MLB 111
KONTROLEBLAD / *CONTROL PAGE*

VAN & VOORLETTERS *SURNAME & INITIALS*		SIGNATURE *HANDTEKENING*	

STUDENTENOMMER *STUDENT NUMBER*								-		1 - 8	TOETSNOMMER *TEST NUMBER*	0	2	9 - 10

VRAAG *QUESTION*	PUNTE *MARKS*					
1				•		11 - 14
2				•		15 - 18
3				•		19 - 22
4				•		23 - 26
5				•		27 - 30
6				•		31 - 34
7				•		35 - 38
8				•		39 - 42
9				•		43 - 46
10				•		47 - 50
11				•		51 - 54
12				•		55 - 58
13				•		59 - 62
14				•		63 - 66
15				•		67 - 70
16				•		71 - 74
17				•		75 - 78
18				•		79 - 82
19				•		83 - 86
Totaal / *Total*				•		87 - 91

UNIVERSITY OF PRETORIA
UNIVERSITEIT VAN PRETORIA

MOLECULAR AND CELL BIOLOGY 111
MOLEKULÊRE EN SELBIOLOGIE 111

SECOND SEMESTER TEST : 11 MAY 2007
TWEEDE SEMESTERTOETS : 11 MEI 2007

PUNTE TOEGEKEN *MARKS AWARDED*	

SURNAME AND INITIALS
VAN EN VOORLETTERS.....

SIGNATURE
HANDTEKENING .....

STUDENT REGISTRATION NUMBER
STUDENT REGISTRASIENOMMER.....

DEGREE (e.g. BSc 1)
GRAAD (bv. BSc 1) .....

DATE OF TEST
DATUM VAN TOETS.....

NAME OF TEST VENUE
NAAM VAN TOETSLOKAAL.....

QUESTION **VRAAG**	**MARKS AWARDED** ***PUNTE TOEGEKEN***	**MAX MARKS** ***MAKS PUNTE***
1		**9**
2		**12**
3		**9**
4		**12**
5		**6**
6		**6**
7		**8**
8		**9**
9		**10**
10		**12**
11		**7**
TOTAL *TOTAAL*		**100**

MOLECULAR AND CELL BIOLOGY 111 (MLB 111)
MOLEKULÊRE EN SELBIOLOGIE 111 (MLB 111)

SECOND SEMESTER TEST / *TWEEDE SEMESTERTOETS*

2007-05-11

MARKS / *PUNTE* : 100
TIME / *TYD* : 100 MIN

EXAMINER / EKSAMINATOR:

Dr Q Kritzinger

The test paper consists of 11 questions and 13 pages. **VERIFY IT !!**
Die toetsvraestel bestaan uit 11 vrae en 13 bladsye. ***KONTROLEER DIT !!***

QUESTION / *VRAAG* 1: [9]

1.1 One of the requirements of genetic material is that it predicts genetic variation. How does DNA comply with this requirement? / *Een van die vereistes vir genetiese material is dat dit genetiese variasie voorspel. Hoe voldoen DNA aan hierdie vereiste?* (2)

……

……

……

……

1.2 A number of researchers (A – I) are associated with the discoveries / hypotheses about the nature of DNA / genes. Indicate which researcher(s) were involved with each discovery / hypothesis listed in 1.2.1 – 1.2.6. **Note:** There is only ONE correct answer for each statement. /
'n Reeks navorsers (A – I) word vereenselwig met die ontdekkings / hipoteses oor die aard van DNA / gene. Dui aan watter navorser(s) betrokke was by elk van die ontdekkings / hipoteses gelys in 1.2.1 – 1.2.6. **Let wel:** Daar is net EEN korrekte antwoord vir elke stelling.

(7)

A. Griffith
B. Hershey & Chase
C. Avery, McCarty & MacLeod
D. Chargaff
E. Nirenberg & Matthei
F. Meselson and Stahl
G. McClintock
H. Watson & Crick
I. Beadle & Tatum

1.2.1 Determined the double helix structure of the DNA molecule. /
Het die dubbelheliks struktuur van die DNA molekuul bepaal.

