Tutorial Letter 101/3/2018

MOLECULAR BIOLOGY

BMI2604

Semesters 1 and 2

Department of Life and Consumer Sciences

This tutorial letter contains important information about your module.

BARCODE

CONTENTS

Page

Dear Student

1 INTRODUCTION

Welcome to the biomedical sciences and particularly haematology! I hope that you will have an enjoyable and fruitful academic year. This module is offered in the Department of Life and Consumer Sciences and your lecturer for this module is **Mr MC Monyama**. I would like to take this opportunity to wish you success with your academic year.

I would also like to encourage you to register on myUnisa. Please check this site regularly for updates, posted announcements and additional resources uploaded throughout the semester. Rapid communications throughout the semester(s) have been made possible through myUnisa. You can use the myUnisa site to submit assignments and we strongly recommend that you submit your assignment online as this will ensure that you receive rapid feedback and comments, access your official study material, have access to the Unisa Library functions, 'chat' to your lecturers or to fellow students and participate in online discussion forums and obtain access to all manner of learning resources.

If at any stage while you are studying you have any questions or require assistance with problems, we are available to assist you. Our contact details are listed in section 3: Lecturer(s) and contact details in this tutorial letter.

Tutorial matter may include the following:
Tutorial Letters 101 and 201

Some of this tutorial material may not be available when you register. If this is the case, this tutorial material will be posted to you as soon as possible. Please note that tutorial matter is also available on myUnisa. PLEASE read the instructions in this tutorial letter carefully and prepare Assignments 01 and 02 ONLY for the semester for which you are REGISTERED. Once you have completed and submitted the assignments you can use the questions in the other assignments as practice or in preparation for the exam. It is very important that your first assignment reaches Unisa on or before the due date. Students who have not submitted this assignment by the due date will not be allowed to write the examination.

2 PURPOSE AND OUTCOMES

2.1 Purpose

Qualifying students are able to know, understand and apply the principles and theory relating to

molecular biology.

2.2 Outcomes

After completing this module, each student should be able to:

- Explain cellular processes such as DNA replication, DNA repair, transcription, translation and regulation of gene expression.
- Discuss some modern molecular laboratory techniques and how they can be used to isolate and characterise DNA for further research.
- Describe applications of molecular biology in biotechnology and medical diagnosis.

3 LECTURER(S) AND CONTACT DETAILS

3.1 Lecturer(s)

Lecturer: Mr MC Monyama
Telephone number: +27 11 471 2230 (during office hours 8:00 – 16:00)
Email address: monyamc@unisa.ac.za

Postal address:
The Lecturer
Department of Life and Consumer Sciences
Private Bag x6
Florida
1710

NOTE: You may enclose more than one letter in an envelope, but do not address enquiries to different departments (e.g. Despatch and Library Services) in the same letter. This will cause a delay in the replies to your enquiries. Please write a separate letter to each department and mark each letter clearly for the attention of that department. **Letters to lecturers may not be enclosed together with assignments**. Always write your **student number and the module code** at the top of your letter.

3.2 Department

The Department of Life and Consumer Sciences is located in the Calabash Building, Unisa Science Campus, Roodepoort, Johannesburg. The Departmental telephone number is +2711 471 2230/2292 and the Departmental fax number is +2711 471 2796.

3.3 University

Should you need to contact the university about matters not related to the content of this module, consult the publication *Study @ Unisa*, which you received with your study material. This brochure contains information on how to contact the university (e.g. to whom you can write for different queries, important telephone and fax numbers, addresses and details of the opening and closing times of particular facilities).

