NZIMLS EXAMINATION FOR QUALIFIED MEDICAL LABORATORY TECHNICIAN

MOLECULAR DIAGNOSTICS 2025

Part 1: Common Syllabus

Part 2: Discipline Specific Syllabus

Candidate Name: «Name»

Candidate No.: «Member_No»

General Instructions

1. Total marks for paper = 100.

2. Marks for each question are as indicated.

3. The paper consists of:

	Common	*Discipline Specific*
Part 1:		
Section A; questions 1-30	6 Marks	9 Marks
Section B; questions 31-34	5 Marks	
Section C; questions 35-36	4 Marks	
Section D; questions 37-39	5 Marks	
Section E; questions 40-45	10 Marks	
Total Part 1:	*30 Marks*	*9 Marks*
Part 2:		
Section A; questions 46-50		6 Marks
Section B; questions 51		5 Marks
Section C; questions 52-65		30 Marks
Section D; questions 66-67		20 Marks
Total Part 2:		*61 Marks*

4. All questions are to be attempted.

5. Use of calculator is permitted.

6. Put all answers into the examination booklet provided.

WORD DEFINITIONS	
Calculate	Perform a mathematical process to get the answer
Classify	Be able to designate to a group
Compare	Detail both the differences and the similarities
Complete	Finish, have all the necessary parts
Convert	Express in alternative units
Define	State meaning clearly and concisely
Describe	Give a complete account demonstrating a thorough practical knowledge
Discuss	Give details, explaining both the positives and negatives
Distinguish	To briefly point out the main differences
Expand	To express at length or in a greater detail
Identify	Recognise according to established criteria
Indicate	Briefly point out
Interpret	Express the results of a test or series of tests in a meaningful format
Label	Give a name to
List	Headings only
Match	Find one that closely resembles another
Name	A word or group of words used to describe or evaluate
Outline	Write brief notes incorporating the essential facts
State	Give the relevant points briefly

PART 1

	Common	*Discipline Specific*
Section A; questions 1-30	6 Marks	9 Marks
Section B; questions 31-34	5 Marks	
Section C; questions 35-36	4 Marks	
Section D; questions 37-39	5 Marks	
Section E; questions 40-45	10 Marks	
Total Part 1:	***30 Marks***	***9 Marks***

PART 1: SECTION A – COMMON AND DISCIPLINE SYLLABUS MULTI CHOICE QUESTIONS

Multi Choice Questions 1 – 30

Instructions: Multi-choice questions – circle one answer for each question. If you make a mistake, clearly cross-out the incorrect answer and circle your new choice.

Marks: 0.5 per correct answer

Total Marks: 15

Example: *Which of the below is a primary colour?*

a. *Green*
b. *Purple*
c. *Red*
d. *Orange*

C1. The prefix "hypo" refers to:

a. Reduced

b. Raised

c. Absent

d. Removed

C2. Olecranon bursitis is associated with which body joint?

a. Shoulder

b. Knee

c. Hip

d. Elbow

C3. Which organs are responsible for removing toxins from the human body?

a. Liver and Stomach

b. Kidney and Stomach

c. Heat and Stomach

d. Liver and Kidneys

C4. Annual Practicing Certificates are issued by:

a. Medical Sciences Council of New Zealand

b. The New Zealand Institute of Medical Laboratory Science (Inc.)

c. IANZ

d. Te Whatu Ora – Health New Zealand

C5. Principles that govern the right behaviour are:

a. Standards

b. Methods

c. Criteria

d. Ethics

C6. A lavender top blood tube contains which anti-coagulant?

a. Sodium fluoride

b. Ethylenediaminetetraacetic Acid

c. Sodium citrate

d. Heparin

C7. Test and tag is a requirement for:

a. First Aid training

b. Fire safety

c. Electrical safety

d. Biohazard safety

C8. Vitreous fluid is taken from:

a. Eye

b. Joint

c. Artery

d. Lumbar puncture

C9. Formalin is a solution primarily used in which laboratory department?

a. Biochemistry

b. Haematology

c. Blood Bank

d. Histology

C10. Which guidelines are used as industry standard for specimen transport?

a. NATA guidelines

b. H&S guidelines

c. IATA guidelines

d. IANZ guidelines

C11. Laboratory computer systems have personalised logins to ensure that:

a. HR know when staff are working

b. Management can track individual staff KPI's

c. Computer entries can be appropriately tracked

d. Errors are logged appropriately

C12. Getting permission from a patient to proceed with a test is best described as:

a. Informed consent

b. Patient confidentiality

c. Cultural competence

d. Patient information

D13. What is the function of DNA ligase in DNA replication?

