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 : 9 MAY 2008
TWEEDE SEMESTERTOETS : 9 MEI 2008

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		**13**
2		**11**
3		**11**
4		**6**
5		**8**
6		**10**
7		**10**
8		**7**
9		**6**
10		**6**
11		**7**
12		**5**
TOTAL *TOTAAL*		**100**

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

SECOND SEMESTER TEST / *TWEEDE SEMESTERTOETS*

2007-05-09

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

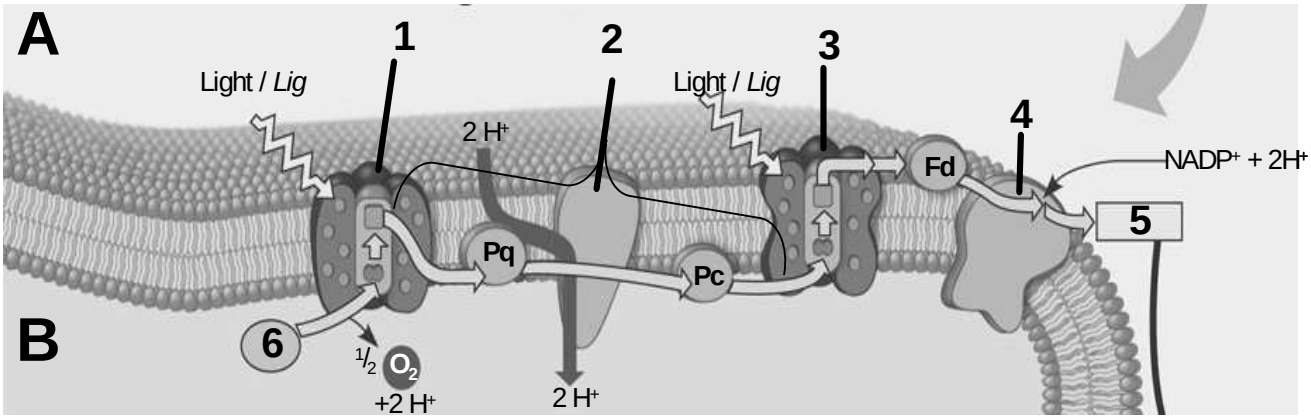
EXAMINER / EKSAMINATOR:

Dr Q Kritzinger

The test paper consists of 11 questions and 15 pages. **VERIFY IT !!**
Die toetsvraestel bestaan uit 11 vrae en 15 bladsye. ***KONTROLEER DIT !!***

QUESTION / *VRAAG* 1: [15]

1.1 Answer the following questions with regards to the figure below: /
Beantwoord die volgende vrae oor die onderstaande figuur:



1.1.1 Match the following labels with their appropriate locations (numbers) in the figure: /
Pas die volgende byskrifte met hul toepaslike plekke (nommers) in die figuur:

(4)

a. electron transport chain / *elektronvervoer ketting*

…….

b. water / *water*

…….

c. NADP-reductase / *NADP-reduktase*

……..

d. photosystem II / *fotosisteem II*

…….

1.1.2 Which wavelengths of visible light are mainly absorbed by the chlorophyll molecules in the light-harvesting complexes (LHC)? /
Watter golflengtes van sigbare lig word hoofsaaklik deur die chlorofil molekules in die lig-insamelings kompleks (LIK) geabsorbeer? (1)

……

1.1.3 Which parts of the chloroplast are represented by A and B, respectively? /
Watter dele van die chloroplas word deur A en B, onderskeidelik, voorgestel? (2)

A = ……

B = ……

1.1.4 Why does the pH of B drop dramatically when photosynthesis is active? /
Hoekom daal die pH van B dramaties wanneer fotosintese aktief is? (1)

……

……

……

……

1.1.5 How is ATP ultimately produced? Consider the formation of the pH gradient /
Hoe word ATP uiteindelik vervaardig? Neem die vorming van die pH gradient in ag. (3)

……

……

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……

1.1.6 Which parts (locations) in the figure will be involved in cyclic electron flow (phosphorylation)? Give the numbers of the parts. /
Watter dele (plekke) in die figuur sal by sikliese elektronvloei (fosforilering) betrokke wees? Noem die nommers van die dele. (1)

