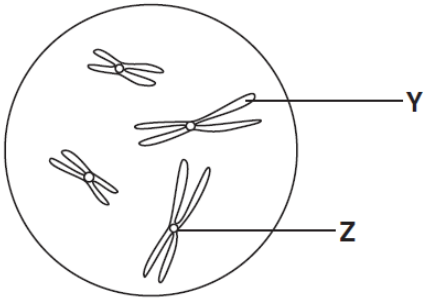
MEGA LECTURE

CHAPTER 5

1. The diagram shows chromosomes in a nucleus.



What are **Y** and **Z**?

	Y	Z
A	centromere	centriole
B	centromere	chromatid
C	chromatid	centriole
D	chromatid	centromere

2. A peptide consists of ten amino acids of four different kinds.

What is the theoretical minimum number of tRNA molecules required to translate the mRNA for this peptide?

A 4

B 10

C 12

D 30

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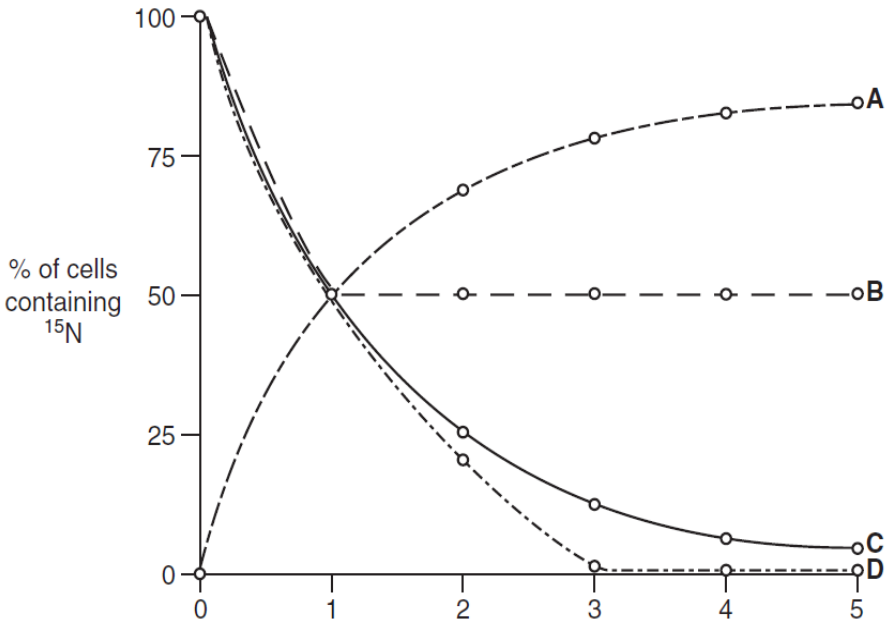
3. Bacteria were cultured in a medium containing heavy nitrogen (^{15}N) until all the DNA was labelled. These bacteria were then grown in a medium containing only normal nitrogen (^{14}N) for five generations. The percentage of cells containing ^{15}N in each generation was estimated.

Which curve provides evidence that DNA replication is semi-conservative?



4. RNA is extracted from β cells in the pancreas. It is used to make DNA coding for human insulin.

Which enzyme is used to make the DNA?

A DNA ligase

B restriction enzyme

C reverse transcriptase

D RNA polymerase

5. Which type of molecule is the end product of translation?

A amino acid

B DNA

C mRNA

D polypeptide

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6. A polypeptide molecule contains the amino acid sequence, glycine – leucine – lysine – valine.

The table shows the DNA codes for these amino acids.

glycine	leucine	lysine	valine
CCC	GAA	TTT	CAA

Transfer RNA molecules with which anticodons are needed for the synthesis of this polypeptide?

A CCC GAA TTT CAA

B CCC GAA UUU CAA

C GGG CUU AAA GUU

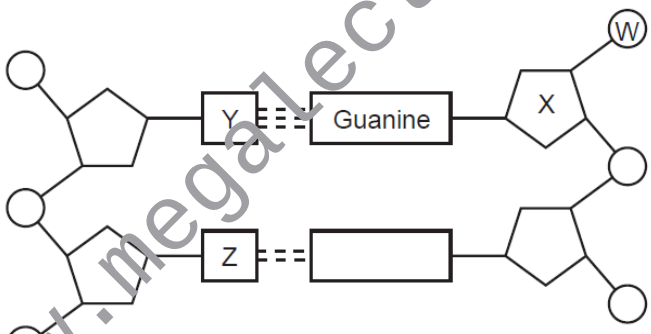
D GGG CUU UUU GUU

7. A protein contains all the common amino acids.

What would be the hypothetical minimum number of types of tRNA molecules needed for the synthesis of this protein?

A 3 **B** 4 **C** 20 **D** 64

8. The diagram shows part of a DNA molecule.



Which letters indicate cytosine, deoxyribose, phosphate and thymine?

	cytosine	deoxyribose	phosphate	thymine
A	W	X	Y	Z
B	Y	X	W	Z
C	Z	W	X	Y
D	Y	Z	X	W

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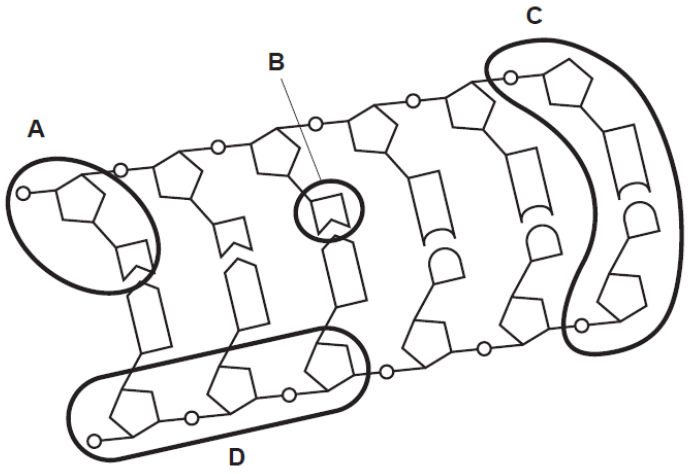
9.	Which statement correctly describes the transcription of DNA? **A** It is a semi-conservative process. **B** It occurs at the surface of the ribosome. **C** It produces messenger RNA. **D** It produces polypeptides.
10.	One of the codons for the amino acid phenylalanine is UUC. Which diagram shows how the tRNA carrying phenylalanine pairs with the corresponding section of mRNA? **A** tRNA AAG mRNA UUC **B** tRNA TTG mRNA UUC **C** tRNA UUC mRNA AAG **D** tRNA UUC mRNA TTG
11.	The diagram shows part of a DNA molecule. Which part is a nucleotide? 