You can also make use of the following contact routes:
Unisa website http://www.unisa.ac.za & http://mobi.unisa.ac.za
Email (general enquiries) info@unisa.ac.za
International students are urged to make use of the email address info@unisa.ac.za
study-info@unisa.ac.za queries related to application and registration.
assign@unisa.ac.za for assignment enquiries
exams@unisa.ac.za for examination enquiries
despatch@unisa.ac.za for study material enquiries
finan@unisa.ac.za for student account enquiries
myUnisaHelp@unisa.ac.za for assistance with myUnisa
myLifeHelp@unisa.ac.za for assistance with myLife email accounts
SMS 32695 – South Africa only
You will receive an auto response SMS with the various SMS options. The cost per SMS is R1.00.
Fax 012 429 4150

NOTE: Whenever you contact the university, whether in writing or telephonically, always mention the **module code and your student number**.

myUnisa webpage (Unisa's online campus)
Access to the myUnisa website requires a computer that is linked to the internet (internet access is available to you at provincial libraries, internet cafés and Unisa regional telecentres, see myUnisa for a list of these places in your area). You should also note that some of these centres allow free internet access on presentation of your student card.

Go to: https://my.unisa.ac.za/portal/
For module-specific information, log in and click on:
BMI2604-18-S1 (for semester 1)
OR
BMI2604-18-S2 (for semester 2)
With the aid of myUnisa, you will ultimately be able to use the internet to perform all study-related functions which are now normally done by telephone, regular postal service or personal visits to the campus.

If you have online access, you should do the following to get started with this module:

- Go to myUnisa (http://my.unisa.ac.za)
- Log in with your myUnisa login details. If you are not sure how to do this, consult the publication *myStudies @ Unisa*. You should have received this with your study material. Alternatively, use the link to access the publication.)
- Once logged in, you will see a link to the module code. If this is not at the top of your screen, click on 'More sites' and select it from the drop-down menu.
- Once you are in the site for this module, read the welcome message.
- Now click on **Additional Resources**, then on the subfolder **Tutorial Matter**, and then on **Tutorial Letter 101**. Read this letter carefully.
- Take particular note of the online links listed in **section 4.3, Electronic Reserves (e-Reserves)**.

You will find that this module requires you to use the internet to access information on aspects of molecular biology. Please take careful note of details of published articles and online links and the information in the associated online articles. NOTE: you will be required in your assignments to accurately refer to articles that you access online.

4 RESOURCES

4.1 Prescribed books

The title of your prescribed textbook is:

Alberts, B, Johnson, A, Lewis, J, Morgan, D, Raff, M, Roberts, K & Walter, P. 2015. Molecular Biology of the Cell. 6th edition. New York: Garland Science. ISBN: 978-0-8153-4464-3.

Please refer to the list of official booksellers and their addresses in the Unisa brochure, *myStudies @ Unisa*.

If you have difficulty in locating an appropriate textbook at the Unisa Booksellers, please contact the Unisa Prescribed Book Section at Tel: 012 429-4152 or e-mail

vospresc@unisa.ac.za.

Textbooks can be ordered on the Internet at http://amazon.com or http://www.kalahari.net or http://www.exclusivebooks.com. Note that second-hand books are available at the following Web sites: http://www.amazon.com or http://www.fetchbooks.com. .

4.2 Recommended books

There are no recommended books for this module.

4.3 Electronic reserves (e-reserves)

There are no e-Reserves for this module. Announcements will be posted on myUnisa as and when required.

4.4 Library services and resources information

For brief information, go to www.unisa.ac.za/brochures/studies

For detailed information, go to http://www.unisa.ac.za/library. For research support and services of personal librarians, click on "Research support".

The library has compiled a number of library guides:

- finding recommended reading in the print collection and e-reserves – http://libguides.unisa.ac.za/request/undergrad
- requesting material – http://libguides.unisa.ac.za/request/request
- postgraduate information services – http://libguides.unisa.ac.za/request/postgrad
- finding, obtaining and using library resources and tools to assist in doing research – http://libguides.unisa.ac.za/Research_Skills
- how to contact the library/finding us on social media/frequently asked questions – http://libguides.unisa.ac.za/ask

5 STUDENT SUPPORT SERVICES

Important information appears in your *Study @ Unisa* brochure.