……

1.2 Even though the steps of photosynthesis that actually produce sugar molecules are part of the carbon fixation reactions, the light-dependent reactions are absolutely essential for sugar synthesis. Briefly explain this statement. /
Al is die stappe van fotosintese wat eintlik suikermolekules vervaardig deel van die koolstoffikserings reaksies, is die lig-afhanklike reaksies uiters noodsaaklik vir suikersintese. Verduidelik kortliks die stelling. (3)

……

……

……

……

……

……

……

……

QUESTION / *VRAAG* 2: [11]

2.1 What is the name of the enzyme that catalyses the first step of the Calvin Cycle? /
Wat is die naam van die ensiem wat die eerste stap van die Calvinsiklus kataliseer? (1)

……

2.2 Where in the chloroplast is this enzyme found? /
Waar in die chloroplas word hierdie ensiem gevind? (1)

……

2.3 What are the TWO reactions that this enzyme catalyzes? Write down the names (or abbreviations) of the reactants and products. /
Wat is die TWEE reaksies wat dié ensiem kataliseer? Skryf neer die name (of afkortings) van die reagense en produkte. (4)

……

……

……

……

2.4 C4 plants employ an additional pathway of carbon fixation to help prevent photorespiration from taking place. /
C4 plante het 'n byskomtige padweg vir koolstoffiksering om te voorkom dat fotorespirasie plaasvind.

2.4.1 With what molecule does CO_2 first bind with in the mesophyll cells of C4 plants? /
Met watter verbinding sal CO_2 eerste bind in die mesofilselle van C4 plante? (1)

.....

2.4.2 Name the enzyme that catalyses the reaction in 2.4.1 /
*Noem die ensiem wat die reaksie kataliseer in 2.4.*1 (1)

.....

2.4.3 In which cells of C4 plants does decarboxylation of malate take place? /
In watter selle van C4 plante vind dekarboksilering van malaat plaas? (1)

.....

2.4.4 Name the products of this reaction(2.4.3). Mention the fate of these products. /
Noem die produkte van dié reaksie (2.4.3). Wat is die bestemming van hierdie produkte. (2)

.....

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.....

QUESTION / *VRAAG* 3: [11]

3.1 Answer the following short questions about the structure of DNA. /
Beantwoord die volgende kort vrae oor die struktuur van DNS.

3.1.1 Which nitrogenous bases are purines? /
Watter stikstof basisse is puriene? (2)

.....

3.1.2 Give the name of the bond that forms between the deoxyribose and phosphate group? /
Gee die naam van die binding wat tussen die deoksiribose en fosfaatgroep vorm? (1)

.....

3.1.3 The percentage of adenine in a double-stranded DNA molecule is 20. What is the percentage of cytosine in that DNA molecule? /
Die persentasie adenien in 'n dubbeldraad DNS molekuul is 20. Wat is die persentasie sitosien in dié DNS molekuul? (1)

.....

3.2 Answer the following questions about DNA replication. /
Beantwoord die volgende vrae oor DNS replisering.

3.2.1 Why is a primer needed for DNA replication? /
Hoekom word 'n primer vir DNS replisering benodig? (2)

.....

.....

.....

.....

.....

.....

3.2.2 How is the primer made? Be sure to mention the enzyme that is involved. /
Hoe word die primer gemaak? Maak seker om die betrokke ensiem te noem. (2)

.....

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.....

3.2.3 Two DNA polymerases are used in DNA replication in prokaryotes. Name them and give their function. /
Twee DNS polimerases word in DNS replisering in prokariote gebruik. Noem hulle en verskaf hul funksies. (3)

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QUESTION / *VRAAG* 4: [5]

Indicate whether each statement is TRUE or FALSE. If your answer is FALSE, motivate why. /
Dui aan of elke stellings WAAR of ONWAAR is. Indien jou antwoord ONWAAR is, motiveer waarom.

4.1 Watson and Crick showed that DNA replication is semi-conservative. /
Watson en Crick het gewys dat DNS replisering semi-konserwatief is. (1)

.....

.....

4.2 Avery and colleagues identified DNA as the transforming factor in crosses between smooth and rough bacteria. /
Avery en kollegas het DNS as die transformerende faktor in kruisings tussen gladde en growwe bakterieë identifiseer. (1)

.....

.....

4.3 The nuclease enzyme cuts out damaged parts of DNA. /
Die nuklease ensiem sny beskadigde dele van DNS uit. (1)

.....

.....

4.4 Retrotransposons are transposable elements that move within the genome by means of a DNA intermediate. /
Retrotransposons is beweeglike elemente wat met die hulp van 'n DNS intermediêr in die genoom beweeg. (1)

.....