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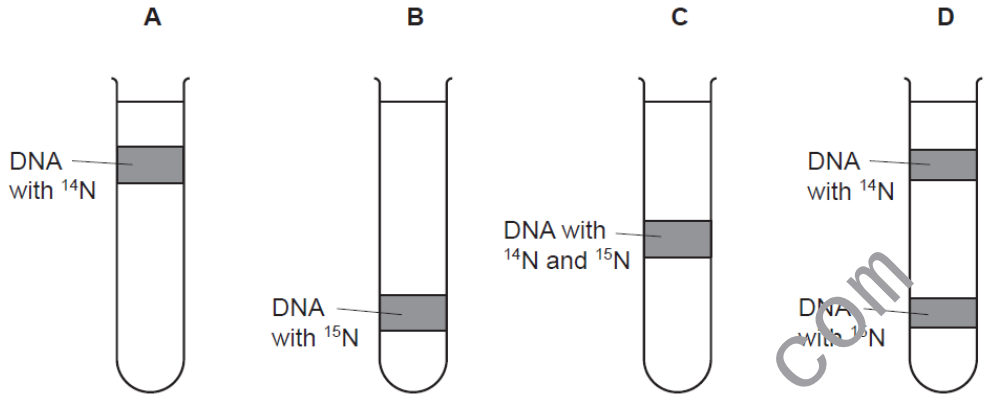
12. Bacteria were grown for many generations in a medium containing a heavy isotope of nitrogen, ^{15}N. They were then transferred to a medium containing the light isotope of nitrogen, ^{14}N. They were given time to replicate DNA and divide once. Their DNA was extracted, spun in a centrifuge and observed using ultra violet light. The DNA with the ^{15}N settled at a lower depth than the DNA with the ^{14}N.

Which shows the predicted results after one generation in the medium with the light isotope?



13. In a genetic engineering experiment a piece of double-stranded DNA containing 6000 nucleotides is transcribed and translated.

What is the total number of amino acids used?

A 500 **B** 1000 **C** 2000 **D** 3000

14. DNA from a chromosome is analysed and 20% of its bases are found to be cytosine.

Which percentage of uracil molecules will be found in mRNA transcribed from this DNA?

A 20 **B** 30 **C** 40 **D** 60

15. Which type of sugar and bonds are found in a DNA molecule?

	type of sugar	bonds linking complementary bases
A	hexose	hydrogen
B	hexose	peptide
C	pentose	hydrogen
D	pentose	peptide

16. A length of double-stranded DNA contains 120 nucleotides and codes for polypeptide X.

What is the maximum length of polypeptide X?

A 20 amino acids

B 40 amino acids

C 60 amino acids

D 120 amino acids

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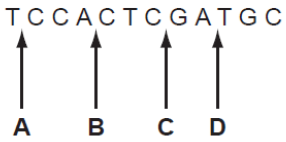
17.	In a DNA molecule, the base sequence AGT codes for the amino acid serine. What is the base sequence of the anti-codon on the tRNA to which serine becomes attached? **A** AGU **B** GAU **C** TCA **D** UCA
18.	The RNA triplet UAG acts as a stop codon terminating the synthesis of a polypeptide. The diagram shows a strand of DNA which codes for four amino acids. Where would a mutation, introducing a thymine nucleotide, result in the termination of transcription? 

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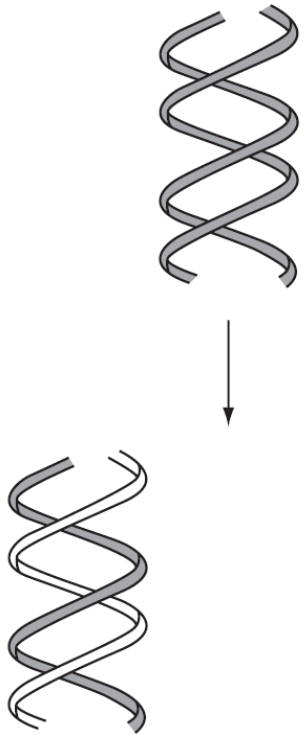
19. The diagram shows a process involving DNA.



What is the name of the process and the stage in the cell cycle at which it occurs?

	process	stage
A	replication	interphase
B	replication	prophase
C	transcription	interphase
D	transcription	prophase

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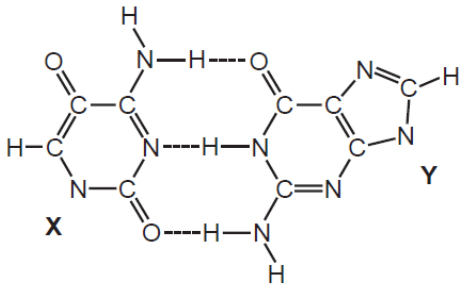
20. The diagram shows two bases, **X** and **Y**, joined by hydrogen bonds (----) in DNA.



What are the correct bases?