6 STUDY PLAN

Use your *Study @ Unisa* brochure for general time management and planning skills.
This is a semester module over 15 weeks and requires 120 hours of study time. This means that you will have to study 8 hours per week for this module. The following is a recommended time schedule which can be used as a guideline for studying this module. Below this time schedule please see an example of a study plan.

ACTIVITY	HOURS
Reading and re-reading study guide	10
Reading relevant chapters in the prescribed textbook	35
Completing study guide activities	10
Studying for and completing the Assignments	20
Studying for examination	40
Final revision	5
TOTAL	**120**

Week	Activity (each week represents 8 hours of study time)
1	Read through your study material (your tutorial letter) and, if you have one, skim through a textbook and identify the relevant chapters in the text. Start accessing articles online. This exercise allows you to gain an overall picture of the module.
2	
3	Read through your textbook, using your study guide, and identify all key areas.
4	
5	
6	Complete and submit Assignment 1. Please allow sufficient time for the assignment to reach Unisa before the due date.
7	Begin with your in-depth study of the initial study units. Please prepare study notes whilst reading and learning the material.
8	Start to complete your Assignment 2
9	
10	Complete and submit Assignment 2. Depending on how you will submit the completed assignment, please note that you should allow sufficient time for the assignment to reach Unisa before the due date.
11	
12	Begin with your in-depth study of later study units. Please prepare study notes while reading and learning the material.
13	
14	
15	Revision and preparation for the exam.

7 PRACTICAL WORK AND WORK-INTEGRATED LEARNING

There are no practicals for this module.

8 ASSESSMENT

8.1 Assessment criteria

8.2 Assessment plan

Summary as to how your final mark will be calculated

Formative assessment:

Assignment 01 (10% of year mark)

Assignment 02 (90% of year mark)

} Year mark (30% of final mark)

Summative assessment:

Examination

} Examination mark (70% of final mark)

} **Final mark**

8.3 Assignment numbers

8.3.1 General assignment numbers

Assignments are numbered consecutively per module, starting from 01.

8.3.2 Unique assignment numbers

Each semester consists of two assignments.

SEMESTER 1
Assignment 01: 821346
Assignment 02: 746476

SEMESTER 2
Assignment 01: 787760
Assignment 02: 893083

8.4 Assignment due dates

SEMESTER 1
Assignment 01: 16th March 2018
Assignment 02: 20th April 2018

SEMESTER 2
Assignment 01: 17th August 2018
Assignment 02: 21st September 2018

8.5 Submission of assignments

Both the assignments are compulsory and must be submitted on or before the stipulated due date. **To receive quicker, online feedback and comments on your assignments submit your assignment electronically.** If you intend to post your assignment, please complete and post it at least **a week** before the due date to ensure that we receive it in time. Please note that FAILURE TO SUBMIT ASSIGNMENT 01 WILL RESULT IN YOUR NOT BEING ALLOWED ADMISSION TO THE EXAMINATION. In exceptional circumstances, only a **valid** medical

certificate associated with a valid long-term illness will be considered as a reason for the late submission of an assignment. In such a case, please notify the lecturer well in advance. Note that if no arrangements were made, the assignment will not be marked. Please attach the medical certificate at the back of your assignment and ensure that you have certified copies of such a certificate.

For detailed information and requirements with regard to assignments, see the brochure entitled *myStudies @ Unisa*, which you received with your tutorial material.
Note: Prepare only the assignments for the semester for which you are registered.

Assignments may not be submitted by fax or email. You may submit written assignments and assignments completed on mark-reading sheets either by regular postal service **or** mobile MCQ submission **or** electronically via myUnisa. Make a copy of your assignment for your own reference and if the original is lost at any stage during the submission process.

Unisa is implementing onscreen marking of assignments to help you receive quicker feedback on your assignments. This will not be the case for all your modules, however, most modules from the Department of Life and Consumer Sciences can be marked in this way.

