



**NAMIBIA UNIVERSITY  
OF SCIENCE AND TECHNOLOGY**

**FACULTY OF HEALTH, NATURAL RESOURCES AND APPLIED SCIENCES**

**DEPARTMENT OF NATURAL AND APPLIED SCIENCES**

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| <b>QUALIFICATION:</b> BACHELOR OF SCIENCE HONOURS               |                             |
| <b>QUALIFICATION CODE:</b> 08BOSC                               | <b>LEVEL:</b> 8             |
| <b>COURSE NAME:</b> BIOSYNTHETIC PATHWAYS AND MOLECULAR BIOLOGY | <b>COURSE CODE:</b> BPM821S |
| <b>SESSION:</b> JANUARY 2023                                    | <b>PAPER:</b> THEORY        |
| <b>DURATION:</b> 3 HOURS  | <b>MARKS:</b> 100           |

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| <b>SUPPLEMENTARY/SECOND OPPORTUNITY QUESTION PAPER</b> |                    |
| <b>EXAMINER</b>  | DR LAMECH MWAPAGHA |
| <b>MODERATOR:</b>                                      | DR EMMANUEL NEPOLO |

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| <b>INSTRUCTIONS</b>  |  |
| <ol style="list-style-type: none"><li>1. Answer ALL the questions.</li><li>2. Write clearly and neatly.</li><li>3. Number the answers clearly.</li><li>4. All written work <b>MUST</b> be done in <b>BLUE</b> or <b>BLACK</b> ink.</li></ol> |  |

**PERMISSIBLE MATERIALS**

None

**THIS QUESTION PAPER CONSISTS OF FIVE (5) PAGES**  
(Including this front page)

**QUESTION 1**

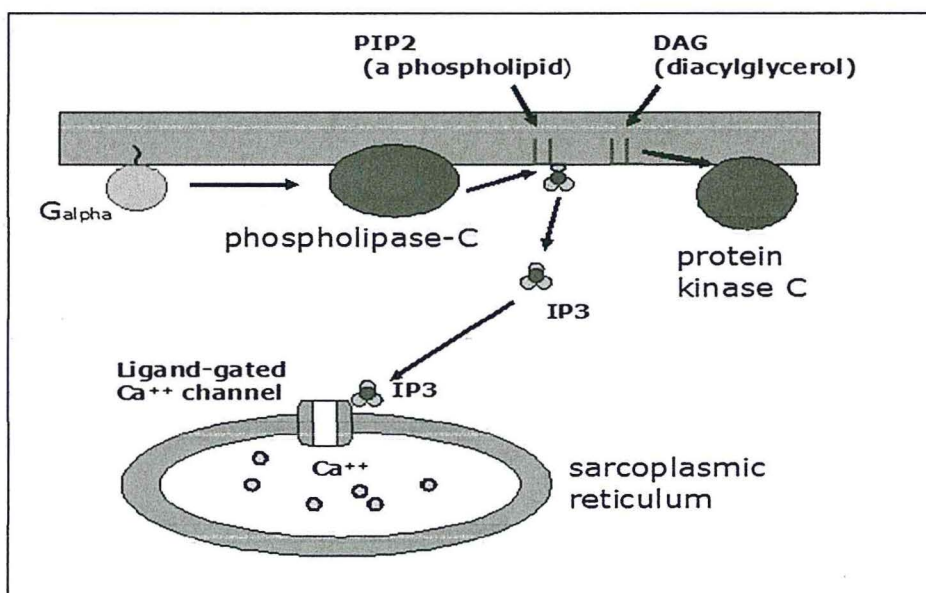
[16]

- a) The Tricarboxylic acid cycle is a source of biosynthetic precursors. Provide **SIX (6)** metabolic precursors and from each give **ONE (1)** example of an amino acid they lead to. (6)
- b) Briefly describe the following databases: (6)
  - I. Genbank database;
  - II. SNPs database;
  - III. PrimerBank;
  - IV. UniProt database;
  - V. RefSeq database;
  - VI. PlasmDB;
- c) What are some of the strategies you could use in designing universal primers? (4)

**QUESTION 2**

[16]

- a) Describe **THREE (3)** specific tasks that are generally tackled by computational tools used in integrating 'omics' data. (3)
- b) Inositol triphosphate (IP3) and diacylglycerol (DAG) are all small molecules that can be found inside most cells, yet they are known to be important second messengers that can increase or decrease in response to a wide variety of signals. However, each signal often produces completely different responses. Explain how such responses occur based on the signalling pathway below. (5)