.....

4.5 In prokaryotes, DNA replication begins at a single origin of replication. /
In prokaryote, begin DNS replisering by 'n enkele oorsprong van replikasie. (1)

.....

.....

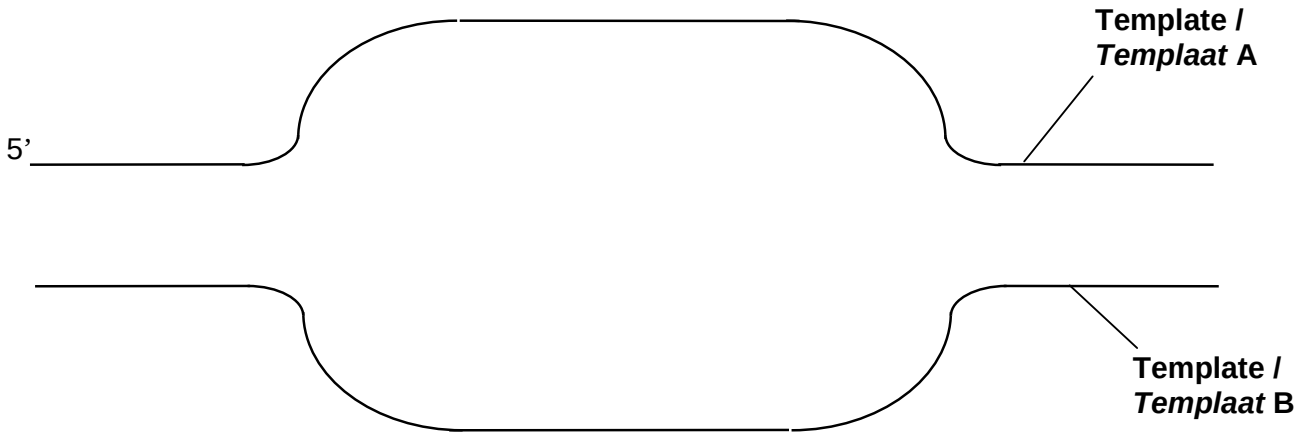
4.6 Mitosis uses a 2N parent cell to form daughter cells containing N chromosomes. /
Mitose gebruik 'n 2N ouersel om dogterselle te vorm wat N chromosome bevat. (1)

.....

.....

QUESTION / *VRAAG* 5: [8]

The following incomplete diagram of a replication bubble indicates a region on a DNA molecule where DNA replication is taking place. The two DNA templates are indicated by A and B, respectively. Complete the diagram by indicating the following **very clearly on the diagram**: / *Onderstaande onvoltooide skets van 'n replikasieborrel dui die plek op 'n DNA molekuul aan waar DNA replikasie plaasvind. Die twee DNA template word aangedui deur 'n A en 'n B. Voltooi die skets deur die volgende baie **duidelik op die skets** aan te dui:*



5.1 The synthesis of the leading strand on **template B**. You have to indicate the nucleic acid components of the strand and the direction in which strand elongation is occurring. /
*Die sintese van die leierdraad op **templaat B**. U moet die nukleïensuurkomponente van die draad sowel as die rigting van kettingverlenging aantoon.* (2)

5.2 The synthesis of TWO Okazaki fragment s on **template A**. You have to indicate the nucleic acid components of the strand and the direction in which strand elongation is occurring. /
*Die sintese van 'n TWEE Okazaki fragmente op **templaat A**. U moet die nukleïensuurkomponente van die draad sowel as die rigting van kettingverlenging aantoon.* (4)

5.3 The region on **template A** where the DNA ligase enzyme will be active. /
*Die gebied op **templaat A** waar die DNA ligase ensiem aktief sal wees.* (1)

5.4 The region where single-strand proteins are active. /
Die gebied waar enkeldraad proteïene aktief is. (1)

QUESTION / *VRAAG* 6: [10]

6.1 On the basis of their work with mutants of the fungus, *Neurospora crassa*, Beadle and Tatum proposed the one gene – one enzyme hypothesis. Why is the one gene – one polypeptide hypothesis a more accurate hypothesis? /
Na aanleiding van hul werk met die mutante van Neurospora crassa*, het Beadle en Tatum die een geen – een ensiem hipotese voorgestel. Hoekom is die een geen – een polipeptied hipotese 'n meer akkurate hipotese?*

(2)

……

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6.2 In eukaryotes, how does RNA polymerase II "know" where to start transcribing a gene? /
In eukariote, hoe "weet" RNS polimerase II waar om 'n geen te transkribeer? (2)

……

.....