	X	Y
A	adenine	cytosine
B	adenine	uracil
C	cytosine	guanine
D	cytosine	thymine

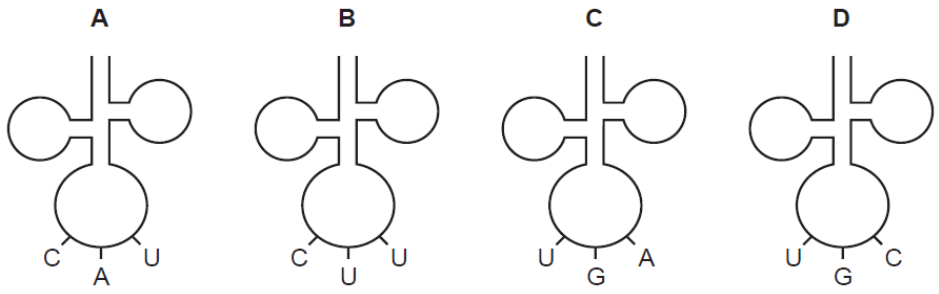
21. Part of the amino acid sequences in normal and sickle cell haemoglobin are shown.

normal haemoglobin	sickle cell haemoglobin
thr-pro-glu-glu	thr-pro-val-glu

Possible mRNA codons for these amino acids are

glutamine (glu) GAA GAG	proline (pro) CCU CCC
threonine (thr) ACU ACC	valine (val) GUA GUG

Which tRNA molecule is **not** involved in the formation of this part of the sickle cell haemoglobin?



22. In the DNA sequence for sickle cell anaemia, adenine replaces thymine in a CTT triplet, forming the triplet CAT. During synthesis of the sickle cell haemoglobin molecule, the amino acid valine is incorporated instead of glutamic acid.

What is the anticodon in the transfer RNA molecule carrying this valine?

A CAU **B** CUA **C** GAU **D** GUA

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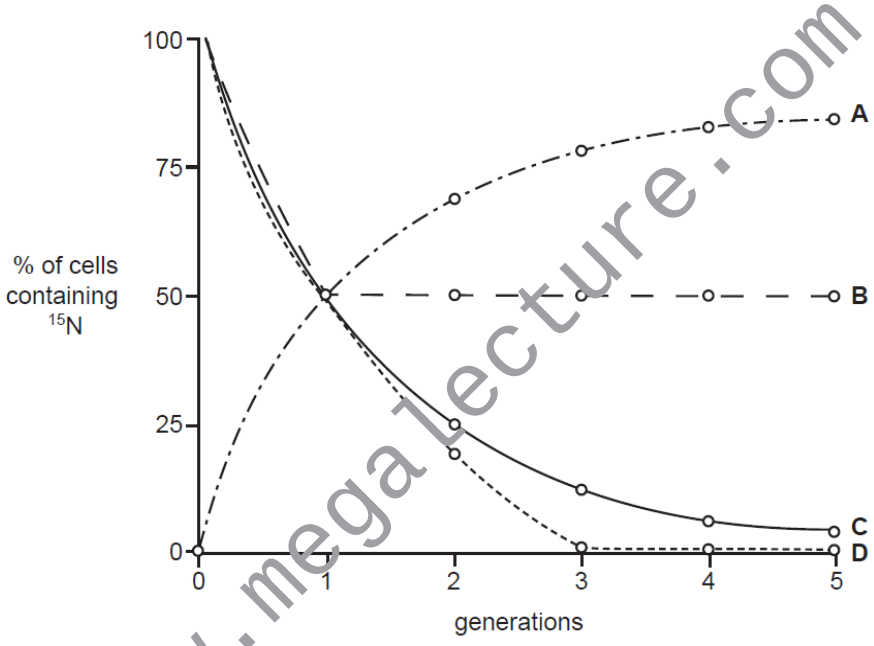
23. Which statements are correct about DNA transcription and translation?

	transcription	translation
A	is semi-conservative	produces mRNA
B	produces mRNA	is semi-conservative
C	occurs at the surface of ribosomes	produces mRNA
D	produces mRNA	occurs at the surface of ribosomes

24. Bacteria were cultured in a medium containing heavy nitrogen (^{15}N) until all the DNA was labelled. These bacteria were then grown in a medium containing only normal nitrogen (^{14}N) for five generations. The percentage of cells containing ^{15}N in each generation was estimated.

Which curve provides evidence that DNA replication is semi-conservative?



25. The table shows the sugars and some bases found in RNA and DNA.

Which is correct?

	RNA	DNA
A	ribose	thymine
B	ribose	uracil
C	thymine	deoxyribose
D	uracil	ribose

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26. What would be the result of analysing part of a DNA molecule?

A hexose sugars and phosphates in equal proportion, and an equal number of cytosine and guanine bases

B nucleotides and phosphates in equal proportion, and an equal number of adenine and cytosine bases

C pentose sugars and phosphates in equal proportion, and an equal number of adenine and thymine bases

D twice as many phosphates as pentose sugars, and an equal number of adenine and guanine bases

27. DNA is said to replicate in a semi-conservative way.

Results of Meselson and Stahl's experiments gave overwhelming support to this theory. They used *E. coli* which has a generation time of 50 minutes.

Here are the steps in their experiment but they are in the wrong order.

P All bacteria contain ^{15}N DNA.

Q All bacteria contain hybrid DNA (^{15}N DNA and ^{14}N DNA).

R Bacteria contain either all ^{14}N DNA or hybrid DNA.

S Bacteria grown in a ^{15}N medium for many generations.

T Bacteria transferred to a ^{14}N medium and sampled every 50 minutes.

Which sequence of letters shows the correct order of the steps in the experiment?

A P → Q → R → S → T

B P → S → T → R → Q

C S → P → T → Q → R

D S → R → Q → P → T

28. In a DNA molecule, the base sequence AGT codes for the amino acid serine.

What is the base sequence of the anti-codon on the tRNA to which serine becomes attached?

A AGU **B** GAU **C** TCA **D** UCA

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29. DNA is said to replicate in a semi-conservative way.

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T Bacteria transferred to a ^{14}N medium and sampled every 50 minutes.

Which sequence of letters shows the correct order of the steps in the experiment?

A P → Q → R → S → T

B P → S → T → R → Q

C S → P → T → Q → R

D S → R → Q → P → T

30. In a DNA molecule, the base sequence AGT codes for the amino acid serine.

What is the base sequence of the anti-codon on the tRNA to which serine becomes attached?

