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OF SCIENCE AND TECHNOLOGY**

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<b>QUALIFICATION : BACHELOR OF SCIENCE HONOURS</b>	
<b>QUALIFICATION CODE: 08BOSC</b>	<b>LEVEL: 8</b>
<b>COURSE: BIOSYNTHETIC PATHWAYS AND MOLECULAR BIOLOGY</b>	<b>COURSE CODE: BPM821S</b>
<b>DATE: JANUARY 2024</b>	<b>SESSION: 1</b>
<b>DURATION: 3 HOURS</b>	<b>MARKS: 100</b>

**SECOND OPPORTUNITY / SUPPLEMENTARY: EXAMINATION QUESTION PAPER**

**EXAMINER: PROF LAMECH MWAPAGHA**

**MODERATOR: DR EMMANUEL NEPOLO**

**INSTRUCTIONS:**

1. Answer all questions on the separate answer sheet.
2. Please write neatly and legibly.
3. Do not use the left side margin of the exam paper. This must be allowed for the examiner.
4. No books, notes and other additional aids are allowed.
5. Mark all answers clearly with their respective question numbers.

**PERMISSIBLE MATERIALS:**

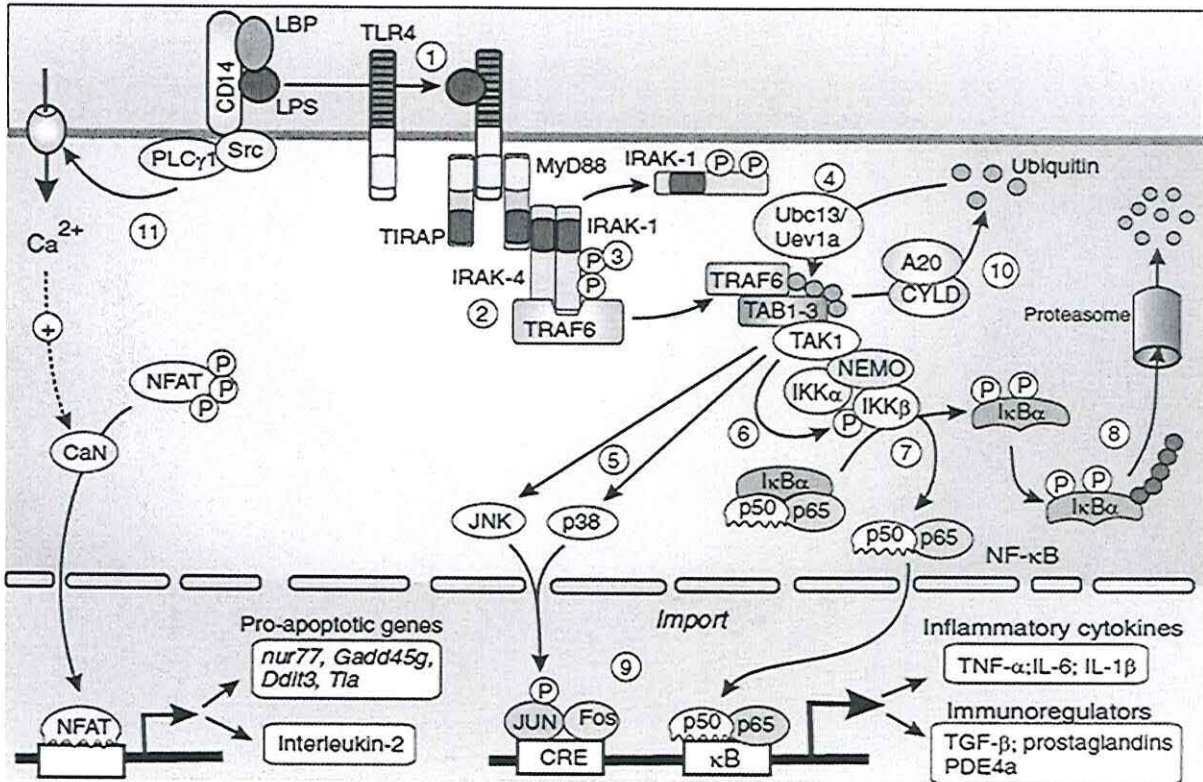
1. None

**This question paper consists of five (5) pages including this front page.**

**Question 1**

[17]

The signalling pathway below is responsible for recognizing distinct pathogen-associated molecular patterns and play a critical role in innate immune responses.



- a) Name the signalling pathway (1)
- b) Briefly describe the activation of the signalling pathway (11)
- c) Outline FIVE (5) functions of the Hedgehog signalling pathway (5)

**Question 2**

[19]

- a) Describe Epigenetic processes (3)
- b) Distinguish between the following PCR's; (8)
  - I. Multiplex PCR:
  - II. Nested PCR:
  - III. Gradient PCR:
  - IV. Touchdown PCR:

c) Four patients presented with suspected signs of head and neck cancer at the Katutura state hospital. A biopsy was removed by local excision and examined. Use the correct TNM classification to describe the four results below; (8)

I. No information available on primary tumor, nodes not assessed and distant metastasis not assessed

.....