To allow us to mark your assignment onscreen, you need to do the following:

1. **Submit the PDF document (your assignment) via myUnisa (online).**

For guidance on how to submit an assignment via myUnisa, see section 8.4 of this tutorial letter or the *Study@Unisa* brochure.

8.6 The assignments

Assignments are seen as part of the learning process for this module. As you complete the assignment, study the textbook, consult other resources, discuss the work with fellow students or tutors or do research - you are actively engaged in learning. Looking at the assessment criteria (e.g. the action words and the mark allocation) given for each assignment will help you to understand what is required of you more clearly.

There are TWO assignments for this module for each semester. You will find the assignments for:

Semester 01 (January to June) in **Appendix A,** and
Semester 02 (July to December) in **Appendix B** of this tutorial letter.

The **due dates** are given with each assignment in Appendix A and B.

The **first** assignment of each of your courses is **compulsory**. You will qualify for **examination admission** for a course only if you submit the first assignment by the due date. If more than one assignment is set for a course, all the assignments for that course will be taken into consideration when calculating your year mark. Thus, to ensure a good year mark that contributes to improving your final mark, submit all your assignments in time.

8.7 Other assessment methods

Not applicable

8.8 The examination

Use your *Study@Unisa* brochure for general examination guidelines and examination preparation guidelines.

This module is offered in a semester period of fifteen weeks. This means that if you are registered for the first semester, you will write the examination in May/June 2018 and the supplementary examination will be written in October/ November 2018. If you are registered for the second semester you will write the examination in October/November 2018 and the supplementary examination will be written in May/June 2019.

For examination admission it is compulsory for you to hand in the first assignment for this module. It is also to your own advantage to do the assignments in order to test your understanding of the subject, and to establish how well prepared you are for the examination. You need to obtain a minimum of 40% in your examination to be able to pass. If you do not obtain at least 40% in the exams, you will fail even if the combination of year and exam mark is more than 50%. You will also need a minimum of 40% in the examination to obtain admission to a supplementary examination.

You require a final mark of 50% to pass this module. Please see the examples below:

- Exam mark below 40% will result in your failing this module.

- Exam mark 40% and Year mark 50% (combination of your first and second assignment marks) = A final mark of 43% - you will be allowed to write a supplementary exam.
  Calculated as:
  40 x 70% (0.70) = 28%
  50 x 30% (0.30) = 15%

- Exam mark 50% and Year mark 60% = A final mark of 53% - you will pass this module
  Calculated as:
  50 x 70% (0.70) = 35%
  60 x 30% (0.30) = 18%

As you can see from these examples it is important to obtain a minimum of 40% for your exam, as well as submitting both your assignments and work hard to obtain a good year mark to ensure that you pass the module.

You will have the opportunity to give an account of your studies in a two-hour examination paper (per module). You will be informed by letter of the dates, places and venues of the examinations. Examination guidelines, posted on myUnisa will give you pointers as to how to prepare for the examination. Revision should be done thoroughly before the examination. Contact us immediately, preferably by direct email, if you encounter any problems. Students can also refer to the *Study@Unisa* brochure for general examination guidelines and examination preparation guidelines. The examination paper is a two (2) hour examination and consists of questions such as those requiring you to provide definitions of terms, draw labelled diagrams as well as answering short and longer essay questions.

You will be informed later by letter of the dates, places and venues of the two-hour examination required per module. Exam guidelines, posted on myUnisa will give you pointers on how to prepare for the examination. Revision should be completed before the examination and you

should contact us immediately by email if you encounter any problems. Students can also refer to the *Study@Unisa* brochure for general examination guidelines and examination preparation guidelines.

9 FREQUENTLY ASKED QUESTIONS

The *Study@Unisa* brochure contains an A-Z guide of the most relevant study information.

10 SOURCES CONSULTED

Not applicable.

