



KENYATTA UNIVERSITY

SUPPLEMENTARY/SPECIAL EXAMINATION 2022/2023

EXAMINATION FOR THE DEGREE OF BACHELOR OF PHARMACY LEVEL IV

PPD 410: PHARMACOGNOSY IV

APRIL/MAY 2023

TIME: 2 HOURS

1. The paper consists of three sections; A, B and C
2. Answer all questions
3. Answer sections A, B and C in separate booklets

SECTION A: BIOSYNTHESIS AND CHEMOTAXONOMY

1. Giving one example, illustrate the relationship between enzymes and co-enzymes in directing biochemical reactions (5 marks)
2. With the help of a diagram, show how plants of different species can be genetically manipulated produce a fertile allopolyploid progeny (5 marks)
3. State four properties of enzymes that enable them to catalyse the synthesis of secondary metabolites (4 marks)
4. Giving examples, explain how the control of enzymatic processes can influence the yield of secondary metabolites in plants (6 marks)
5. With regard to photosynthesis;
 - a) Provide a balanced equation that summarises the process (2 marks)
 - b) Using illustrations, Describe both the light and dark reactions (8 marks)
6. Discuss the ways in which the production of secondary metabolites in plants can be artificially manipulated (10 Marks)

SECTION B: PLANT BIOTECHNOLOGY

1. Distinguish the following terms: (4 marks)
 - a) Totipotency and Pluripotency
 - b) Callus and Meristem
 - c) Primary metabolites and Secondary metabolites
 - d) Translation and Transcription

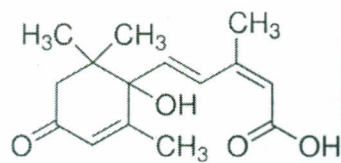
2. Answer TRUE or FALSE (5 marks)
 - a) Organic carbon is supplied by adding glucose to culture medium.
 - b) Agarose contains agaropectin sulphate groups
 - c) Bubble column reactors damage hairy roots due to high shear stress.
 - d) Stirred cultures are mixed using aeration and magnetic stirrers.
 - e) Continuous cultures are maintained in exponential state
 - f) In turbidostat culture, steady state condition the density, growth rate, chemical composition and metabolic activity of the cells remain constant.
 - g) Mechanical protoplast removal is the most efficient and maintains cell viability
 - h) Gellan gums consist of a polysaccharide produced by red algae
 - i) Molybdenum deficiency inhibits cell division and elongation in both root tip and shoot tip meristems
 - j) Calcium hypochlorite is less injurious to plant tissues than sodium hypochlorite

3. Using bullets, explain FOUR factors affecting tissue culture (4 marks)

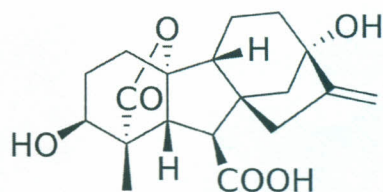
4. Discuss FOUR properties of hairy roots that make them suitable for secondary metabolite production (4 marks)

5. Name and outline the significance of the following phytohormones in PTCOC (6 marks)

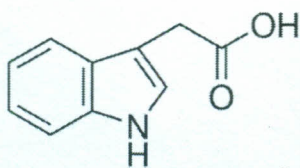
a)



b)



c)



6. You have been hired by a biotechnology firm to produce a giant strain of a certain plant by using recombinant DNA technology. An increase in plant size will increase production of a certain secondary metabolite Y. From research you learn that growth in this plant is normally inhibited by an endogenous protein called shorty substance P (SSP). SSP is synthesized from a compound called TSP in a single reaction catalysed by the enzyme runtase. A researcher has already isolated cDNA for runtase and its sequence is known.

- a) Using recombinant DNA techniques, device a strategy for producing the giant strain. (9 marks)
- b) Describe how you would test the following in the plant you produce. (4 marks)
 - i. Genotype
 - ii. Phenotype
- c) Device TWO other strategies to maximize secondary metabolite yield. (4 marks)

SECTION C: PLANT DRUGS OF ABUSE AND TOXIC PLANTS

1. Pyrethrum flower is an important source of insecticides worldwide
 - a) Name four phytoactive constituents attributed to this plant (2 marks)
 - b) Give reasons why pyrethrum is among the most popular insecticides (3 marks)
2. Giving examples, describe how non-pharmacological interventions can be used to mitigate the effects of recreational use of plant drugs of abuse in Kenya(5 marks)
3. Cassava is a common food crop in Kenya that is also associated with poisoning;
 - a) Name the species and plant part from which the food is obtained (1 mark)
 - b) Describe how proper preparation can minimize risk of poisoning (1 mark)
 - c) List two compounds that are responsible for poisoning (2 marks)
 - d) Describe the mechanism responsible for acute poisoning (3 marks)
 - e) Explain how patients presenting with acute poisoning at a hospital can be managed (3 marks)
4. Neem oil is a potent alternative to synthetic pesticides
 - a) Describe how it is obtained (2 marks)
 - b) Compare its properties to those of synthetic pesticides (4 marks)
 - c) Describe its mechanism of activity (4 marks)
5. The extract of a plant has been shown to be efficacious in the treatment of diabetes. Discuss how you will utilize animal models to estimate the toxicity of the plant extract in humans (10 marks)