a. Cleaves the DNA at a specific site

b. Synthesises the complementary DNA strand

c. Catalyses bonding of the DNA sugar-phosphate backbone

d. Denatures the DNA template

D14. Which of the following about DNA replication is correct?

a. DNase separates the double-stranded DNA

b. Uracil is inserted to pair with Adenine

c. DNA is synthesised in one direction

d. DNA replication is semi-conservative

D15. The complementary base pairs between DNA strands are held together by what type of bond?

a. Phosphodiester

b. Hydrogen

c. Van der Waals

d. Covalent

D16. A karyotype of 47,XY,+21 is consistent with a diagnosis of:

a. Down's syndrome

b. Patau syndrome

c. Cri du chat syndrome

d. Klinefelter's syndrome

D17. Which of the following statements about DNA is **NOT** correct?

a. DNA forms a double helix structure

b. DNA has antiparallel strands

c. DNA contains deoxyribose sugar in its backbone

d. Uracil is one of the nucleotides found in DNA

D18. Which of the following best describes translation in the central dogma of molecular biology?

a. Proteins are used as a template to produce DNA

b. mRNA is used as a template to produce DNA

c. mRNA is used as a template to produce proteins

d. DNA is used as a template to produce RNA

D19. Which of the following statements about polymerase chain reaction (PCR) is correct?

a. It can amplify DNA indefinitely until the reaction is stopped

b. It can amplify genes without prior sequence knowledge

c. It can produce millions of DNA amplicons from one starting template

d. It uses dideoxynucleotides to extend the new strand

D20. Which of the following statements about digital droplet PCR is **NOT** correct?

a. A single sample is partitioned into smaller reactions

b. A standard curve is required for absolute quantification of DNA

c. The principle is based on water-oil emulsion droplet

d. Fluorescence is used to count positive and negative droplets per sample

D21. The correct sequence of events in PCR is?

a. Extension, denature, anneal

b. Denature, extension, anneal

c. Anneal, denature, extension

d. Denature, anneal, extension

D22. Which of the following techniques would be suitable for monitoring minimal residual disease?

a. G-banding

b. Real-time quantitative PCR

c. Sanger sequencing

d. Microarray

D23. The correct sequence of events during cell division is?

a. Prophase, Metaphase, Anaphase, Telophase

b. Anaphase, Metaphase, Prophase, Telophase

c. Metaphase, Anaphase, Telophase, Prophase

d. Telophase, Prophase, Metaphase, Anaphase

D24. If the nucleotide "G" was inserted at the point where the asterisk (*****) is, how would it affect the sequence?

mRNA strand: AUG CUU CAU UAC***** GAU AAA UGA

a. The sequence will remain the same

b. AUG CUU CAU UAG CGAU AAA UGA

c. AGG CUU CAU UAC GGU AAA UGA

d. AUG CUU CAU UAC GGA UAA AUG

D25. Which of the following statements about RNA splicing is correct?

a. Exons are removed and introns are spliced together

b. Introns are removed and exons are spliced together

c. The polyA tail is removed, the introns and exons are spliced together

d. The promoter region is removed and the introns are spliced together

D26. Which of the following statements about DNA methylation is **NOT** correct?

a. Silenced genes are associated with unmethylated gene promoters

b. DNA methylation profile differs between cell and tissue types

c. It refers to the addition of a methyl group in CpG dinucleotides

d. DNA methylation affects gene expression

D27. Which of the following statements about mitochondrial DNA is correct?

a. It can be found in the nucleus.

b. It is a single-stranded molecule.

c. It is maternally inherited.

d. It is packaged into nucleosomal units.

D28. Which of the following is a limitation of *Fluorescence in situ hybridisation* (FISH)?

a. It cannot detect structural rearrangements.

b. It is unable to detect microdeletions.

c. It requires cell cultures for testing.

d. It is limited to the region complementary to the DNA probe.

