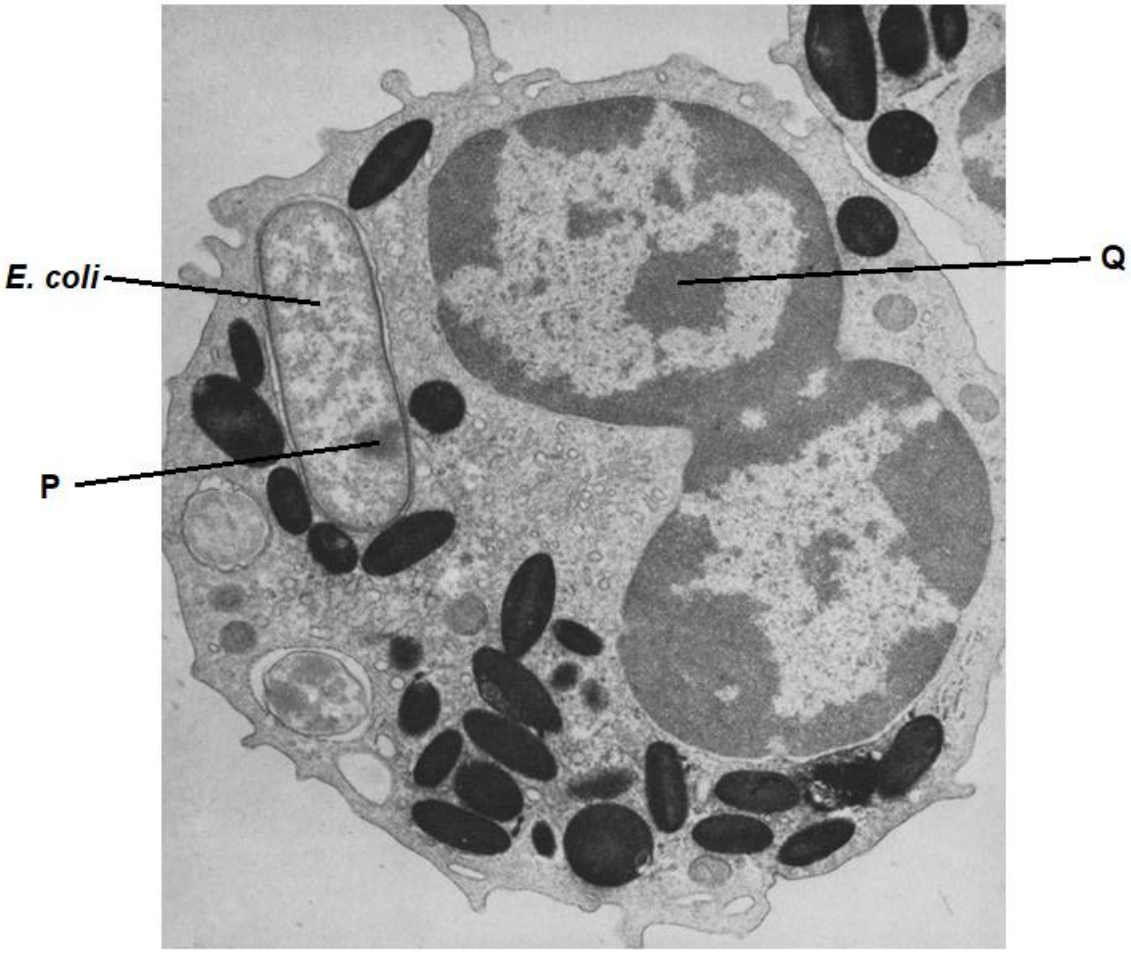
For illustration only:

A student from class 5C41, with index number 01, should shade "4101".



This document consists of **14** printed pages.