A AGU **B** GAU **C** TCA **D** UCA

31. What is the minimum number of base substitutions required to change the nucleotide sequence of the HbA (normal) allele to the HbS (sickle cell) allele?

A 1 **B** 2 **C** 3 **D** 4

32. What would be the result of analysing part of a DNA molecule?

A hexose sugars and phosphates in equal proportion, and an equal number of cytosine and guanine bases

B nucleotides and phosphates in equal proportion, and an equal number of adenine and cytosine bases

C pentose sugars and phosphates in equal proportion, and an equal number of adenine and thymine bases

D twice as many phosphates as pentose sugars, and an equal number of adenine and guanine bases

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33. The mechanism of action of four drugs that inhibit DNA replication is stated below.

- Aphidicholine inhibits DNA polymerase.
- Cytarabine is converted into a molecule that can substitute for a DNA nucleotide and also inhibits DNA repair mechanisms.
- Epirubicin inhibits an enzyme involved in the unwinding of DNA and separation of strands.
- Hydroxycarbamide inhibits an enzyme involved in the production of deoxyribonucleotides.

Which row correctly matches a drug to an explanation of the mechanism of action?

	explanation of mechanism of action			
	decreased pool of available nucleotides inhibits chain elongation	DNA strands not available as templates for transcription	DNA damaged during replication and cell death occurs	exposed DNA template strands unable to be copied
A	aphidicholine	epirubicin	cytarabine	hydroxycarbamide
B	epirubicin	cytarabine	hydroxycarbamide	aphidicholine
C	hydroxycarbamide	aphidicholine	epirubicin	cytarabine
D	hydroxycarbamide	epirubicin	cytarabine	aphidicholine

34. The following events occur during transcription.

1 Bonds break between complementary bases.
2 Bonds form between complementary bases.
3 Sugar-phosphate bonds form.
4 Free nucleotides pair with complementary nucleotides.

Before the mRNA leaves the nucleus, which events will have occurred twice?

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

35. Which type of sugar and types of bonds are found in a DNA molecule?

	type of sugar	types of bonds
A	non-reducing	hydrogen and ionic
B	non-reducing	hydrogen and peptide
C	reducing	covalent and hydrogen
D	reducing	hydrogen and peptide

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36. The table shows the tRNA anticodons for four amino acids.

amino acid	anticodon (tRNA)
asparagine	UUA
glutamic acid	CUU
proline	GGA
threonine	UGG

A cell makes a polypeptide with the following amino acid sequence.

glutamic acid – asparagine – threonine – proline

What was the sequence of bases on the DNA from which this was formed?

A GGAAATACCCTT

B CAAAATACCCCT

C CTTTTATGGGGA

D CTTTTATCCGGA

37. What does the enzyme RNA polymerase synthesise?

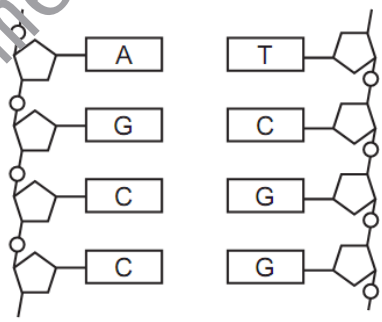
A a polypeptide from an mRNA template

B a strand of DNA from an mRNA template

C mRNA from a DNA template

D mRNA from a tRNA template

38. The diagram shows part of a DNA molecule.



How many hydrogen bonds are involved in holding these strands of DNA together?

A 11 **B** 9 **C** 8 **D** 4

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39. What is the function of the enzyme DNA polymerase?

A to synthesise a polypeptide using mRNA as a template

B to synthesise a strand of DNA using a polypeptide as a template

C to synthesise a strand of DNA using DNA as a template

D to synthesise a strand of mRNA using DNA as a template

40. The following events occur in the replication of DNA.

1. bonds between complementary bases break
2. bonds between complementary bases form
3. opposite strands separate
4. sugar-phosphate bonds form
5. free nucleotides pair with complementary nucleotides on each strand

In which order do these events take place?

	first → last				
A	1	3	5	2	4
B	1	5	3	2	4
C	3	1	5	4	2
D	5	1	3	4	2

41. The sequence of bases on part of a molecule of DNA is shown.

TACAAATGACCA sense strand
ATGTTTACTGGT antisense strand

What is the sequence of bases in mRNA transcribed from this sequence?

A ATGTTTACTGGT

B AUGUUUACUGGU

C TACAAATGACCA

D UACAAAUGACCA

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42. The table gives the tRNA anticodons for four amino acids.

amino acid	anticodon (tRNA)
asparagine	UUA
glutamic acid	CUU
proline	GGA
threonine	UGG

A cell makes a polypeptide with the amino acid sequence:

glutamic acid – asparagine – threonine – proline

What was the sequence of bases on the mRNA from which this was formed?

A GAAAATACCCCT

B AGGGGUGUUUUC

C TCCCCGCAAAAG

D GAAAAUACCCCU

43. Which structural feature of the DNA molecule varies?

A the arrangement of the sugar-phosphate groups

B the double helical arrangement

C the order of bases on a single nucleotide chain

D the pairing of purines with pyrimidines

44. Three polypeptides were made using synthetic mRNA molecules as shown.

synthetic mRNA used	polypeptide produced
UUUUUUUUUUUU	phenylalanine-phenylalanine-phenylalanine-phenylalanine
AAAAAAAAAAAA	lysine-lysine-lysine-lysine
UUUAAAUUUAAA	phenylalanine-lysine-phenylalanine-lysine

What are the DNA codes for the amino acids phenylalanine and lysine?

	phenylalanine	lysine
A	AAA	TTT
B	AAA	UUU
C	TTT	GGG
D	UUU	AAA

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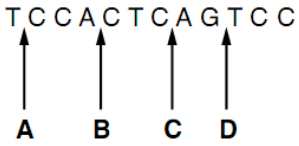
45. The RNA triplet UAG acts as a stop codon, terminating the synthesis of a polypeptide. The diagram shows a strand of DNA which codes for four amino acids.