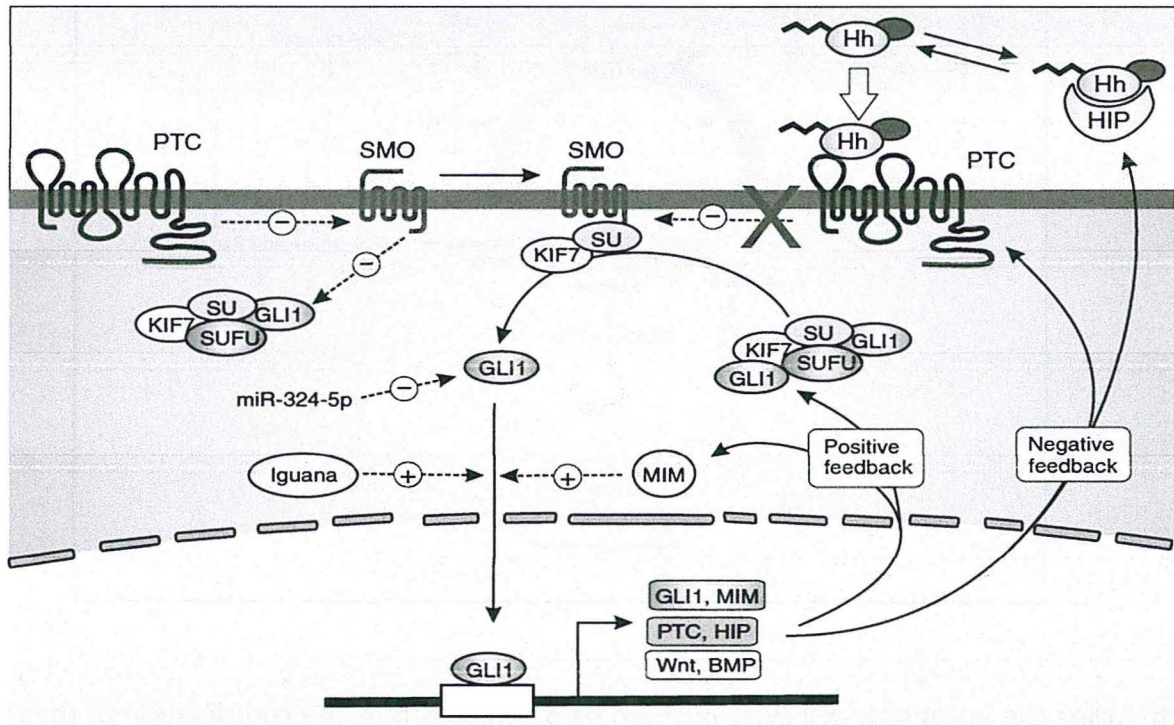
c) Discuss signal transduction

(8)

**QUESTION 3**

[14]

The signalling pathway below is responsible for multiple processes that operate during both development and adult life.



a) Name the signalling pathway

(1)

b) Briefly describe the activation of the signalling pathway

(8)

c) Outline **FIVE (5)** functions of the signalling pathway named in (a) above

(5)

**QUESTION 4**

[12]

a) Based on ADME properties, why is drug development a challenging task?

(4)

b) Describe the two pathways utilized by the body for the excretion of compounds once they have entered the bloodstream

(4)

c) Discuss how cholera toxin disrupts the regulation of intestinal secretion following GPCR signalling.