1 The figure shows an *E. coli* engulfed by a basophil, a type of white blood cell.



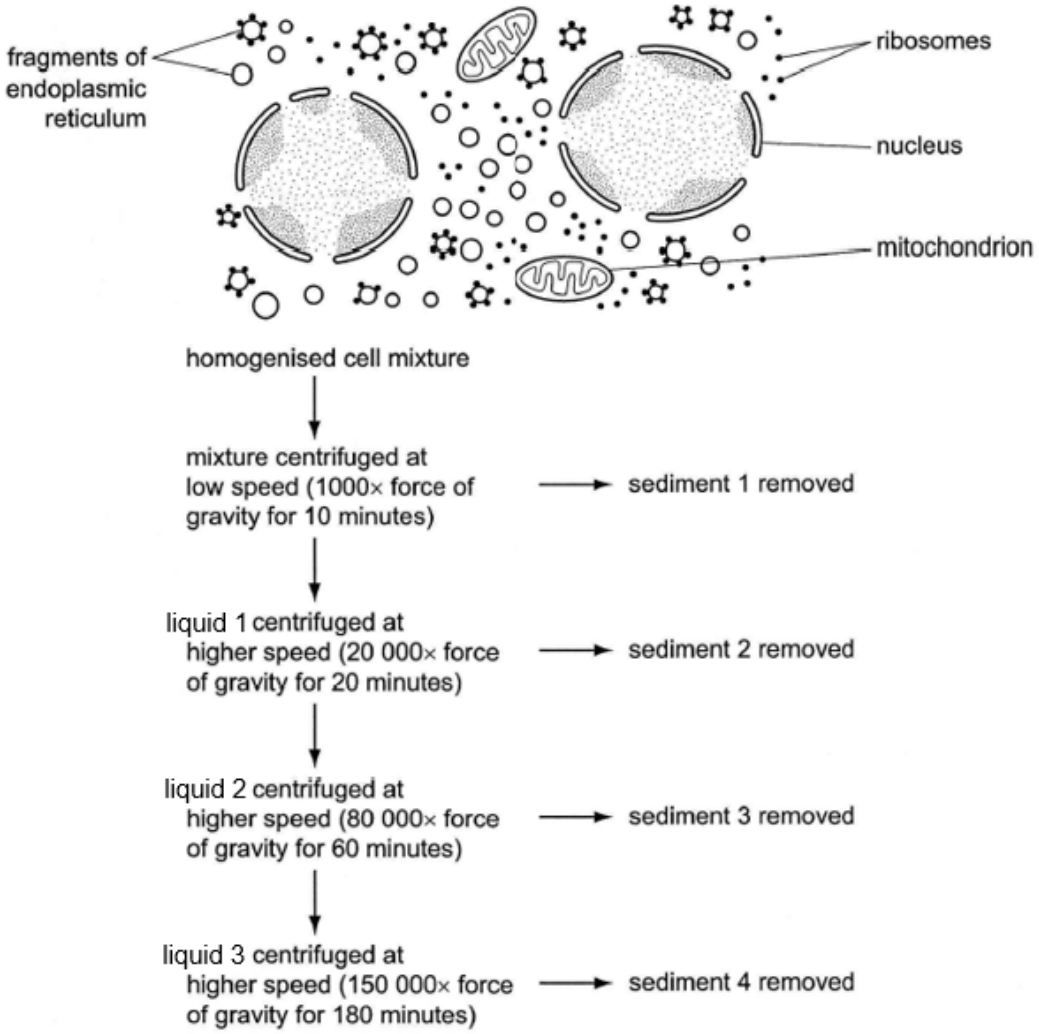
Ramzi S Cotran & Mortimer Litt, 1969

Which statements are true for both region **P** and region **Q**?

1 Both contain DNA tightly coiled.
2 Both are the sites of RNA synthesis.
3 Both are the sites of ATP synthesis.
4 Both have circular DNA.

A 1 and 2
B 2 and 3
C 3 and 4
D 1, 2 and 4

2 The flow diagram shows a technique called cell fractionation used to separate cell organelles by their relative sizes. Cells are homogenised and mixed with buffer to prepare them for cell fractionation. The diagram shows the appearance of the homogenised cell mixture.



Which organelles are found in liquid 1?