Where would a mutation, introducing a thymine nucleotide, result in the termination of transcription?



46. Which enzyme rejoins sections of DNA in genetic engineering?

A DNA ligase

B DNA polymerase

C restriction enzyme

D reverse transcriptase

47. When **not** involved in protein synthesis, ribosomes exist as separate subunits.

What do these subunits consist of?

A mRNA and lipid

B mRNA and tRNA

C rRNA and lipid

D rRNA and protein

48. In the DNA sequence for sickle cell anaemia, adenine replaces thymine in a CTT triplet, forming the triplet CAT. During synthesis of the sickle cell haemoglobin molecule, the amino acid valine is incorporated instead of glutamic acid.

What is the anticodon in the transfer RNA molecule carrying this valine?

A CAT **B** CAU **C** GTA **D** GUA

49. In transcription, what is transcribed and what is the product?

	transcribed	product
A	DNA	mRNA
B	DNA	polypeptide
C	mRNA	DNA
D	mRNA	polypeptide

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50.

The table shows mRNA triplets and their corresponding amino acids.

mRNA triplet	GCA	GCG	GAA	GAG	AAA	AAG
amino acid	ala	ala	glu	glu	lys	lys

A tripeptide is glu-lys-ala.

Which sequence of bases in DNA could code for this tripeptide?

A CTCCGTTTT

B CTTTTCCGT

C TTCCGTCTT

D TTTCTCCGC

51.

Analysis of DNA produced the following ratios of nitrogenous bases.

source of DNA	ratio of purines to pyrimidines
bean seeds	0.99
cow heart	1.01
human liver	1.02
rat bone marrow	1.00

Which statement explains the differences in the ratios?

A Animal DNA contains more purines than pyrimidines.

B Different parts of organisms contain different proportions of purines and pyrimidines.

C DNA contains thymine instead of uracil.

D There are variations in the accuracy of analytical techniques.

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52. A polypeptide has the amino acid sequence glycine – arginine – lysine – serine.

The table gives possible tRNA anticodons for each amino acid.

amino acid	tRNA anticodons
arginine	UCC GCG
glycine	CCA CCU
lysine	UUC UUU
serine	AGG UCG

Which sequence of bases on DNA would code for the polypeptide?

A CCACGCAAGAGC

B CCTTCCTTCTCG

C GGAAGGAAAAGC

D GGTTGGTTGTGC

53. The table shows the percentages of nitrogenous bases in four samples of nucleic acids.

Which base is adenine?

sample	bases				
	A	**B**	**C**	**D**	uracil
1	19	31	30	19	nil
2	27	23	24	26	nil
3	25	25	nil	25	25
4	17	32	33	18	nil

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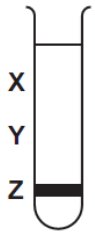
54. A culture of bacteria had all its DNA labelled with the heavy isotope of nitrogen, ^{15}N. The culture was then allowed to reproduce using nucleotides containing normal ^{14}N. The DNA was examined using a centrifuge after one generation and again after two generations.

The diagram shows the position of the DNA band at **Z** in the centrifuge tube when the DNA was first labelled.



In which pattern would the DNA be found after the first and after the second cell generations?

	after first generation	after second generation
A	half at **X** and half at **Y**	quarter at **X**, quarter at **Z** and half at **Y**
B	half at **X** and half at **Z**	quarter at **X**, quarter at **Z** and half at **Y**
C	all at **Y**	half at **X** and half at **Y**
D	all at **Z**	half at **Y** and half at **Z**

55. What terminates the formation of a polypeptide chain during protein synthesis in cells?

A when a 'stop' codon is reached on the mRNA molecule

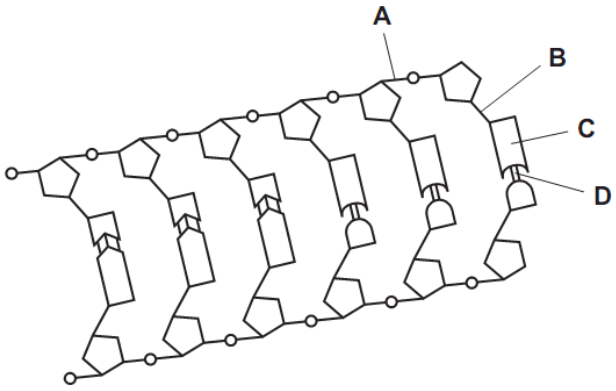
B when a 'stop' codon is reached on the tRNA molecule

C when the ribosome reaches the end of the mRNA molecule

D when the ribosome reaches the end of the tRNA molecule

56. The diagram shows part of a DNA molecule.

Where are hydrogen bonds found?



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57. Which type of molecule is the end product of translation?

A amino acid

B DNA

C mRNA

D polypeptide

58. An unidentified single-stranded molecule was described as having the following features.

- complementary base pairing along some of its length
- an area that can attach to a ribosome
- a site to which a specific amino acid attaches

What is the unidentified molecule?

A DNA polymerase

B messenger RNA

C RNA polymerase

D transfer RNA

59. Some antibacterial drugs can affect the synthesis of proteins.

antimicrobial drug	rifampicin	streptomycin	tetracycline
mode of action	binds to RNA polymerase	genetic code misread during translation	prevents binding of tRNA to ribosome

Which is the correct set of immediate effects of these drugs?

antimicrobial drug	rifampicin	streptomycin	tetracycline
A	defective protein synthesised	mRNA does not bind to ribosome	amino acids not added to growing chain
B	mRNA not synthesised	defective protein synthesised	amino acids not added to growing chain
C	mRNA not synthesised	mRNA does not bind to ribosome	transcription prevented
D	transcription prevented	defective protein synthesised	mRNA does not bind to ribosome

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60. What is the function of the enzyme RNA polymerase?