II. Carcinoma *in situ* at primary site, no clinically positive nodes (not palpable) and no distant metastasis

.....

III. Tumor 2-4 cm in diameter, single clinically positive ipsilateral (on same side) node less than 3 cm and no distant metastasis

.....

IV. Tumor has invaded adjacent structures, Node or nodes greater than 6 cm and distant metastasis is present

.....

**Question 3**

**[10]**

a) As a visiting Medical scientist, you have been tasked with assisting the lab. to generate specific primers for the detection *clostridium spp.* in the local public swimming pool. Briefly delineate **FIVE (5)** parameters that you will consider in order to generate the ideal primers. (5)

b) Describe the process of GPCR desensitization

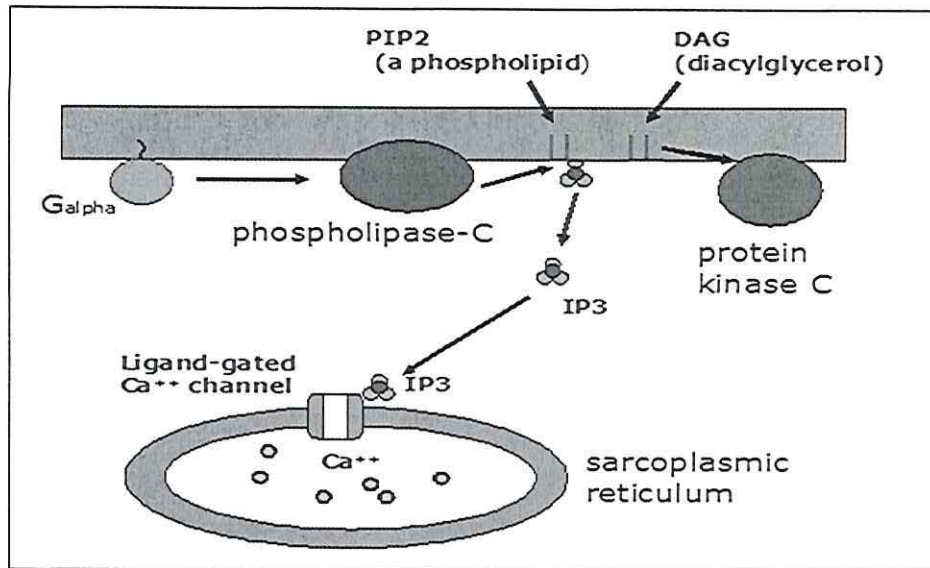
(5)

**Question 4**

**[11]**

a) 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)





- b) Biomarker development involves multiple processes, linking initial discovery in basic studies, validation, and clinical implementation. The ultimate goal of the processes is to establish clinically accessible biomarker tests with clinical utility, informing clinical decision-making to improve patient outcomes. Name **SIX (6)** key challenges that maybe envisioned at the clinical implementation stage of biomarker development. (6)

**Question 5**

[11]

- a) Outline the effect of deregulation of the retinoblastoma protein Rb on events downstream in the cell cycle. (4)
- b) A genome sequencing project has identified 10,000 single nucleotide polymorphisms within a newly derived cell line from a primary metastatic lung tumour. Outline approaches you could take to identify the factors that contribute to the tumour phenotype. (7)

**Question 6**

[12]

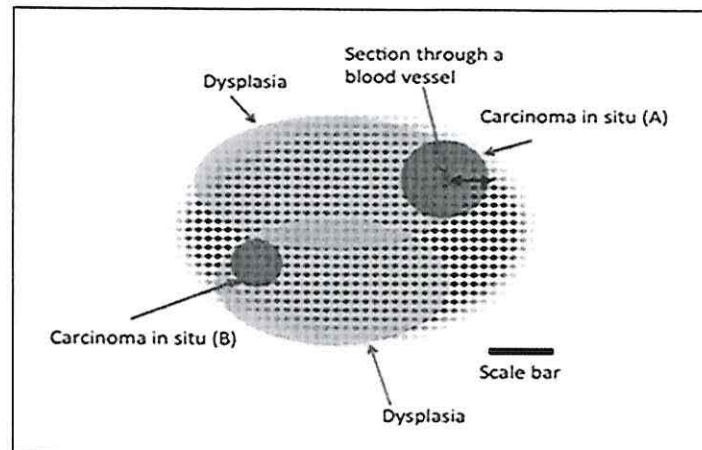
- a) Briefly describe the following terminologies. (5)
- I. Transamination:
  - II. Relational database:
  - III. Ubiquitination:
  - IV. Chaperones:
  - V. Oncogenesis:

b) State **SEVEN (7)** unique functions of database management systems. (7)

**Question 7**

[20]

The image below depicts a microscopic segment of human prostate epithelium, with each dot representing a single cell and coloured sections representing cell types with varied histological descriptions.



- a) Why is tumour growth limited by distance to the nearest blood vessel? (2)
- b) Outline two possible reasons why two separated areas of carcinoma are seen within this field. (4)
- c) What strategies could you use to determine whether the two areas of dysplastic tissue are different? (6)
- d) Describe **FOUR** hallmarks of cancer that are likely to be present in carcinoma B. Suggest molecular changes that could have caused these. (8)

**THE END**