D29. What type of collection tube should blood for DNA extraction be collected in?

a. EDTA

b. Lithium Heparin

c. Sodium Citrate

d. Serum separating tube

D30. Which of the following is **NOT** used in PCR?

a. DNA Polymerase

b. Primers

c. Magnesium

d. DNase

Total marks: 15

END OF PART 1, SECTION A

PART 1, SECTION B – COMMON SYLLABUS QUESTIONS

Labelling of diagrams e.g. anatomy, hazard identification, instrument

Questions 31 – 34

Total Marks: 5

C31. Name the following hazard symbols: (2 marks)

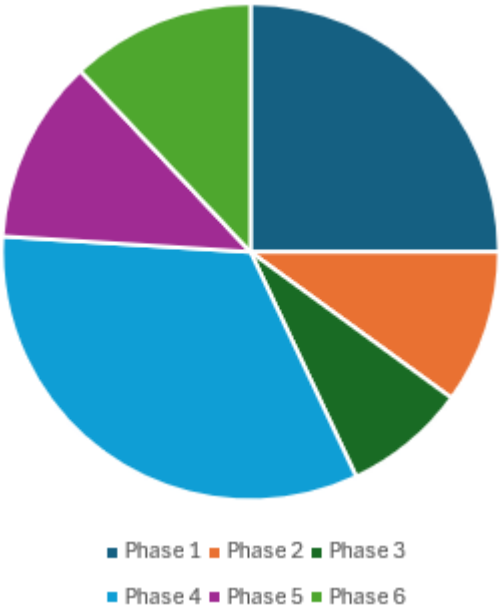
(0.5 mark per correct answer)

a.		b.	
c.		d.	

a. _____ b. _____

c. _____ d. _____

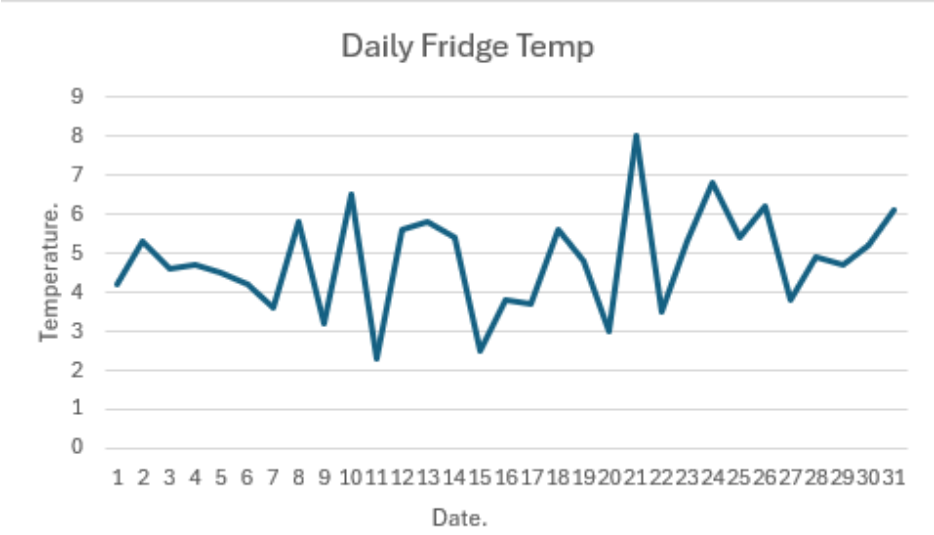
C32. Name the type of graph pictured below: (1 mark)



Type of graph: _____

What is the approximate percentage of the chart that is phase 1? _____

C33. Name the type of graph pictured below: (1.5 marks)



Type of graph: _____

Name the axis: Temperature = _____ Date = _____

C34.	Name the piece of equipment pictured below:	(0.5 mark)

Total marks: 5

END OF PART 1, SECTION B

PART 1, SECTION C – COMMON SYLLABUS QUESTIONS

Tables, match column definition

Section C – Questions 35 to 36

Total marks: 4

C35. Match the columns by **writing the Roman numeral from the test list in Column B** against the correct match in Column A. (2.5 marks)

Column A	Column B
a. Microtome	i. Inflammatory marker
b. C Reactive Protein	ii. Coagulation
c. Prothrombin time	iii. Foetal Red Cells
d. Polymerase Chain Reaction	iv. Molecular technique
e. Kleihauer test	v. Histology

Column A	Column B
a. Microtome	
b. C Reactive Protein	
c. Prothrombin time	
d. Polymerase Chain Reaction	
e. Kleihauer test	

C36. Expand the common abbreviations: (1.5 marks)