……..

1.2.2 Components of heat-inactivated S cells were purified. The components were tested for the ability to transform live R cells. The transforming agent was found to be DNA. / *Komponente van hitte-geinaktiveerde S selle is gesuiwer. Die komponente is getoets vir hul vermoë om lewende R selle te transformeer. Die transformerende agent is vasgestel as DNA.*

……..

1.2.3 Phages with labeled proteins or DNA were allowed to infect bacteria. It was shown that the DNA entered the bacterial cells, and was therefore the genetic material. /
Fages met gemerkte proteïene of DNA is toegelaat om bakterieë te besmet. Dit het gewys dat DNA, wat die bakteriesel binnegedring het, wel die genetiese material was.

……..

1.2.4 Pieces of DNA can jump from one position in a chromosome to another. /
Stukkies DNA kan van een posisie in 'n chromosoom na 'n ander een spring.

……..

1.2.5 In DNA from any species, the amount of adenine equals the amount of thymine, and the amount of guanine equals the amount of cytosine. /
In DNA van enige spesie, is die aantal adenien gelyk aan die aantal timien, en die aantal guanien is gelyk aan die aantal sitosien.

……..

1.2.6 First experiments towards elucidation/cracking of the genetic code. /
Eerste eksperimente om die genetiese kode te verstaan.

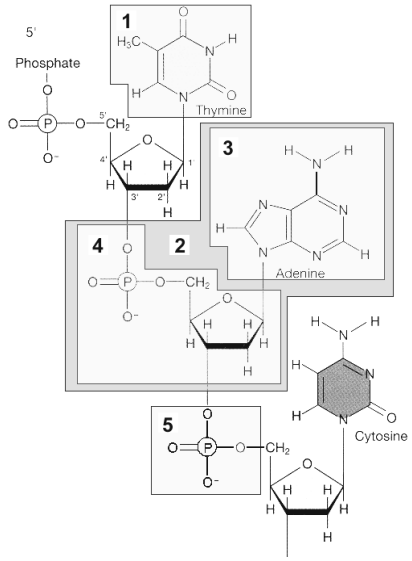
……

1.2.7 DNA replication is semi-conservative. / *DNA repliseer semi-konserwatief.*

……

QUESTION / *VRAAG* 2: [12]

2.1 Answer the following questions by referring to the figure supplied*. / Beantwoord die volgende vrae aan die hand van die gegewe figuur.*



2.1.1 Which portion is the backbone of this molecule? (give the number of the box) / *Watter deel vorm die ruggraat van die molekuul? (gee die nommer van die kassie)* (1)

…….

2.1.2 To which class of nitrogenous bases does the portion in Box 3 belong? / *Aan watter klas van stikstofbasisse behoort die deel in Kassie 3?* (1)

…….

2.1.3 Which portion indicates a phosphodiester linkage? (give the number of the box) / *Watter deel dui 'n fosfodiester binding aan? (gee die nommer van die kassie)* (1)

…….

2.1.4 How many hydrogen bonds will exist between the nitrogenous base in Box 1 and its complementary base in an opposite strand? / *Hoeveel waterstofbindings sal ontstaan tussen die stikstofbasis in Kassie 1 en sy komplementêre basis in 'n teenoorgestelde draad?* (1)

……

2.1.5 What type of polynucleotide is represented in the figure? Give TWO reasons for your answer. /
Watter tipe polinukleotied word in die figuur voorgestel? Verskaf TWEE redes vir jou antwoord. (3)

.....

.....

.....

2.2 Why does a new DNA strand only elongate in the 5' to 3' direction? /
Hoekom word 'n nuwe DNA draad net in 'n 5' na 3' rigting verleng? (2)

.....

.....