11 IN CLOSING

Not applicable

12 ADDENDUM

Appendix A – Assignments for the first semester
Appendix B – Assignments for the second semester

Plagiarism
It is incumbent of all of us to behave ethically and so I would seriously remind you of a major problem regarding unethical behavior in education, namely plagiarism.

Plagiarism is the act of taking words, ideas and thoughts of others and passing them off as your own. It is a form of theft which involves a number of dishonest academic activities. The *Disciplinary code for students* (2004) is given to all students at registration. You are advised to study the *Code*, especially sections 2.1.13 and 2.1.4 (2004:3-4). Also read the University's Policy *on (Copyright infringement and plagiarism*).

Avoiding Plagiarism

We cannot place enough emphasis on the seriousness of plagiarism. Please do not plagiarise – it is a form of THEFT. If plagiarism is detected, lecturers cannot determine if the student has learnt the subject material and so it is very difficult to assign a mark. In this case, the assessor must ask the question: "Who is being assessed, the student who prepared the assignment or the author of the plagiarised text?

Ideally, the student should understand and learn the subject matter and write an assignment answer on this material in his/her own words. If, for whatever reason, this is difficult for the student to achieve, we recommend that the student answer the question by:

- Writing down subject material from the text
- Remembering to place this quote within inverted commas
- Ending the quote by supplying a correct reference of the author of this quoted material
- providing a few personal sentences that indicate that the student has reflected on this material.

Note: This latter reflection indicates that the student has read, understood and can place the answer in an academic, personal, social, research. etc context.

APPENDIX A: FIRST SEMESTER COMPULSORY ASSIGNMENTS

Department of Life and Consumer Sciences

Molecular Biology – BMI2604

Semester code: 01

Assignment 01

Due Date: 16th March 2018

Unique assignment number: 821346

INSTRUCTIONS

1) Use the mark-reading sheet provided to answer these questions.

2) Fill in all your **personal details** on the mark-reading sheet.

3) Indicate the correct answer clearly by shading in the appropriate number on the mark- reading sheet with an HB pencil.

4) If more than one number is shaded in any answer, NO marks will be awarded for that question.

Multiple-choice questions 2 × 10 = **[20]**

The purpose of this assignment is to familiarise yourself with the study material content by means of techniques designed to **improve your study skills**. **Take note** that you will have to consult your **textbook** as well as the study guide to answer Assignment 01. After reading the sections in your study guide, answer the questions below.

1. The following are common features of the central dogma, except..... .
    1. DNA
    2. RNA
    3. proteins
    4. control mechanisms
    5. increased mutation

2. The following are associated with acids, bases and buffers, except …… .
    1. pH
    2. pI
    3. pKa
    4. pKb
    5. p2

3. The following are macromolecular subunits, except ……. .
    1. histones
    2. amino acids
    3. nucleotides
    4. fatty acids
    5. nucleoside triphosphates

4. The following are associated with cellular metabolism, except…… .
    1. ATP
    2. protabolism
    3. anabolism
    4. catabolism
    5. energy

5. The following are closely associated with DNA, except ……. .
    1. methylation
    2. binding proteins
    3. motifs
    4. translation
    5. transcription

6. The following are associated with growth of healthy cells in a laboratory, except ……. .
    1. medium
    2. intact membranes
    3. enumeration
    4. tissue culture
    5. lysis

7. The following are associated with cancer cells, except ……. .
    1. telomeres
    2. monoclonal antibodies
    3. neurones
    4. immortality
    5. transformation

8. The following may be associated with chromatography, except …….. .
    1. polyacrylamide gel
    2. size exclusion
    3. gas
    4. liquid
    5. affinity

9. The following are associated with electrophoresis, except …….. .
    1. PAGE
    2. AGE
    3. exchange
    4. 2-D
    5. SDS

10. The following are associated with cloning, except …….. .
    1. restriction endonucleases
    2. vectors
    3. FACS
    4. transfection
    5. PCR

Department of Life and Consumer Sciences

Molecular Biology – BMI2604
Semester code: 01

Assignment 02

Due Date: 27th April 2018

Unique assignment number: 746476

INSTRUCTIONS

1) Type your assignment on a computer. You may print on ordinary white paper and not necessarily the Unisa typing paper provided. Please use 1,5 spacing and Arial or a similar font of 11 or 12 pitch. Leave a line open between questions. If you are not able to type your assignment on a computer, use a black or blue pen and please write neatly.