.....

.....

6.3 Fill in the missing words. / *Vul die ontbrekende woorde in.* (6)

…….. and other proteins form a molecular complex, called a spliceosome, on a pre-mRNA containing …….. and …….. . Within the spliceosome, …….. base pairs with specific nucleotides at specific sites. The RNA transcript is cut, releasing the …… and at the same time splicing the …….. together.

…….. en ander proteïene vorm 'n molekulêre kompleks, genoem die spliseosoom, op 'n pre-mRNS wat …….. en …….. bevat. In die spliseosoom, basispaar die …….. met spesifieke nukleotiedes op spesifieke plekke. Die RNS transkrip word gesny, en die …… word vrygestel terwyl die …….. terselftertyd aanmekaar gelas word.

QUESTION / *VRAAG* 7: [10]

Answer the following questions about the events that take place in the elongation of a polypeptide chain during translation.
Beantwoord die volgende vrae oor die gebeurtenisse wat plaasvind in die verlenging van 'n polipeptiedketting tydens vertaling (translasie).

7.1 At which site on the ribosome does the incoming tRNA bind to the mRNA? /
By watter setel op die ribosoom bind die inkomende tRNA op die mRNA? (1)

……

7.2 At which end is the amino acid attached to the tRNA molecule? /
Aan watter ent is die aminosuur aan die tRNA molekuul geheg? (1)

……

7.3 Which two processes ensure that the correct amino acid is added to a growing polypeptide chain? /
Watter twee prosesse verseker dat die korrekte aminosuur aan die groeiende polipeptiedketting geheg is? (4)

.....

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.....

7.4 What molecule acts as a catalyst for the formation of the bond between the new amino acid and the growing polypeptide chain? /
Watter molekule tree as 'n katalis op in die vorming van die binding tussen die nuwe aminosuur en die groeiende polipeptiedketting? (1)

…….....

7.5 What type of bond is formed in 7.1.4? /
Watter tipe binding word in 7.1.4 gevorm? (1)

……

7.6 To which tRNA molecule is the growing polypeptide chain attached following the formation of the bond? Give the name of the site on the ribosome. /
Aan watter tRNS molekuul is die groeiende polipeptied ketting geheg na die vorming van hierdie binding? Gee die naam van die setel op die ribosoom. (1)

……

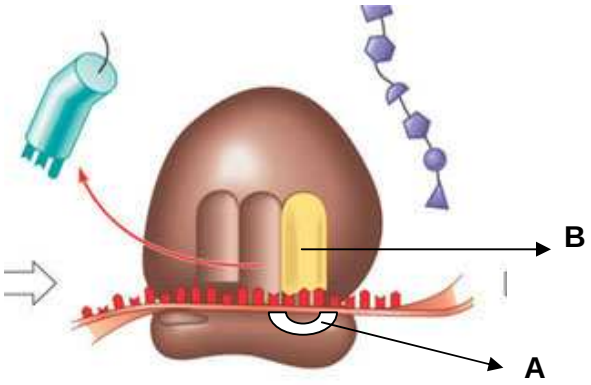
7.7 At which site on the ribosome is the tRNA carrying the polypeptide chain found after translocation has taken place? /
By watter setel op die ribosoom is die tRNS, wat die polipeptiedketting dra, gevind nadat translokasie plaasgevind het? (1)

……

QUESTION / *VRAAG* 8: [7]

Study the figure below and answer the following questions. /
Bestudeer die figuur hieronder en beantwoord die volgende vrae.

.



8.1 Which phase of translation is depicted in the above illustration? /
Watter fase van translasie word deur die bogenoemde illustrasie voorgestel? (1)

……

8.2 In which part of the cell will this process take place? /
In watter deel van die sel sal die proses plaasvind? (1)

……

8.3 Identify the part on the mRNA molecule indicated by A. /
Identifiseer die deel van die mRNS molekuul wat deur A aangedui word. (1)

……

8.4 Indicate on the illustration the direction (orientation) of the mRNA molecule. /
Dui op die illustrasie die rigting (orientasie) van die mRNA molekuul aan. (1)

8.5 Identify structure B, found at the A site of the ribosome. /
Identifiseer struktuur B, gevind op die A setel van die ribosoom. (1)

……

8.6 Briefly describe the role of structure B in the above illustrated process. /
Beskryf kortliks die rol van struktuur B in die geillustreerde proses hierbo. (2)

……

……

……

……

QUESTION / *VRAAG* 9: [6]

A part of DNA and its complementary mRNA part is given below. Answer the questions and use the codon table at the back of the paper where required. /
Gegewe is 'n DNS gedeelte en sy komplementêre mRNA deel. Beantwoord die vrae en gebruik die kodontabel agter aan u vraestel waar nodig.