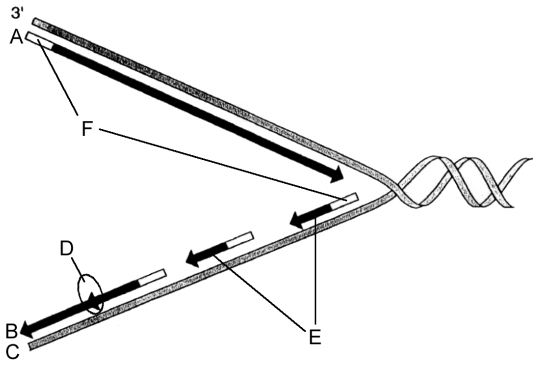
2.3. In a double DNA strand, the spontaneous loss of amino groups from adenine results in hypoxanthine, an unnatural base, opposite thymine. What combination of enzymes could the cell use to repair such damage? / (3)
In 'n dubbel DNA draad, vorm die spontane verlies van aminogroepe vanaf adenien, hipoksantien, 'n onnatuurlike basis, oorkant timien. Watter kombinasie van ensieme (3) sal die sel gebruik om sulke beskadiging te herstel?

.....

.....

QUESTION / *VRAAG* 3: [9]

Answer the following questions with regard to the replication fork shown below. /
Beantwoord die volgende vrae oor die replikasie vurk hieronder.



3.1 Indicate on the figure the orientation (direction) of the lagging strand. /
Dui op die figuur die oriëntasie (rigting) van die sloerdraad aan. (1)

3.2.1 Identify the segments labeled F. / *Identifiseer die stukke gemerk F.* (1)

……

3.2.2 Which type of nucleotides is found in these segments? /
Watter tipe nukleotiedes word in die stukkies gevind? (1)

……

3.2.3 Name the enzyme that forms these segments. /
Noem die ensiem wat die stukkies vorm. (1)

……

3.3 Name the enzyme that is represented by D? What is its function? /
Gee die naam van die ensiem wat deur D voorgestel word. Wat is sy funksie? (2)

……

……

3.4 Indicate on strand A where DNA polymerase III is active. /
Dui op draad A aan waar DNA polimerase III aktief is. (1)

3.5 Indicate on the figure where DNA helicase is active. /
Dui op die figuur aan waar DNA helikase aktief is. (1)

3.6. Single-strand binding proteins also function during this process. What is their precise function? / *Enkeldraad bindingsproteïene funksioneer ook tydens hierdie proses. Wat is hul spesifieke funksie?* (1)

……

……

QUESTION / *VRAAG* 4: [12]

4.1 Compare and contrast the functioning of DNA polymerase III and RNA polymerase II with the help of the headings in Column A. /
Vergelyk en kontrasteer die werking van DNA polimerase III en RNA polimerase II met die hulp van die opskrifte in Kolom A. (6)

Column / *Kolom A*	**DNA polymerase / *polimerase***	**RNA polymerase / *polimerase***
Direction of synthesis of a new strand? / *Rigting van sintese van 'n nuwe draad?*		
Requires a primer? / *Benodig 'n primer?*		
Type of nucleotides used? / *Tipe nukleotiedes gebruik?*		

4.2 The one gene-one enzyme hypothesis is not entirely accurate. Moreover, the one gene-one polypeptide hypothesis also needs revision. Briefly explain why. /
Die een geen-een ensiem hipotese is nie heeltemal akkuraat nie en die een geen-een polipeptied hipotese benodig ook hersiening. Verduidelik kortliks hoekom. (3)

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4.3 Eukaryotic mRNA has a significantly longer half life that its prokaryotic counterpart. How is this accomplished in eukaryotes? /
Eukariotiese mRNA het 'n merkwaardige langer halflewe as sy prokariotiese eweknie. Hoe word dit teweeggebring in eukariote? (3)