2) If you want to submit a hard copy of this assignment, use the assignment cover and envelope provided. When stapling your answers inside the cover, staple only in the top left-hand corner.

3) Your student number is the number just below your address. This number must be filled in on the assignment cover and must also be quoted in all correspondence with the university

4) Answer all questions as briefly and clearly as possible in your own words.

5) Number your answers correctly**.**

Question 1 **[20]**

1.1 Define the following:

1.1.1 Gene

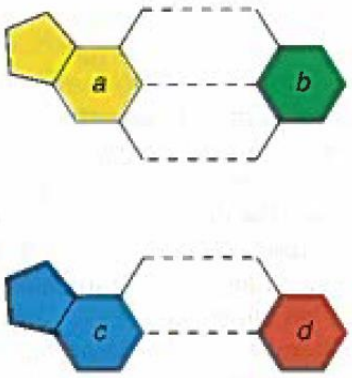
1.1.2 Topoisomerase

1.1.3 Necrosis

1.1.4 Okazaki fragments

1.1.5 Histones (5X2=10)

1.2 The drawings below are the oulines of two DNA base pairs, with the bases identified a,b,c and d. Describe in details the real identities of these bases. (10)



Question 2 **[10]**

What do we mean by primary, secondary, tertiary and quaternary structures of protein?

Question 3 **[12]**

Recombinant DNA technology has had a dramatic impact on all aspects of molecular biology, allowing scientist to routinely study cells and their macromolecules in ways that were unimaginable. Describe manipulations central to this technology.

Question 4 **[18]**

4.1 Discuss the major players in apoptosis

4.2 You are an oncologist required to treat a solid tumour. Outline steps on how you would use your knowledge of cell cycling to achieve this.

Question 5 **[20]**

5.1 Given the sequence of a portion of a bacterial gene below:

5'GTATCGTATGCATGCATGCATCGTGAC'3

3'CATAGCATACGTACGTACGTAGCACTG'5

The template strand is on the bottom.

5.1.1 Assuming that transcription starts with the first T in the template strand, and continues to the end, what would be the sequence of the mRNA derived from this fragment? (4)

5.1.2 Find the initiation codon in this mRNA. (4)

5.1.3 Would the1re be an effect on translation of changing the G in the template strand to C if so, what effect? (4)

5.1.4 Would there be an effect on translation of changing the last T in the template strand to C? if so what effect? (4)

5.1.5 Would there be an effect on translation of changing the last T in the template strand to G? if so what effect? (4)

Question 6 **[20]**

With the aid of simple, labelled diagrams, show how an RNA sequences can give rise to different amino acid sequences.

Total marks= 100

APPENDIX B: SECOND SEMESTER COMPULSORY ASSIGNMENTS

Department of Life and Consumer Sciences

Molecular Biology – BMI2604

Semester code: 02

Assignment 01

Due Date: 17th August 2018

Unique assignment number: 787760

INSTRUCTIONS

1) Use the mark-reading sheet provided to answer these questions.

2) Fill in all your **personal details** on the mark-reading sheet.

3) Indicate the correct answer clearly by shading in the appropriate number on the mark-reading sheet with an HB pencil.

4) If more than one number is shaded in any answer, NO marks will be awarded for that question.

Multiple-choice questions 2 × 10 = **[20]**

The purpose of this assignment is to familiarise yourself with the study material content by means of techniques designed to **improve your study skills**. **Take note** that you will have to consult your **textbook** as well as the study guide to answer Assignment 01. After reading the sections in your study guide, answer the questions below.