A.	B.
a. CKD	
b. DKA	
c. AML	

Total marks: 4

END OF PART 1, SECTION C

PART 1, SECTION D – COMMON SYLLABUS QUESTIONS

Calculations

Section D – Questions 37 to 39

Total marks: 5

C37. (2 marks)

a. A 200 µL pipette is due for calibration. 5 aliquots of deionised water were taken and weighed. The results are below. *(1 mark)*

i. 0.2015 gm
ii. 0.2018 gm
iii. 0.2009 gm
iv. 0.2002 gm
v. 0.2011 gm
vi. Calculate the average weight of the aliquots taken?
(Show all calculations)

b. Calculate the percentage variance of the mean from the desired 200 µL?
(Show all calculations) *(1 mark)*

C38. Convert the following: (2 marks)

1.5 mL	to		µL
3/8	to		%
0.25 kg	to		mg
7.5 cm	to		mm

C39. How many millilitres of alcohol is required to make 2.0 litres of a 70% alcohol bench wash solution? (1 mark)

_____

Total marks: 5

END OF PART 1, SECTION D

PART 1, SECTION E – COMMON SYLLABUS QUESTIONS

Short answer questions (answers = one or more words, short sentences)

Section E – Questions 40 to 45

Total marks: 10

C40. Define a notifiable incident according to the Health and Safety at Work Act 2015. (1.5 marks)

C41. Describe the theory and laboratory procedure of decontamination of biohazards and infectious agents in the laboratory. (2.5 marks)

C42. Define patient confidentiality. (1.5 marks)

C43. Define the ISO 15189 standard, what is its function and who it is administered by in New Zealand. (1.5 marks)

C44. Describe precautions taken to ensure safety and security of laboratory data. (1.5 marks)

C45. Define the concept of safe practice within the laboratory. (1.5 marks)

Total marks: 10 marks

END OF PART 1, SECTION E

PART 2

Discipline Specific

Section A; questions 46-50	6 Marks
Section B; questions 51	5 Marks
Section C; questions 52-65	30 Marks
Section D; questions 66-67	20 Marks
Total Part 2:	***61 Marks***

PART 2, SECTION A – DISCIPLINE SYLLABUS QUESTIONS

Labelling of diagrams e.g. anatomy, hazard identification, instrument

Questions 46 –50

Total Marks: 6

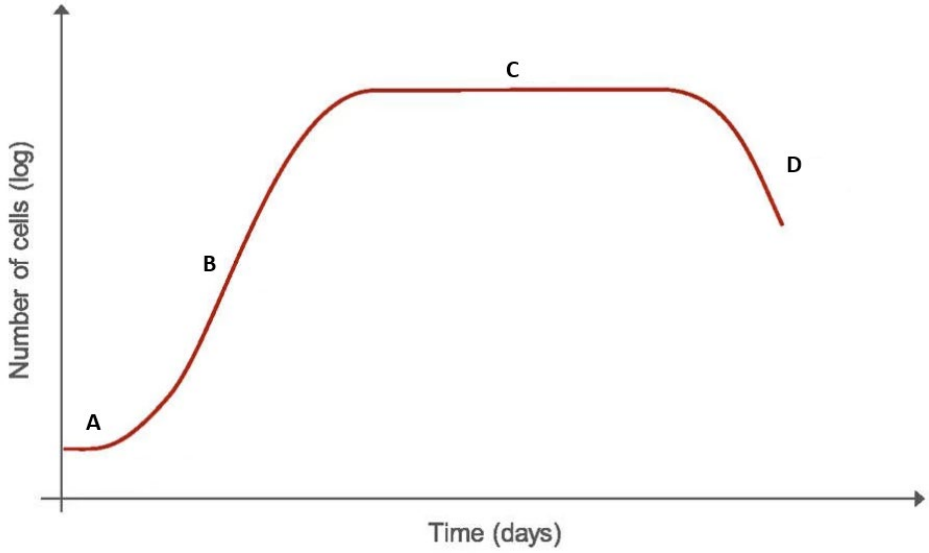
D46. Name the piece of equipment pictured below and describe its use: (1 mark)

D47. Name the piece of equipment pictured below: (1 mark)

D48. Name the piece of equipment pictured below: (1 mark)

D49. Name the piece of equipment pictured below: (1 mark)

D50. Name the stages of the cell growth curve below. (2 marks)



A.

B.

C.

D.