A Nucleus

B Mitochondria

C Nucleus and endoplasmic reticulum

D Mitochondria, endoplasmic reticulum, and ribosome

3 Which statements about the differences between phospholipids and triglycerides are false?

1 Phospholipids have hydrophobic regions but triglycerides do not.

2 The fatty acids in a triglyceride are always saturated but the fatty acids in a phospholipid may be saturated or unsaturated.

3 Phospholipids contain phosphoester bonds but triglycerides do not.

4 Phospholipids are non-polar but triglycerides are polar.

A 1 and 2

B 2 and 3

C 3 and 4

D 1, 2 and 4

4 Cellulose is a molecule responsible for providing mechanical support in plant cells. Some properties of cellulose are described as follows:

1 Alternate glucose monomers are rotated, instead of residues being arranged in the same orientation.

2 Only one type of monomer is found in cellulose.

3 Cellulose is unable to interact well with water.

4 Numerous cellulose chains are bundled together via extensive hydrogen bonds.

Which properties account for starch being suitable as an energy storage molecule?

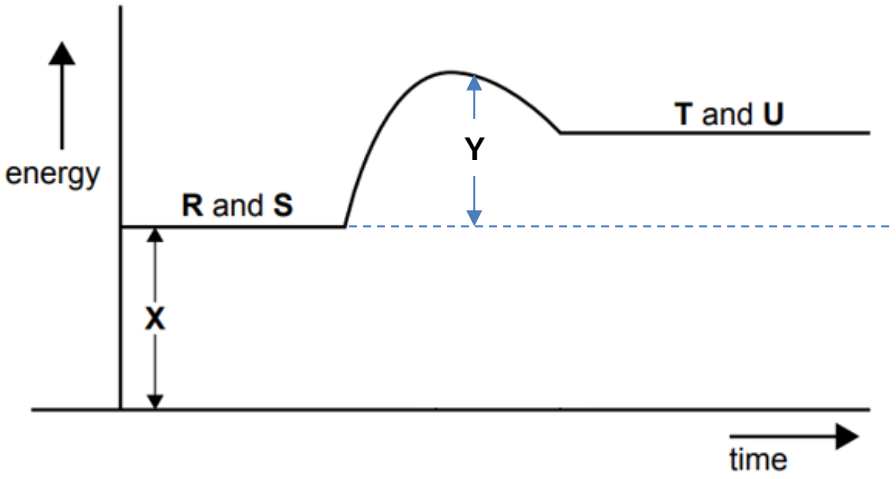
A 3 and 4

B 1, 2 and 3

C 1, 3 and 4

D 2, 4 and 5

5 In a chemical reaction, reactants **R** and **S** are converted into products **T** and **U**. The graph shows the energy levels of these molecules over time.

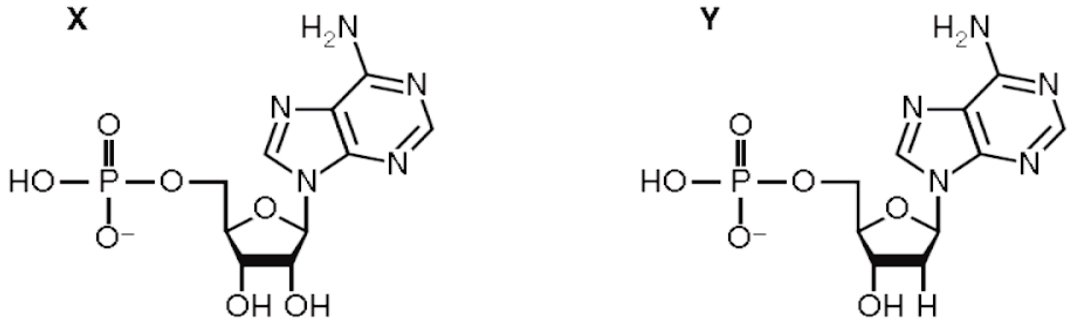


Which statements can be concluded from the graph?

1 The value of activation energy is shown by **X**.
2 The value of activation energy is shown by **Y**.
3 An enzyme has been added to the reaction mixture.
4 An enzyme helps to lower the activation energy by proximity effect.
5 **R** and **S** have lower energy than **T** and **U**.