1. Which of the following enzymes synthesise RNA using DNA as a template?

    1. RNA polymerase
    2. DNA gyrase
    3. DNA polymerase
    4. RNA ligase
    5. RNAse

2. Which part of the tRNA molecule binds to the mRNA molecule during translation?

    1. amino acid
    2. 5’ end
    3. binding loop
    4. anticodon
    5. codon

3. Transcription by *E. coli* polymerase occurs in ……. .

    1. two phases known as initiation and termination
    2. three phases known as initiation, elongation and termination
    3. four phases known as initiation, propagation, elongation and termination

4. The number of cells in the human body is controlled by …… .

1. the rate of cell division
2. the rate of cell death
3. necrosis
4. the rate of cell division and cell death

5. PCR can be used to amplify a specific region of DNA from the following samples, except …… .

1. RNA
2. DNA
3. skin
4. plasmid
5. lipid

6. The extension of the DNA strand following synthesis by DNA polymerase occurs in the …… .

1. 3' to 5' direction
2. 5' to 5' direction
3. 5' to 3' direction
4. 3' to 3' direction

7. The synthesis of mRNA based from a DNA template is called …… .

1. DNA replicon
2. transcription
3. translation
4. replication
5. restriction

8. Features of prokaryotic organisms include the following, except that they…… .

1. may have a nucleus
2. may have ribosomes
3. may be multicellular
4. may have a cell wall made of peptidoglycan
5. may have an outer lipid membrane

9. Features of genes include the following, except that they are…… .

1. a unit of hereditary information
2. a functional unit of inheritance
3. a section of DNA
4. a portion of a chromosome
5. a portion of a ribosome

10. How many common amino acids are found in proteins?

1. 5
2. 17
3. 20
4. 80
5. An infinite number

Department of Life and Consumer Sciences

Molecular Biology – BMI2604

Semester code: 02

Assignment 02

Due Date: 21St September 2018

Unique assignment number: 893083

INSTRUCTIONS

1) Type your assignment on a computer. You may print on ordinary white paper and not necessarily the Unisa typing paper provided. Please use 1,5 spacing and Arial or a similar font of 11 or 12 pitch. Leave a line open between questions. If you are not able to type your assignment on a computer, use a black or blue pen and please write neatly.

2) If you want to submit a hard copy of this assignment, use the assignment cover and envelope provided. When stapling your answers inside the cover, staple only in the top left-hand corner.

3) Your student number is the number just below your address. This number must be filled in on the assignment cover and must also be quoted in all correspondence with the university.

4) Answer all questions as briefly and clearly as possible in your own words.

5) Number your answers correctly.

Question 1 **[20]**

1.1 Which DNA purine forms three H bonds with its partner in the other DNA strand? Which forms two H bond? (2)

1.2 Draw the general structure of an amino acid and give the correct names for the four groups attached to the alpha-carbon of all amino acids (5)

1.3 Name and briefly discuss three important features of the genetic code (9)

1.4 Use a rough diagram to compare the structures of a protein α-helix and an antiparallel β-sheet. (4)

Question 2 **[20]**

Outline steps involved in DNA synthesis at the replication fork. How do DNA polymerase correct their mistakes.

Question3 **[20]**

3.1 Describe the process of cloning a DNA fragment into the *Pst*I site of the vector pBR322. How would you screen for clones that contain an insert?

3.2 Define the following:

3.2.1 Coding strands

3.2.2 Reading frame

3.2.3 Posttranscriptional modification

3.2 4 Coding region

3.2.5 Promoter (5x2=10)

Question 4 **[20]**

Discuss control of transcription initiation by regulatory proteins.

Question 5 **[20]**

Explain the morphological changes in apoptosis. (8)

Discuss features of the eukaryotic cell cycle. (12)

Total marks= 100