Total marks: 6 marks

END OF PART 2, SECTION A

PART 2, SECTION B – DISCIPLINE SYLLABUS QUESTIONS

Tables, match column definition

Questions 51

Total marks: 5

D51. Match the columns **by writing the Roman numeral from the test list in Column B against the correct match in Column A**. (5 marks)

Column A	Column B
a. A cell with three times the haploid number of chromosomes.	i. Heterochromatin
b. Genetically active regions of the chromosomes.	ii. Duplication
c. Genetically inert or inactive regions of the chromosomes.	iii. Triplet code
d. A series of three bases in the DNA or RNA molecule that codes for a specific amino acid	iv. Reverse Transcriptase
e. A type of chromosomal aberration or mutation in which part of a chromosome or sequence of DNA is reversed in its order.	v. Locus
f. The first individual in a family to be identified as possibly having a genetic disorder or condition.	vi. Promoter
g. An enzyme that catalyses the synthesis of DNA from RNA.	vii. Inversion
h. The site of a gene on a chromosome.	viii. Triploid
i. The presence of an extra copy of DNA or chromosome material.	ix. Proband
j. Recognition sequence for the binding of RNA polymerase	x. Euchromatin

Column A	Column B
a. A cell with three times the haploid number of chromosomes.	
b. Genetically active regions of the chromosomes.	
c. Genetically inert or inactive regions of the chromosomes.	
d. A series of three bases in the DNA or RNA molecule that codes for a specific amino acid.	
e. A type of chromosomal aberration or mutation in which part of a chromosome or sequence of DNA is reversed in its order.	
f. The first individual in a family to be identified as possibly having a genetic disorder or condition.	
g. An enzyme that catalyses the synthesis of DNA from RNA.	
h. The site of a gene on a chromosome.	
i. The presence of an extra copy of DNA or chromosome material.	
j. Recognition sequence for the binding of RNA polymerase	

Total marks: 5 marks

END OF PART 2, SECTION B

PART 2, SECTION C – DISCIPLINE SYLLABUS QUESTIONS

Short answer questions (answers = one or more words, short sentences)

Questions 52 to 65

Total marks: 30

D52. List and briefly explain **TWO (2)** conditions required for successful culture of human cells. (2 marks)

D53. Name and explain the **THREE (3)** modes of inheritance of bacterial genomes. (3 marks) *(0.5 mark per point)*

D54. (3 marks)

a. Define *reciprocal balanced translocation.* *(1 mark)*

b. Explain why microarray will not be able to detect the genetic rearrangement in part (a) of this question. *(1 mark)*

c. Give **TWO (2)** limitations of conventional G-banding. *(1 mark)*

D55. Cystic fibrosis is a genetic condition that follows a pattern of autosomal recessive inheritance. (5 marks)

a. Define *autosomal recessive inheritance* *(1 mark)*

b. Draw a Punnett square to demonstrate the genotypes of the offspring for two parents who are carriers of the cystic fibrosis gene (Rr x Rr). Label the alleles in the diagram. *(2.5 marks)*

		Father	
Mother			

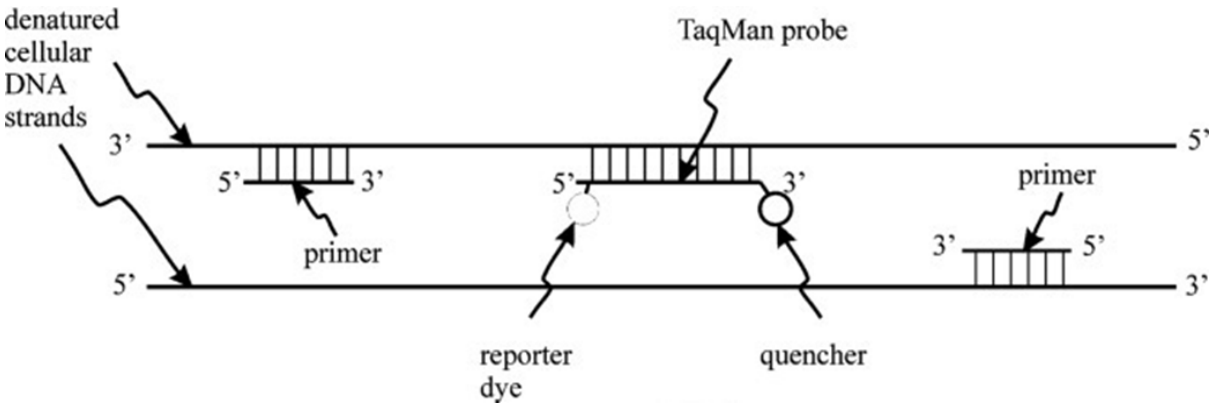
c. Based on your punnet square above:

i. What is the probability that the offspring born will be affected with cystic fibrosis? *(0.5 mark)*

ii. What is the probability that the offspring born will be a carrier for the cystic fibrosis allele? *(0.5 mark)*

iii. What is the probability that the offspring born will **NOT** be a carrier for the cystic fibrosis allele? *(0.5 mark)*