A 1 and 3
B 2 and 5
C 1, 3 and 4
D 2, 3, 4 and 5

6 The molecular structures of two nucleotides, **X** and **Y**, are shown in the diagram. The base in each nucleotide is adenine.



Which statements are true about nucleotides **X** and **Y**?

1 **X** is an adenosine monophosphate and forms two hydrogen bonds with its complementary nucleotide during transcription.

2 **X** is a deoxyribonucleotide and forms a complementary base pair with a uracil nucleotide during transcription.

3 **X** is found in RNA and **Y** forms two hydrogen bonds with its complementary nucleotide during transcription.

4 **Y** is found in DNA and forms a complementary base pair with a uracil nucleotide during replication.

A 1 and 2

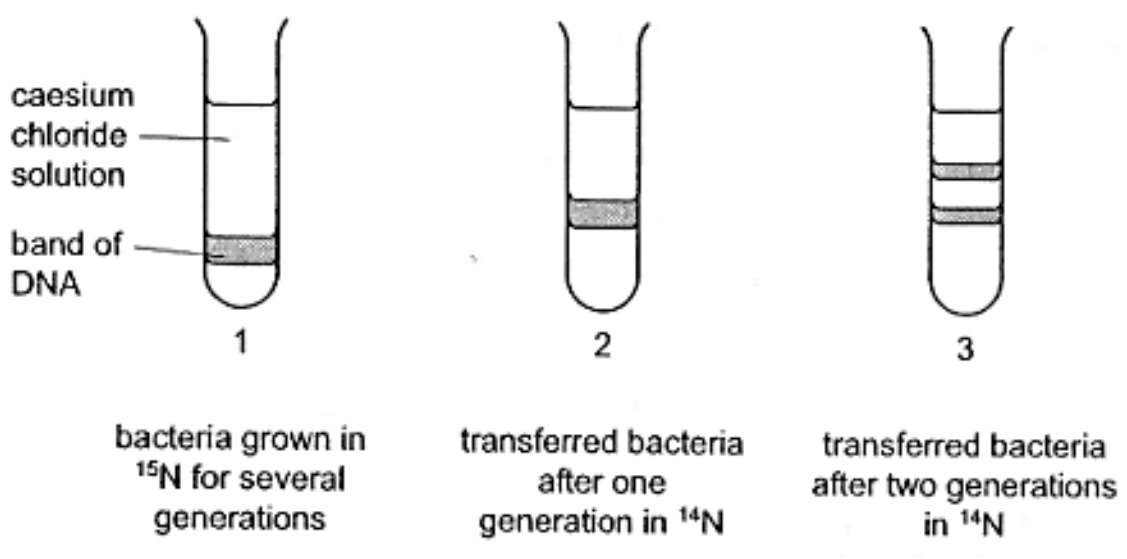
B 1 and 3

C 2 and 3

D 1, 3 and 4

7 Bacteria grown in ^{15}N medium for many generations were transferred to ^{14}N medium to replicate for two generations. DNA from the bacteria was extracted and separated by density gradient centrifugation.

Their results are summarised in the diagram below.



What percentage of DNA strands consist of ^{15}N and ^{14}N after two generations in ^{14}N medium?

	Percentage of DNA containing	
	^{15}N	^{14}N
A	0	100
B	12.5	87.5
C	50	50
D	25	75

8 Polymerase Chain Reaction (PCR) is the main molecular technique to detect HIV in a patient using a HIV test-kit.

Which statement explains why the development of HIV test-kit was only possible after the genome sequence of HIV was available?

A The sequence of the genome of HIV mutates very frequently.