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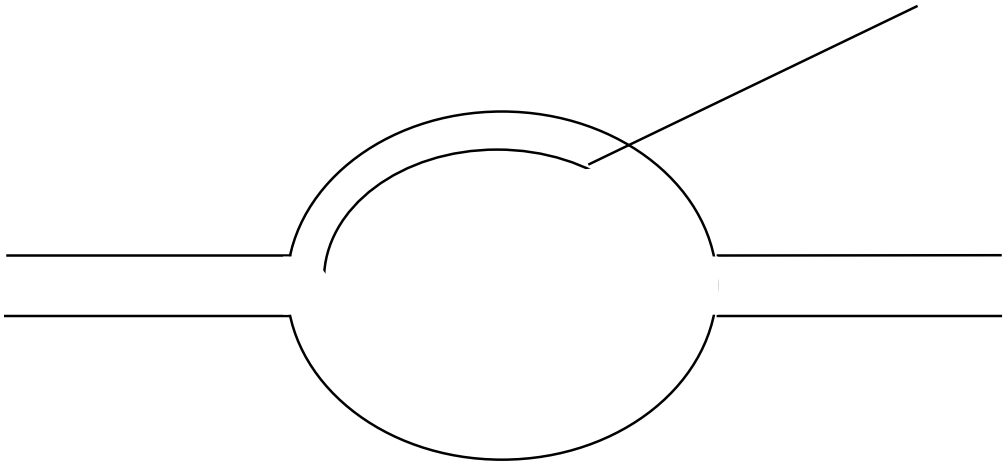
QUESTION / *VRAAG* 5: [6]

The diagram below depicts an active transcription bubble after a short period of mRNA synthesis during the transcription process of a eukaryotic gene. Indicate the following on this diagram: /
Onderstaande diagram verteenwoordig 'n skematiese voorstelling van die transkripsieborrel na 'n kort periode van mRNA-sintese tydens die transkripsie van 'n eukariotiese geen. Dui die volgende aan op hierdie skets:

5.1 the coding/template and the non-coding/non-template strands; / *die kodeer/templaat en nie-kodeer-/nie-templaat-draad;* (1)
5.2 the orientation (direction) of both DNA strands and that of the newly synthesised RNA strand; / *die oriëntasie (rigting) van beide DNA-stringe en dìé van die nuut-gesintetiseerde RNA-draad;* (2)
5.3 the location of a possible promotor sequence; / *die ligging van 'n moontlike promotorvolgorde;* (1)
5.4 the location of a possible modified guanine cap; / *die ligging van 'n moontlike gewysigde guanien kroon;* (1)
5.5 the specific area of activity of the RNA polymerase II; / *die spesifieke area waar die RNA-polimerase II aktief is.* (1)



QUESTION / *VRAAG* 6: [6]

6.1 Briefly explain how a translation-initiation complex is formed. /
Verduidelik kortliks hoe 'n translasie-inisiasie kompleks gevorm word. (4)

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6.2 There are 61 mRNA codons that specify an amino acid, but only 45 tRNAs. How can this statement be explained? /
Daar is 61 mRNA kodons wat vir 'n aminosuur spesifiseer, maar net 45 tRNAs. Hoe kan hierdie stelling verduidelik word? (2)

……

……

……

……

QUESTION / *VRAAG* 7: [8]

Fill in the missing words of the following sentences regarding translation. / *Vul in die ontbrekende woorde van die volgende sinne oor vertaling.*

7.1. The enzyme ……, which catalyzes the transfer of the polypeptide chain attached to the tRNA in the …….. site to the aminoacyl-tRNA in the ……..site, is a(an) …….. molecule and not a protein. This molecule is thus an example of a …… .

Die ensiem, ……, wat die oordrag van die polipeptiedketting op die tRNA in die ……. setel na die aminoasiel-tRNA in die ……. setel kataliseer, is 'n …….. molekuul en nie 'n proteïen nie. Hierdie molekuul is dus 'n voorbeeld van 'n …… . (5)

7.2 Translocation is the process whereby the …….. moves in order to place the tRNA bound to the growing polypeptide chain in the ……. site, thereby freeing the …….. site for a new aminoacyl-tRNA.

