

**University of Ruhuna- Faculty of Technology**  
**Bachelor of Biosystems Technology Honours Degree**  
**Level IV (Semester II) End Semester Examination, December 2023**  
**Academic year 2021/2022**

**Course Unit: BSTA232 Natural product Development Technology**  
**Duration: 1 & 1/2 hours**

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Instructions to candidates:

Answer only **Three (3)** questions.

Each question should be started with a new page.

1. Traditionally, practicing herbal remedies (Ginger, Aloe vera, Turmeric) has been proven clinically to have the potential to be used as a treatment against arthritis. You have been hired by the ABC company to manufacture herbal tablets for arthritis patients.
  - a. Discuss the key areas you must consider in manufacturing of the arthritis tablet.  
(30 marks)
  - b. Design a flow chart of manufacturing process of the arthritis tablets including machineries are proposed.  
(40 marks)
  - c. Discuss potential hazardous contaminants and residues that could affect the safety of herbal medicine.  
(30 marks)
  
2. Lipsticks are one of the most widely used cosmetic products. Social, psychological, and therapeutic benefits can be attained from using lipstick.
  - a. List five (05) ideal characteristics of lipstick.  
(20 marks)
  - b. Briefly discuss the main ingredients used in lipstick formulation.  
(40 marks)
  - c. Briefly explain evaluation tests to determine efficiency, stability, and consistency of the lipstick.  
(40 marks)
  
3. Medicinal plants have always been the natural factories of phytochemicals including carbohydrates, fatty acids, flavonoids, tannins, phenols, steroids, alkaloids and terpenoids which are responsible for their biological activities.
  - a. Why is it difficult to isolate sugars, either simple sugars or polysaccharides?  
(30 marks)
  - b. Explain why acid base extraction is helpful to purify the alkaloids. (Hint: Isolation of morphine from opium)  
(30 marks)

- c. Briefly discuss the strengths, weaknesses, opportunities, and threats (SWOT) to traditional medicine product development process in the Sri Lanka.

(40 marks)

4. A student conducted research to develop a *Coscinium fenestratum* (Wenivelgata) capsule by using the water extract of Wenivelgata.

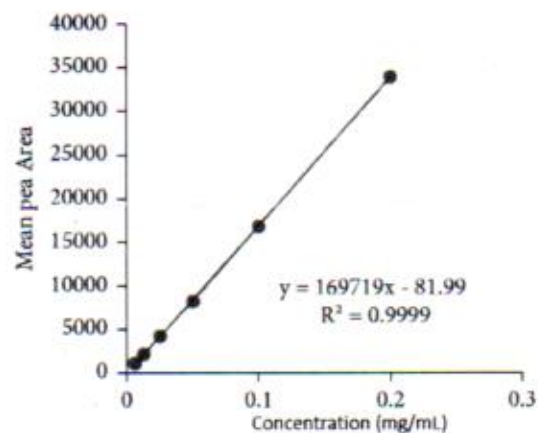
- a. List the ingredients of the capsule shell.

(20 marks)

- b. Briefly discuss the advantages and disadvantages of the Wenivelgata capsule for oral administration.

(30 marks)

- c. The main biologically active compound of the water extract of Wenivelgata is berberine, which belongs to the alkaloid family. The water extract was analyzed to determine the berberine content by using HPLC, and the standard curve of berberine is given below.



- i. The peak area obtained for berberine in the sample was 699.066, calculate the amount of berberine in 100 mL of the water extract.

(30 marks)

- ii. Traditionally, berberine has been used as an antimicrobial, antiprotozoal, and antidiarrheal agent in Ayurvedic medicine. Explain how you prove the antimicrobial activity of the water extract of Wenivelgata.

(20 marks)

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