DNA / *DNS*
5'-ATGACCGGTTCATGCTTA……-3'
3'-TACTGGCCAAGTACGAAT…….-5'

MRNA / *mRNS*
5'-AUGACCGGUUCAUGCUUA……3'

9.1 Give the corresponding amino acid sequence. / *Gee die ooreenstemmende aminosuur volgorde.* (2)

.....

9.2 The last base of the fifth codon (on the DNA template) mutates from a G to a T, after exposure of the DNA to a mutagen. What will the effect of this type of point mutation be? Be sure to give the name of this type of point (base-pair) mutation. /
Die laaste basis van die vyfde kodon (op die DNS-templaat) muteer vanaf 'n G na 'n T, na blootstelling van die DNS aan 'n mutagens. Wat sal die effek van hierdie puntmutasie wees? Onthou om die naam te gee van hierdie tipe punt- (basis-paar) mutasie. (2)

.....

.....

……

……

9.3 The last base of the third codon (on the DNA template) mutates from an A to a G, after exposure of the DNA to a mutagen. What will the effect of this type of point mutation be? Be sure to give the name of this type of point (base-pair) mutation. /
Die laaste basis van die derde kodon (op die DNS-templaat) muteer vanaf 'n A na 'n G, na blootstelling van die DNS aan 'n mutagens. Wat sal die effek van hierdie puntmutasie wees? Onthou om die naam te gee van hierdie tipe punt- (basis-paar) mutasie. (2)

.....

.....

……

……

QUESTION / *VRAAG* 10: [6]

Give the correct scientific name for each of the following. /
Verskaf die korrekte wetenskaplike naam vir elk van die volgende. (6)

	Description / *Beskrywing*	**Term**
10.1	Proteins that form part of the nucleosome / *Proteïene wat deel maak van 'n nukleosoom*	
10.2	DNA that is found between nucleosomes / *DNS wat tussen nukleosome voorkom*	
10.3	Mitotic phase in which the nuclear membrane defragments / *Mitotiese fase waarin die kernmembraan defragmenteer*	
10.4	The mitotic phase where looped chromatin attached to a protein scaffold, forming a 300 nm fiber, is found. / *Die mitotiese fase waar gevoude chromatien geheg aan 'n proteïen steier, wat 'n 300 nm vesel vorm gevind word.*	
10.5	Mitotic phase in which daughter nuclei form. / *Mitotiese fase waarin dogter kerne vorm.*	
10.6	The state (phase) in which mature muscle and nerve cells are in. / *Die stadium (fase) waarin volwasse spier- en senuweeselle is.*	

QUESTION / *VRAAG* 11: [7]

11.1 If there are 20 centromeres in a cell at anaphase, how many chromosomes are there in each daughter cell following cytokinesis? /
As daar 20 sentromere in 'n sel by anafase is, hoeveel chromosome sal daar in elke dogtersel na sitokinese wees? (1)

.....

11.2 Briefly explain the current hypothesis of how the kinetochore microtubules function in the poleward movement of the chromosomes. /
Verduidlik kortliks die huidige hipotese wat beskryf hoe die kinetokoor mikrobuisies funksioneer in die beweging van die chromosome na die twee pole toe? (3)

.....

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……

11.3 The drug cytochalasin B blocks the function of actin. Which aspect of the cell cycle would be most disrupted by cytochalasin B? Briefly explain your answer. /
Die middel sitochlalasin B blok die funksie van aktien. Watter aspek van die selsiklus sou die meeste deur sitochalasin B ontwrig word? Verduidelik kortliks jou antwoord. (3)

.....

.....

.....

.....