Translokasie is die proses waar die …… beweeg om die tRNA gekoppel aan die groeiende polipeptiedketting in die …… setel te bring, en sodoende die …… setel beskikbaar te stel vir 'n nuwe aminoasiel-tRNA. (3)

QUESTION / *VRAAG* 8: [9]

Provide the most correct scientific term for each of the following descriptions. /
Verskaf die mees korrekte wetenskaplike term vir elk van die volgende beskrywings.

Description / *Beskrywing*	**Term**
The site where replication begins on a DNA molecule. / *Die plek waar replikasie van 'n DNA molekuul sal begin.*	
Proteins that are needed to initiate transcription in eukaryotic organisms. / *Proteïene wat benodig word om transkripsie in eukariotiese organismes te begin.*	
The type of bonds responsible for maintaining the shape of the tRNA molecule. / *Die tipe bindings verantwoordelik vir die handhawing van die tRNA se vorm.*	
Groups of ribosomes reading a single mRNA simultaneously. / 'n *Groep ribosome wat 'n enkele mRNA gelyktydig lees.*	
The place in the cell where translation takes place. / *Die plek in die sel waar vertaling (translasie) plaasvind.*	
The enzyme that catalyzes the attachment of an amino acid to tRNA. / *Die ensiem wat die binding van 'n aminosuur met 'n tRNA kataliseer.*	
Noncoding segment of DNA that is transcribed but is removed before mRNA leaves the nucleus. / *Nie-koderende stuk DNA wat getranskribeer word maar verwyder word voordat mRNA die nukleus verlaat.*	
Certain RNA molecules involved with pre-mRNA splicing reactions. / *Sekere RNA molekules betrokke by pre-mRNA splitslassing reaksies.*	
A movable DNA segment that requires an RNA intermediate. / *'n Beweeglike stuk DNA wat 'n RNA intermediêr benodig.*	

QUESTION / *VRAAG* 9: [10]

Given below is the first part of the template or coding strand of a DNA molecule. Answer the questions and use the codon table on the last page of the test paper where required. / *Hieronder is die eerste gedeelte van die templaat of kodeerdraad van 'n DNA molekuul. Beantwoord die vrae en gebruik die kodontabel op die laaste bladsy van u toetsvraestel waar nodig.*

3'-TACTGATCTTTAACCCTAGGATGCACT-5'

9.1 Give the corresponding mRNA sequence. Indicate the orientation (direction) of the nucleic acid. / *Gee die ooreenstemmende mRNA-volgorde.* Dui die orientasie (rigting) van die nukleïensuur aan. (3)

.....

9.2 How many amino acids would you find in the corresponding polypeptide? / *Hoeveel aminosure is daar in die ooreenstemmende polipeptied?* (1)

.....

9.3 Give the corresponding anticodon of the aminoacyl-tRNA that will recognize the fifth codon on the mRNA. Indicate the orientation (direction) of the anticodon. / *Gee die ooreenstemmende antikodon van die aminoasiel-tRNA wat die vyfde kodon op die mRNA sal herken. Dui die orientasie (rigting) van die antikodon aan.* (2)

……

9.4 After exposure of the DNA to a mutagen, the eighth nucleotide of the DNA template mutates from a C to a G. What will the effect of this type of point mutation be? Be sure to give the name of this type of point mutation. / *Na blootstelling van die DNA aan 'n mutagens, muteer die agste nukleotied op die DNA-templaat vanaf 'n C na 'n G. Wat sal die effek van hierdie puntmutasie wees? Onthou om die naam van hierdie tipe puntmutasie te gee.* (2)

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.....