A to form a polypeptide using mRNA as a template

B to form a strand of DNA using mRNA as a template

C to form a strand of mRNA using DNA as a template

D to form a strand of mRNA using tRNA as a template

61. The table gives the tRNA anticodons for four amino acids.

amino acid	anticodon (tRNA)
asparagine	UUA
glutamic acid	CUU
proline	GGA
threonine	UGG

A cell makes a polypeptide with the amino acid sequence:

glutamic acid – asparagine – threonine – proline

What was the sequence of bases on the strand of the DNA which was complimentary to the mRNA from which this polypeptide was formed?

A CTTTTATGGGGA

B CUUUUAUGGGGA

C GAAAATACCCCT

D GAAAAUACCCCU

62. The following statements describe events that take place during DNA replication and transcription.

Which statement is not correct?

		DNA replication	transcription
A	adenine pairs with thymine	yes	no
B	both DNA polynucleotide chains act as templates	yes	no
C	the original DNA molecule is changed after the process	no	yes
D	uracil pairs with adenine	no	yes

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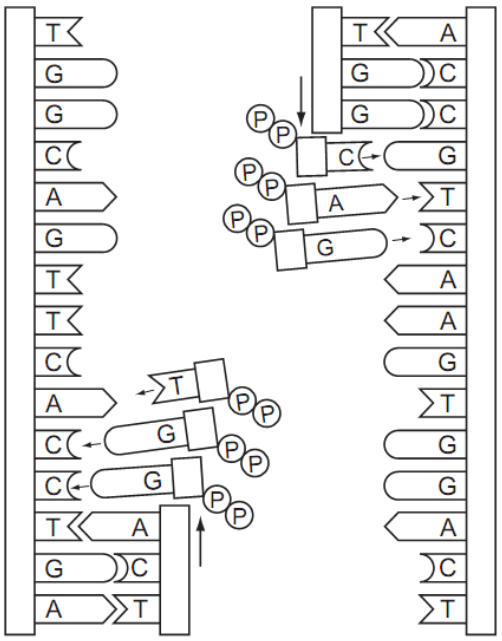
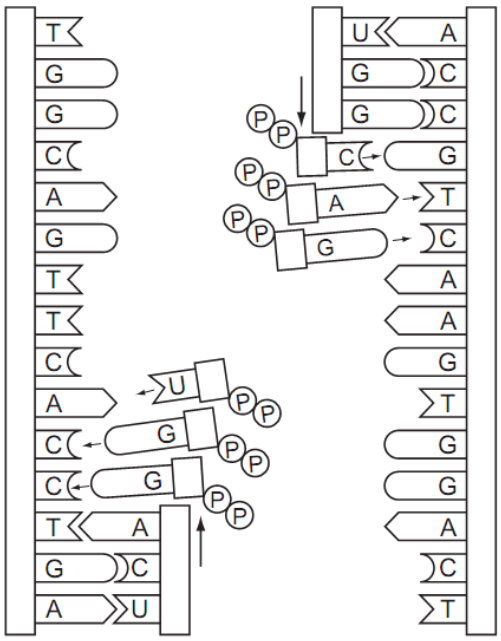
63.	A peptide consists of ten amino acids of four different kinds. What is the theoretical minimum number of tRNA molecules required to translate the mRNA for this peptide? **A** 4 **B** 10 **C** 12 **D** 30
64.	What does the enzyme DNA polymerase synthesise in a cell? **A** a polypeptide using DNA as a template **B** a strand of DNA using a polypeptide as a template **C** a strand of DNA using DNA as a template **D** a strand of mRNA using DNA as a template
65.	Which diagram shows the semi-conservative replication of a section of a molecule of DNA? **A**  **B** 

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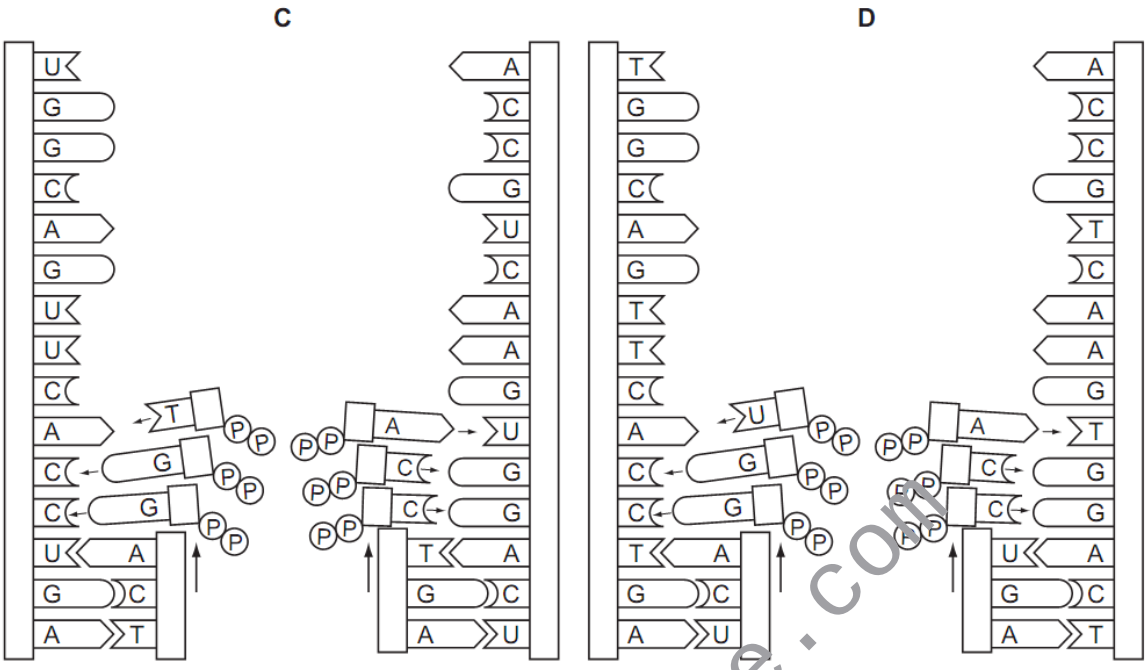

66. DNA was extracted from the salivary glands of a fruit fly and a human cheek cell.

In which way did the DNA molecules differ?