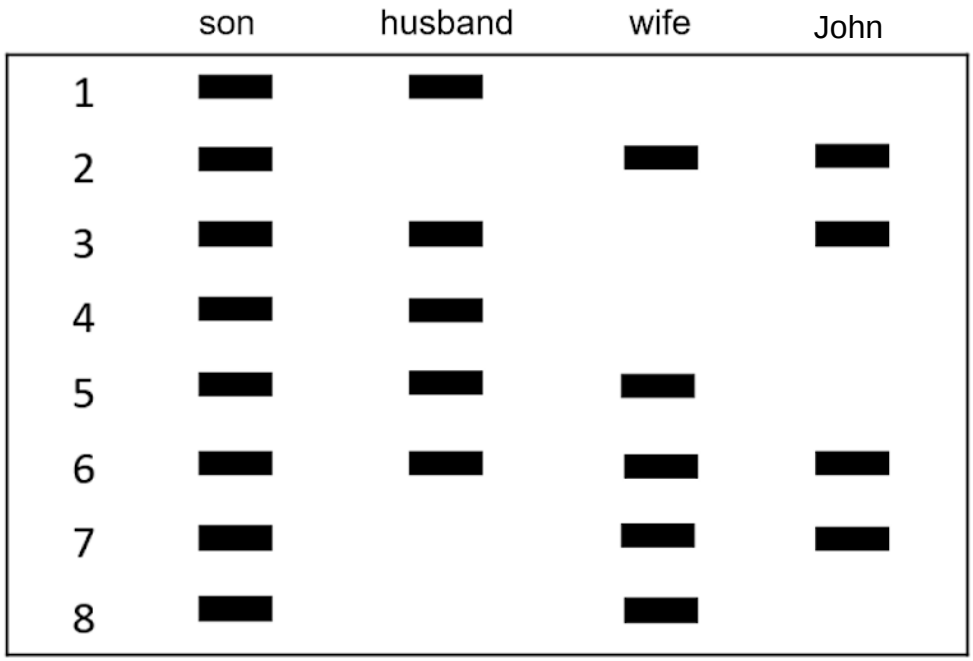
B DNA sequences flanking the target gene must be known to enable the synthesis of primers flanking the target DNA sequences.

C The temperatures used for denaturation stage, annealing stage, and extension stage during PCR are determined by the genome sequence of HIV.

D PCR is not error-free. The information on the genome sequence of HIV will ensure that no contamination will be present in the sample.

9 The diagram shows the results of electrophoresis of DNA fragments from three members of a family and another person named John, who claims that he is the biological father of the son.

Autoradiography produced the following band patterns:



Which bands indicate that the husband is the father of the son and not John?

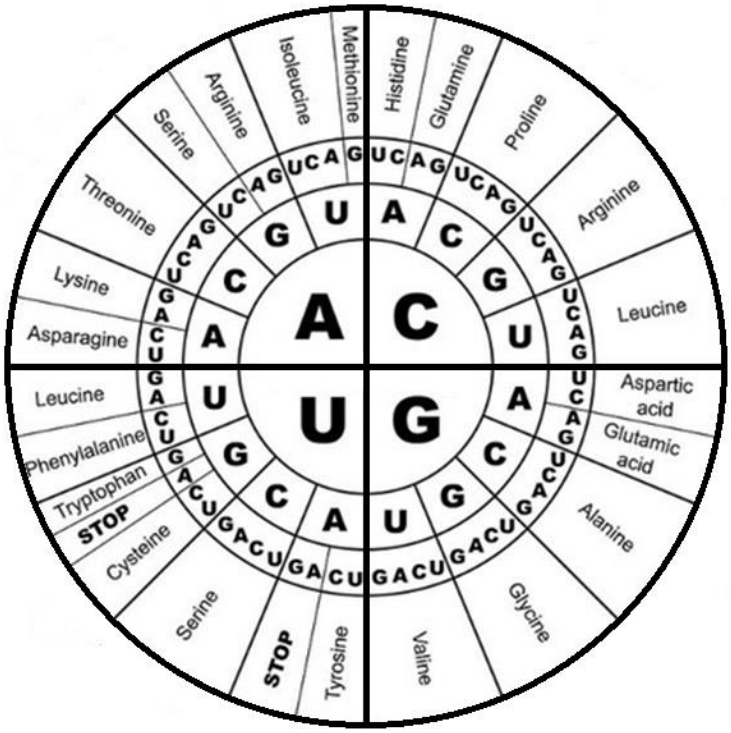
A 1 and 4

B 3 and 6

C 2 and 7

D 4 and 6

10 The mRNA codons for amino acids are shown.



A mutagen causes the adenine in DNA to pair with cytosine during transcription.