……

……

9.5 What will happen if, due to the action of a mutagen, the first and second bases of the second codon are deleted from the DNA template? / *Wat sal gebeur indien, as gevolg van die aksie van 'n mutagens, die eerste en tweede basisse van die tweede kodon op die DNA templaat uitgelaat word?* (2)

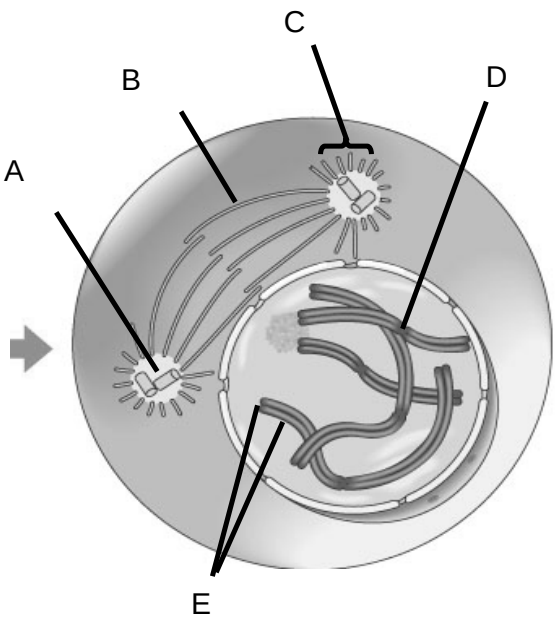
.....

……

……

QUESTION / *VRAAG* 10: [12]

10.1 Answer the following questions by referring to the figure supplied. /
Beantwoord die volgende vrae aan die hand van die gegewe figuur.



10.1.1 Which phase of mitosis is represented in the figure? /
Watter fase van mitose word deur die figuur aangedui? (1)

……..

10.1.2 Provide the labels for A – E. / *Verskaf byskrifte vir A – E.* (5)

A. …… D. ……

B. …… E. ……

C. ……

10.1.3 Give the function of structure A. / *Noem die funksie van struktuur A.* (1)

.....

.....

10.1.4 During which phase will the nuclear membrane begin to defragment? /
Gedurende watter fase sal die kernmembraan begin om te defragmenteer? (1)

……..

10.1.5 According to the cell cycle, which process follows mitosis? /
Volgens die selsiklus, watter proses volg mitose? (1)

……..

10.2 What is a kinetochore and where is it found? Also mention the mitotic phase in which they first become apparent. /
Wat is 'n kinetokoor en waar kom dit voor? Meld ook aan in watter mitotiese fase hulle vir die eerste keer opmerkbaar is. (3)

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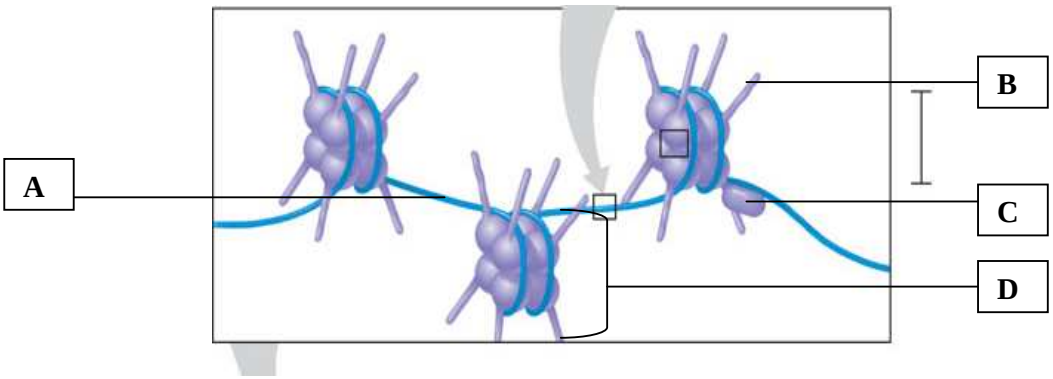
QUESTION / *VRAAG* 11: [7]

Answer the following questions by referring to the figure supplied. /
Beantwoord die volgende vrae aan die hand van die gegewe figuur.



11.1 Provide labels for A - D: / *Verskaf byskrifte vir A – D:* (4)

A. …… C. ……

B. …… D. ……

11.2 Why is the charge of structure B important in DNA packaging? /
Hoekom is die lading van struktuur B belangrik in die verpakking van DNA? (2)

.....