A in the ratio of adenine to thymine

B in the sequence of the nucleotides

C in the type of pentose sugar

D in the types of nucleotide

67. Which statement describes the semi-conservative replication of DNA?

A Parental DNA is broken down into nucleotides and reassembled with new nucleotides.

B Parental DNA is split into triplets and new triplets are added.

C Parental DNA is split into two strands, each of which is replicated.

D Parental DNA remains intact and a new daughter DNA copy is built from new nucleotides.

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68. The table shows the percentages of nitrogenous bases in four samples of nucleic acids.

Which base is adenine?

sample	percentage of nitrogenous bases				
	A	**B**	**C**	**D**	uracil
1	19	31	30	19	nil
2	27	23	24	26	nil
3	25	25	nil	25	25
4	17	32	33	18	nil

69. The table shows the role of four different proteins involved in DNA replication.

protein	helicase	topoisomerase	single-strand binding protein	DNA polymerase
role	unwinds the parental DNA double helix	breaks and rejoins the DNA strands	binds to separated DNA strands to stabilise them	synthesises strand of DNA

Which shows the function of these proteins?

	helicase	topoisomerase	single-strand binding protein	DNA polymerase
A	adds DNA nucleotides to the 3' end of a growing polynucleotide strand	prevents original strands reforming complementary base pairs	enables tension caused by unwinding to be released	makes strands available as templates
B	enables tension caused by unwinding to be released	prevents original strands reforming complementary base pairs	makes strands available as templates	adds DNA nucleotides to the 3' end of a growing polynucleotide strand
C	enables tension caused by unwinding to be released	makes strands available as templates	adds DNA nucleotides to the 3' end of a growing polynucleotide strand	prevents original strands reforming complementary base pairs
D	makes strands available as templates	enables tension caused by unwinding to be released	prevents original strands reforming complementary base pairs	adds DNA nucleotides to the 3' end of a growing polynucleotide strand

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70. The table shows the percentages of bases in DNA from various types of cell.

source of DNA	percentage of bases in DNA			
	adenine	guanine	thymine	cytosine
calf thymus	28.2	21.5	27.8	22.5
bull spleen	27.9	22.7	27.3	22.1
bull sperm	28.6	22.2	27.2	22.0
rat bone marrow	28.7	21.4	28.4	21.5
yeast	31.3	18.7	32.9	17.1

What is a valid deduction from these data?

A All cells from the same species have approximately the same content of DNA.

B Small differences in DNA from different cells have large effects.

C The four bases show complementary base pairing.

D The structure of DNA is different in yeast and animal cells.

71. Which row shows the correct combination?

	triplet code	codon	anticodon
A	DNA	mRNA	tRNA
B	DNA	tRNA	mRNA
C	mRNA	DNA	tRNA
D	tRNA	mRNA	DNA

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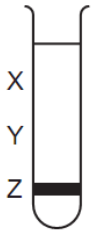
72. A culture of bacteria had all its DNA labelled with the heavy isotope of nitrogen (^{15}N). A sample was taken and spun in a centrifuge.

The diagram shows the position of the DNA band at Z in the centrifuge tube.



The culture was then allowed to reproduce using nucleotides containing the normal isotope of nitrogen (^{14}N). Samples were taken and spun in a centrifuge after one generation and again after two generations.

In which pattern would the DNA be found after the first and after the second generations?

	after first generation	after second generation
A	half at X and half at Y	quarter at X, quarter at Z and half at Y
B	half at X and half at Z	quarter at X, quarter at Z and half at Y
C	all at Y	half at X and half at Y
D	all at Z	half at Y and half at Z

73. Male bees are haploid. They develop from unfertilised eggs. Female bees are diploid.

Which statements are correct?

1 All male bees are genetically identical.

2 Male bee sperm cells are produced by mitosis.

3 New combinations of genes only occur in female bees.

A 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 1, 2 and 3

74. In a genetic engineering experiment a piece of double-stranded DNA containing 6000 nucleotides coding for a specific polypeptide is transcribed and translated.

What is the total number of amino acids in this polypeptide?

A 500 **B** 1000 **C** 2000 **D** 3000

75. What makes the exact copying of DNA molecules possible?

A base pairing

B hydrogen bonding between nucleotides

C sugar-phosphate backbone

D the double helix shape

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76.	Which molecule has its synthesis directly controlled by DNA? **A** amylase **B** cholesterol **C** glycogen **D** phospholipid
77.	Bacteria were grown in a medium containing ^{15}N. After several generations, all of the DNA contained ^{15}N. Some of these bacteria were transferred to a medium containing the common isotope of nitrogen, ^{14}N. The bacteria were allowed to divide once. The DNA of some of these bacteria was extracted and analysed. This DNA was all hybrid DNA containing equal amounts of ^{14}N and ^{15}N. The remaining bacteria were left in the medium with ^{14}N and allowed to divide one more time. The DNA of some of these bacteria was extracted and analysed. What is the composition of this DNA? **A** 25% hybrid DNA **B** 50% hybrid DNA **C** 75% hybrid DNA **D** 100% hybrid DNA
78.	Which cell components contain mRNA? 1 chloroplast 2 mitochondrion 3 nucleus 4 rough endoplasmic reticulum **A** 1, 2, 3 and 4 **B** 1, 2 and 3 only **C** 2, 3 and 4 only **D** 3 and 4 only
79.	What is the correct sequence for the processes involved in the formation of an enzyme in a cell? **A** transcription → condensation → translation → ionic bonding **B** translation → hydrogen bonding → transcription → condensation **C** transcription → translation → condensation → ionic bonding **D** translation → transcription → ionic bonding → hydrogen bonding