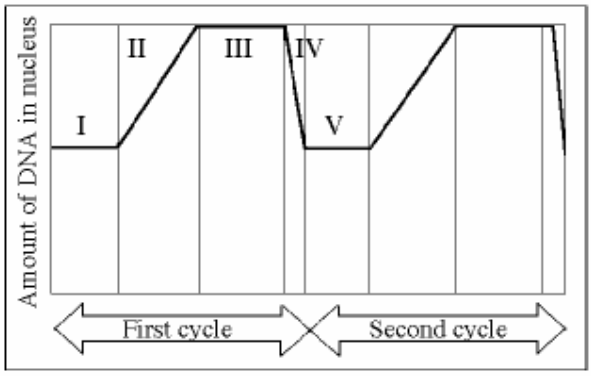
.....

…….....

QUESTION / *VRAAG* 12: [5]

The following questions are based on the figure below.
Die volgende vrae word op die onderstaande figuur gebaseer.

Amount of DNA in nucleus /
Hoeveelheid DNS in selkern



12.1 Which number represents mitosis? /
Watter nommer dui mitose aan? (1)

……..

12.2 MPF reaches its threshold concentration at the end of this stage. Give the number of the stage. /
MPF bereik sy threshold konsentrasie aan die einde van hierdie stadium. Gee die nommer van hierdie stadium. (1)

……..

12.3 G_1 is represented by which number(s)? /
G_1 word deur watter nommer(s) voorgestel? (1)

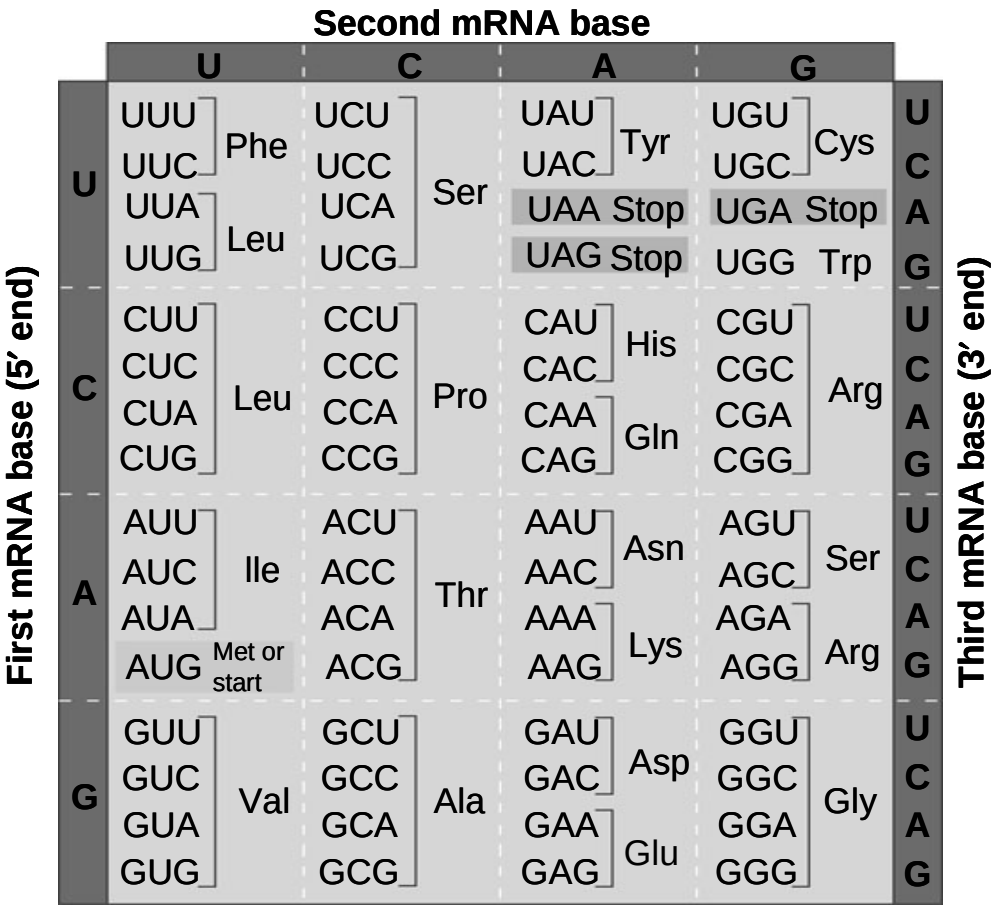
……..

12.4 Which number represents DNA synthesis? /
Watter nommer stel DNS sintese voor? (1)

……

12.5 Cyclin levels increase during these stages. Give the numbers of these stages. /
Siklien vlakke neem toe gedurende hierdie stadiums. Gee die nommers van die stadiums. (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