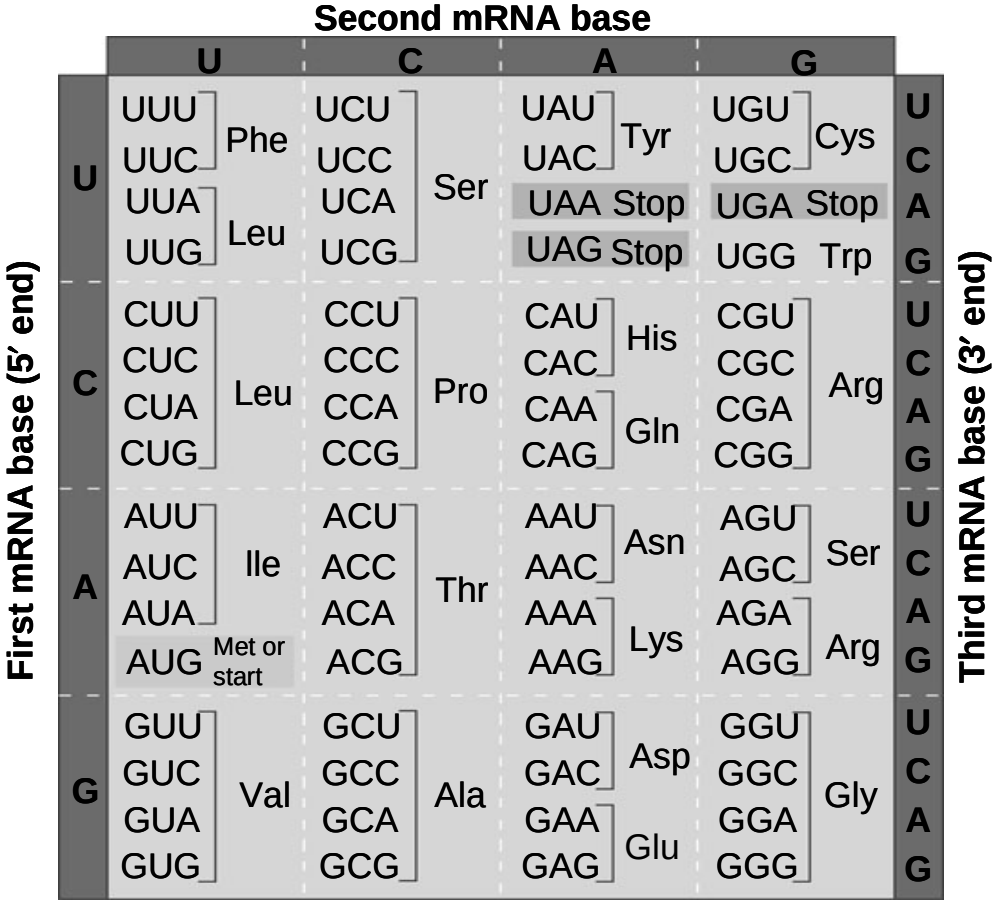
.....

.....

11.3 What is the function of structure C in chromatin packaging? /
Wat is die funksie van struktuur C in chromatien verpakking? (1)

.....

.....


Second mRNA base
U
C
A
G
First mRNA base (5′ end)
Third mRNA base (3′ end)
UUU Phe
UUC
UUA Leu
UUG
UCU Ser
UCC
UCA
UCG
UAU Tyr
UAC
UAA Stop
UAG Stop
UGU Cys
UGC
UGA Stop
UGG Trp
CUU Leu
CUC
CUA
CUG
CCU Pro
CCC
CCA
CCG
CAU His
CAC
CAA Gln
CAG
CGU Arg
CGC
CGA
CGG
AUU Ile
AUC
AUA
AUG Met or start
ACU Thr
ACC
ACA
ACG
AAU Asn
AAC
AAA Lys
AAG
AGU Ser
AGC
AGA Arg
AGG
GUU Val
GUC
GUA
GUG
GCU Ala
GCC
GCA
GCG
GAU Asp
GAC
GAA Glu
GAG
GGU Gly
GGC
GGA
GGG