Which tripeptide is synthesised when the DNA fragment 3’ ACCGTCAAT 5’ is used in protein synthesis in the presence of this mutagen?

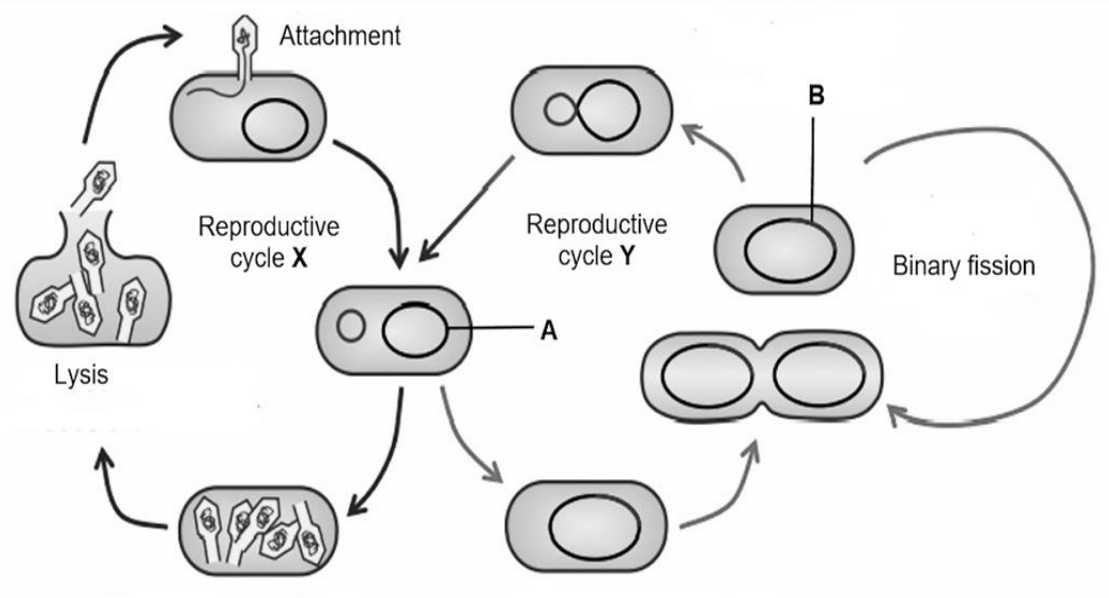
A proline-valine-proline

B arginine-glutamine-proline

C tryptophan-glutamine-leucine

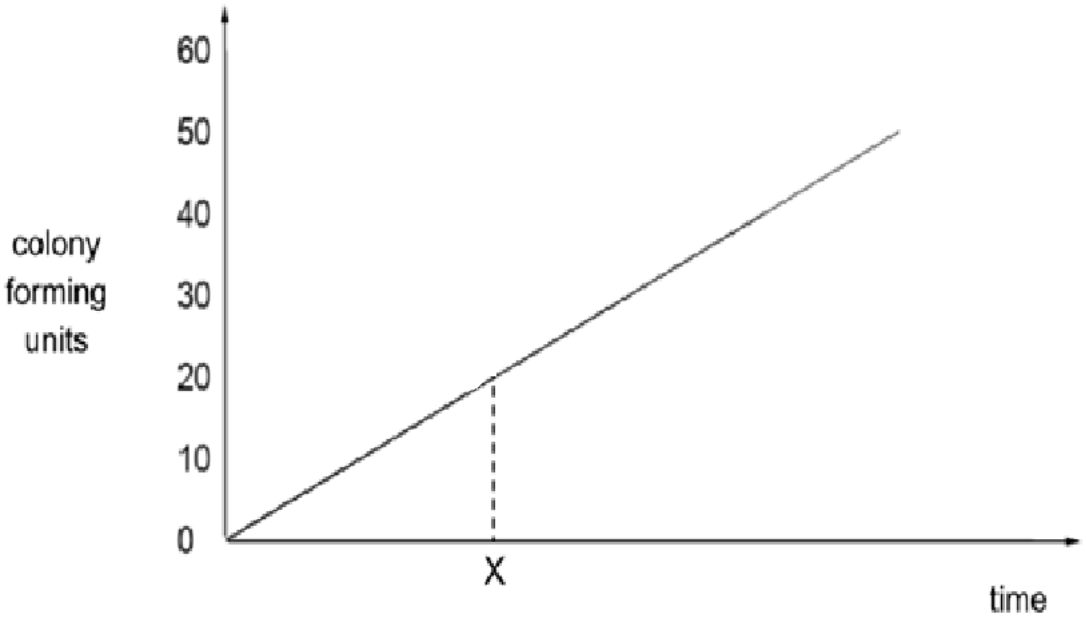
D threonine-valine-asparagine

11 Which row correctly identifies the reproductive cycles **X** and **Y** and structures **A** and **B**?



	X	Y	A	B
A	lytic	lysogenic	bacterial DNA	prophage
B	lysogenic	lytic	virus DNA	prophage
C	lytic	lysogenic	virus DNA	provirus
D	lysogenic	lytic	bacterial DNA	provirus

12 The graph shows how the total number of colony forming units in a mutant strain of bacteria varies with time. It was initially grown in the presence of glucose and when glucose was depleted, it was then supplied with lactose at X.