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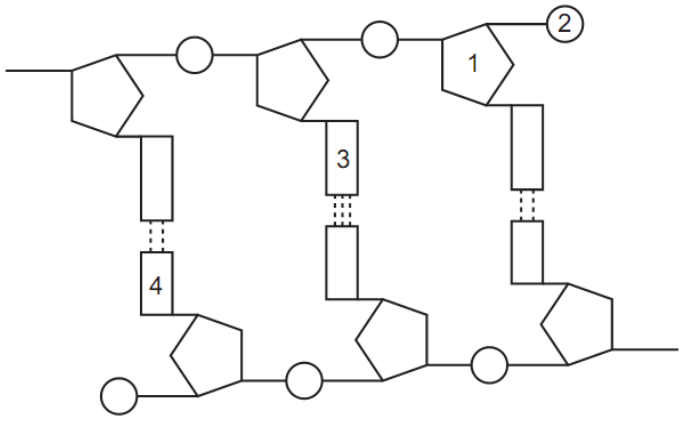
80. The diagram shows part of a DNA molecule.



Which row correctly identifies the structures labelled 1, 2, 3 and 4?

	1	2	3	4
A	cytosine	phosphate	guanine	deoxyribose sugar
B	deoxyribose sugar	phosphate	adenine	cytosine
C	deoxyribose sugar	phosphate	cytosine	thymine
D	phosphate	deoxyribose sugar	cytosine	adenine

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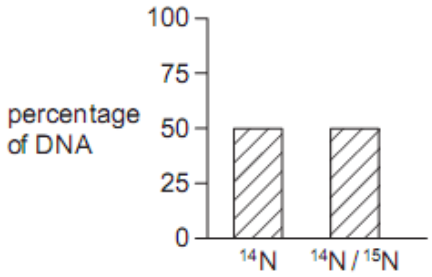
81. Bacteria were grown in a medium containing ^{15}N. After several generations, all of the DNA contained ^{15}N. Some of these bacteria were transferred to a medium containing the common isotope of nitrogen, ^{14}N. The bacteria were allowed to divide once. The DNA of some of these bacteria was extracted and analysed. This DNA was all hybrid DNA containing equal amounts of ^{14}N and ^{15}N.

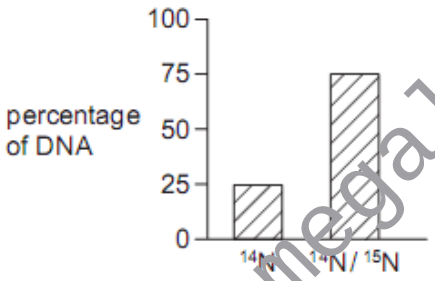
Some bacteria from the medium with ^{15}N were transferred into a medium of ^{14}N. The bacteria were allowed to divide twice. The graph shows the percentages of ^{14}N and ^{15}N in the DNA of these bacteria.



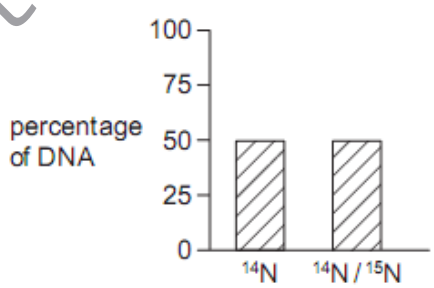
Some bacteria from the medium with ^{15}N were transferred into a medium of ^{14}N. The bacteria were allowed to divide three times.

What would be the percentages of ^{14}N and ^{15}N in the DNA extracted from these bacteria?

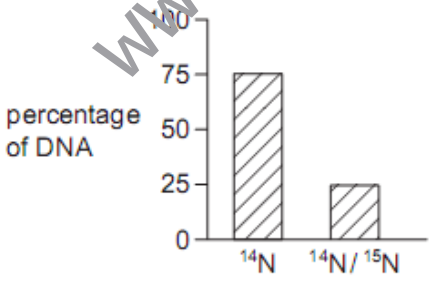
A



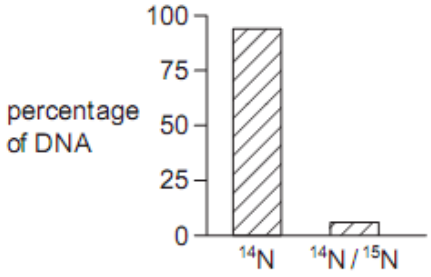
B



C



D



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82.	What makes the exact copying of DNA molecules possible? **A** base pairing **B** hydrogen bonding between nucleotides **C** sugar-phosphate backbone **D** the double helix shape
83.	Which molecule has its synthesis directly controlled by DNA? **A** amylase **B** cholesterol **C** glycogen **D** phospholipid
84.	A gene codes for the production of a protein, p53, that binds to damaged DNA during interphase and prevents its replication. A carcinogen in cigarette smoke mutates this gene. Which statement explains why this mutation may cause cancer? **A** Lack of p53 allows cells to undergo mitosis. **B** Lack of p53 allows cells with damaged DNA to replicate. **C** The carcinogen in cigarette smoke increases the rate of cell division. **D** The p53 causes uncontrolled cell division.
85.	In a genetic engineering experiment a piece of double-stranded DNA containing 6000 nucleotides coding for a specific polypeptide is transcribed and translated. What is the total number of amino acids in this polypeptide? **A** 500 **B** 1000 **C** 2000 **D** 3000
86.	Bacteria were grown in a medium containing ^{15}N. After several generations, all of the DNA contained ^{15}N. Some of these bacteria were transferred to a medium containing the common isotope of nitrogen, ^{14}N. The bacteria were allowed to divide once. The DNA of some of these bacteria was extracted and analysed. This DNA was all hybrid DNA containing equal amounts of ^{14}N and ^{15}N. The remaining bacteria were left in the medium with ^{14}N and allowed to divide one more time. The DNA of some of these bacteria was extracted and analysed. What is the composition of this DNA? **A** 25 % hybrid DNA **B** 50 % hybrid DNA **C** 75 % hybrid DNA **D** 100 % hybrid DNA

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