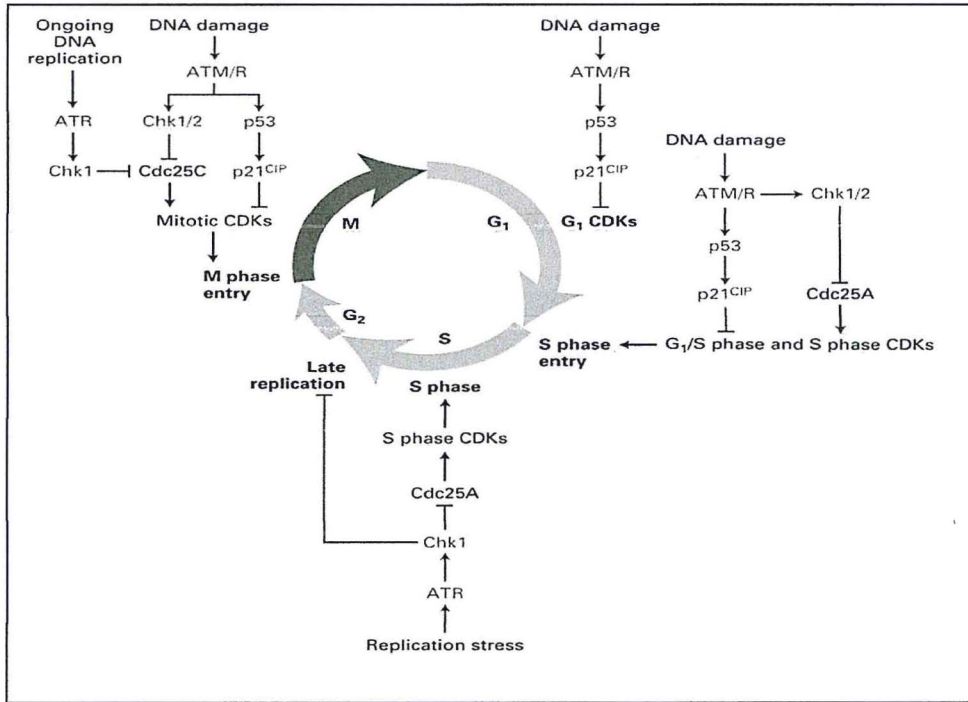
(4)



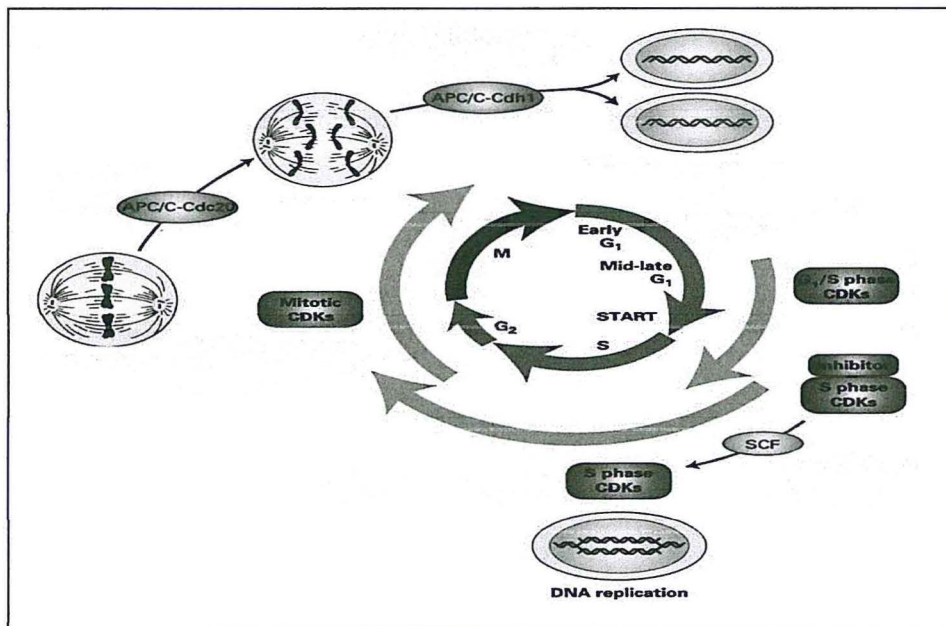
**QUESTION 5**

[16]

a) Cyclin-dependent kinases (Cdk) play a critical role in regulating the cell cycle pathway. Using the figure below explain how CDK's play this role. (6)



b) Using the eukaryotic cell cycle diagram below discuss how the coordination of the cycle phases is dependent on a series of cell cycle checkpoints. (10)



**QUESTION 6**

**[14]**

- a) State **FOUR (4)** characteristics of an ideal screening Biomarker (4)
- b) Give a detailed description of the TNM system of staging cancers (10)
- Based on:
- T- Extent of the tumour (Size, in cm)
  - N- Extent of spread to the lymph nodes
  - M- Presence or absence of metastasis

**QUESTION 7**

**[12]**

- a) Deduce why HeLa cells being cancer cells are useful for research into anything other than cancer? (2)
- b) Briefly describe the following hallmarks of cancer; (10)
- I. Enabling replicative immortality;
  - II. Evading Immune Destruction;
  - III. Tumour-promoting inflammation;
  - IV. Sustaining proliferative signalling;
  - V. Inducing angiogenesis;

**THE END**