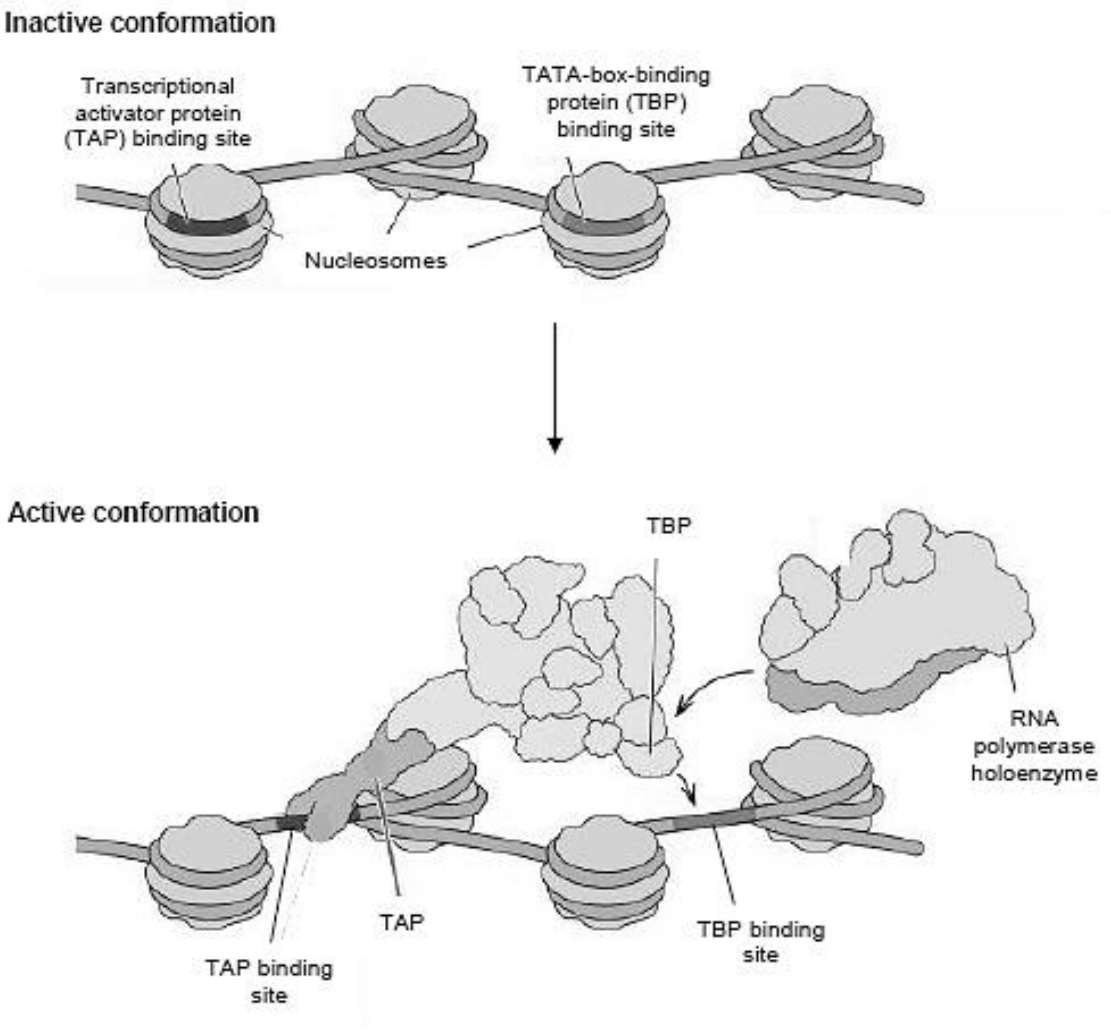


Which row shows the correct genotype of the following gene and regulatory sequences?

	Lac I	promoter	operator	*Lac Z*	*Lac Y*	*Lac A*
A	-	+	+	+	+	+
B	+	-	+	+	-	-
C	-	+	+	-	+	+
D	+	-	-	-	+	+

Key:
+ wild-type
- mutant

13 The figure shows the process of chromatin modification prior to transcription.



Which statement regarding chromatin modification is correct?

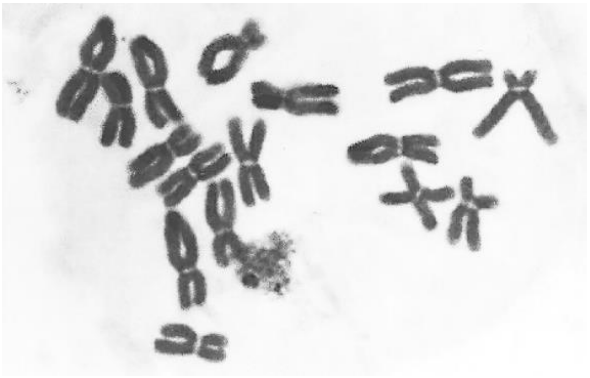
A TAP binding results in immediate downregulation of transcription.

B Chromatin modification complexes result in the reversible acetylation or deacetylation of DNA.

C In the active conformation of chromatin, the repositioning of nucleosomes allows for the exposure of TAP and TBP binding sites, leading to protein binding.

D The binding of TAP and TBP to their binding sites is dependent on the recognition of histone tails.

14 The figure shows a diploid onion cell at metaphase during mitosis.



What are the final products at the end of cytokinesis?

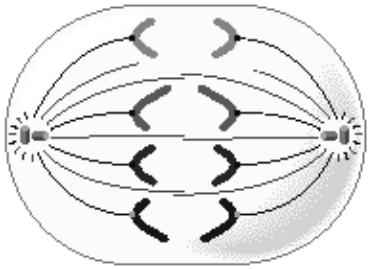
A 4 cells, each with 4 chromosomes

B 2 cells, each with 8 chromosomes

C 4 cells, each with 8 chromosomes

D 2 cells, each with 16 chromosomes

15 A student observed an animal cell in the process of mitosis and drew the chromatids and the microtubules.



Which row correctly describes the centrioles and their associated microtubules at this stage of mitosis?

	centrioles	associated microtubules
A	a single centriole at each pole of the cell	centriole to centromere microtubules become shorter
B	one pair of centrioles at each pole of the cell	centriole to centriole microtubules become shorter
C	a single centriole at each pole of the cell	centriole to centriole microtubules become shorter
D	one pair of centrioles at each pole of the cell	centriole to centromere microtubules become shorter