D56. Real-time PCR can be used for genotyping patients with Cystic Fibrosis. The diagram below shows the TaqMan method. (4 marks)

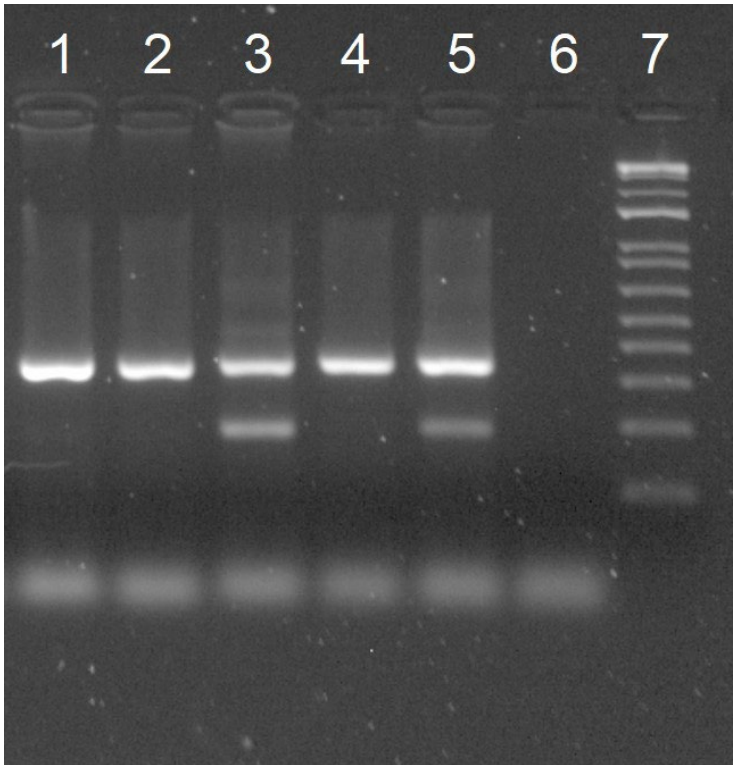


a. Describe the function of the Quencher in the TaqMan probe: *(1 mark)*

b. Explain how fluorescence is generated by the TaqMan probe. *(2 marks)*

c. Give **TWO (2)** advantages of real-time PCR. *(1 mark)*

D57. The image below shows an end-point PCR gel electrophoresis. Answer the questions that follow. (2.5 marks)



Lane 1	Lane 2	Lane 3	Lane 4	Lane 5	Lane 6	Lane 7
Patient 1	Patient 2	Patient 3	Negative Control	Positive Control	No Template control	DNA Ladder

a. On the **right side of the image above**, use an arrow to indicate the direction of the migration of DNA. *(0.5 mark)*

b. Label the shortest DNA fragment that can be seen in Lane 3. *(0.5 mark)*

c. Which patients have a positive result? *(0.5 mark)*

d. Which patients have a negative result? *(0.5 mark)*

e. Name **ONE (1)** gel media commonly used in electrophoresis. *(0.5 mark)*

D58. Explain why a DNA ladder must be included when performing a gel electrophoresis. (1 mark)

D59. Explain how DNA is visualised in End-point PCR. (1.5 marks)

D60. List **TWO (2)** factors that affect the movement of DNA in gel electrophoresis. (1 mark)

D61. List **TWO (2)** limitations of End-point PCR. (1 mark)

D62. Define the term reference genome: (1 mark)

D63. Distinguish between Sequencing Depth and Coverage. (1 mark)

D64. Explain the term "sequencing by synthesis" used in Next Generation Sequencing (NGS). (3 marks)

D65. Give **TWO (2)** advantages of NGS. (1 mark)

Total marks: 30 marks

END OF PART 2, SECTION C

PART 2, SECTION D – DISCIPLINE SYLLABUS QUESTIONS

Essays

Questions 66 to 67

Total marks: 20

D66. In essay format, discuss the principle of **ONE (1)** method used to assess DNA yield and the importance of measuring the quantity and quality of DNA. (10 marks)

D67. In essay format, discuss the principle and process of Sanger sequencing and its applications. (10 marks)

Total marks: 20 marks

END OF PART 2, SECTION D

END OF PAPER

EXTRA PAPER

Question #	Answer