



The Open University of Sri Lanka

B.Sc. Degree Programme

Industrial Chemistry – CMU 3232 – Level 5

Continuous Assessment Test I (NBT) - 2013/14

Duration: One hour

Date: 10.04.2014

Time: 12.45 pm – 1.45 pm

Reg. No. ....

Invigilator's Signature: .....

Question No.	Marks
1	
2	
<b>Total</b>	
<b>%</b>	

Answer all the questions.

1.a. i. What is natural rubber?

.....  
 .....

ii. The natural rubber industry is divided into two branches; latex based industries and dry rubber based industries. A number of chemicals are used as additives in natural rubber industry. Give **three (03)** additives that are used in latex based rubber industry.

.....  
 .....

iii. Primary processing of rubber involves chemical steps including coagulation. How is coagulation brought about?

.....  
.....

iv. Write two examples of products manufactured in each of the industries based on latex and rubber.

Latex based products .....

.....

Dry rubber based products .....

.....

v. What is the main environmental problem associated with latex based industry?

.....  
.....

(40 marks)

b. Write down the raw material used for the extraction of the following metals. Indicate the process involved.

	Raw material	Process
Iron	.....	.....
Aluminium	.....	.....

(10 marks)

c. i. What is the main difference between the primary and secondary metabolites?

.....  
.....  
.....

ii. Plant oils are broadly classified into two categories; fixed and essential oils. Distinguish between fixed oils and essential oils.

	Fixed oils	Essential oils
1.		
2.		
3.		

(30 marks)

2.a i. what are the methods available for extracting fixed oils from oil-bearing plant materials?

-----  
 .....

ii. Draw a flow chart to show the production of crude coconut oil by dry process.

(40 marks)

b. i. Acid value (AV) is a chemical test carried out to ascertain the quality of oils.

Define acid value.

.....  
.....  
.....

ii. What does it measure?

.....

iii. Ten grams of oil sample is dissolved in 50 cm<sup>3</sup> ethanol. The mixture is treated with 50.0 cm<sup>3</sup> 0.1 M KOH. What is acid value of this oil sample? Relative atomic mass: [K= 56.1; O= 16; H =1]

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.....  
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.....  
.....  
.....  
.....  
.....  
.....

iv. What does AV tell you about this oil?

.....

(30 marks)

c. i. Since ancient times essential oil has been part of our lives. Give three uses of essential oils.

.....  
.....

ii. Give the suitable method for extracting essential oil from each of the following plant parts.

Cinnamon bark .....

Lemon grass .....

Citronella leaves .....

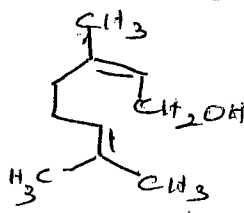
Lavender flowers .....

Cumin seeds .....

iii. What is value addition in relation to essential oils?

.....  
.....  
.....

iv. Give structures and names of **two (2)** important value added products that can be obtained from chemical conversions of geraniol.



1. ....

2. ....

(50 marks)

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**Answer Guide**

I.a. (i) Natural rubber is an polymer of cis- isoprene

(ii) Additives that are used in latex based rubber industry:

- I. Surface active agents
- II. Viscosity modifiers
- III. Vulcanizing agents
- IV. Fillers
- V. Antioxidants
- VI. Acceleratory and secondary gelling

(iii) **Latex based products:** Balloon, Gloves, Elastic thread, Cushion, Carpet backings, Rubberized coir, Baby teets

**Dry rubber based products:** Tyre re-threading, Solid rubber sheets, Garden hoses, Solid tyres, Sleeves for rubber band, Rubber mats, Footwear

(iv) By natural acid formation by microbes.

Added acid (HCOOH)

Protease

(v) The effluent/ natural rubber serum left after precipitation of rubber has high COD and BOD/ Polluting water ways.

b.

	<b>Raw material</b>	<b>Process</b>
Iron	Iron oxides/Sulphides	Reductive extractive metallurgy
Aluminium	Bauxite	Electrolysis

c. (i) **Primary metabolites:** Essential to maintain life in living organisms

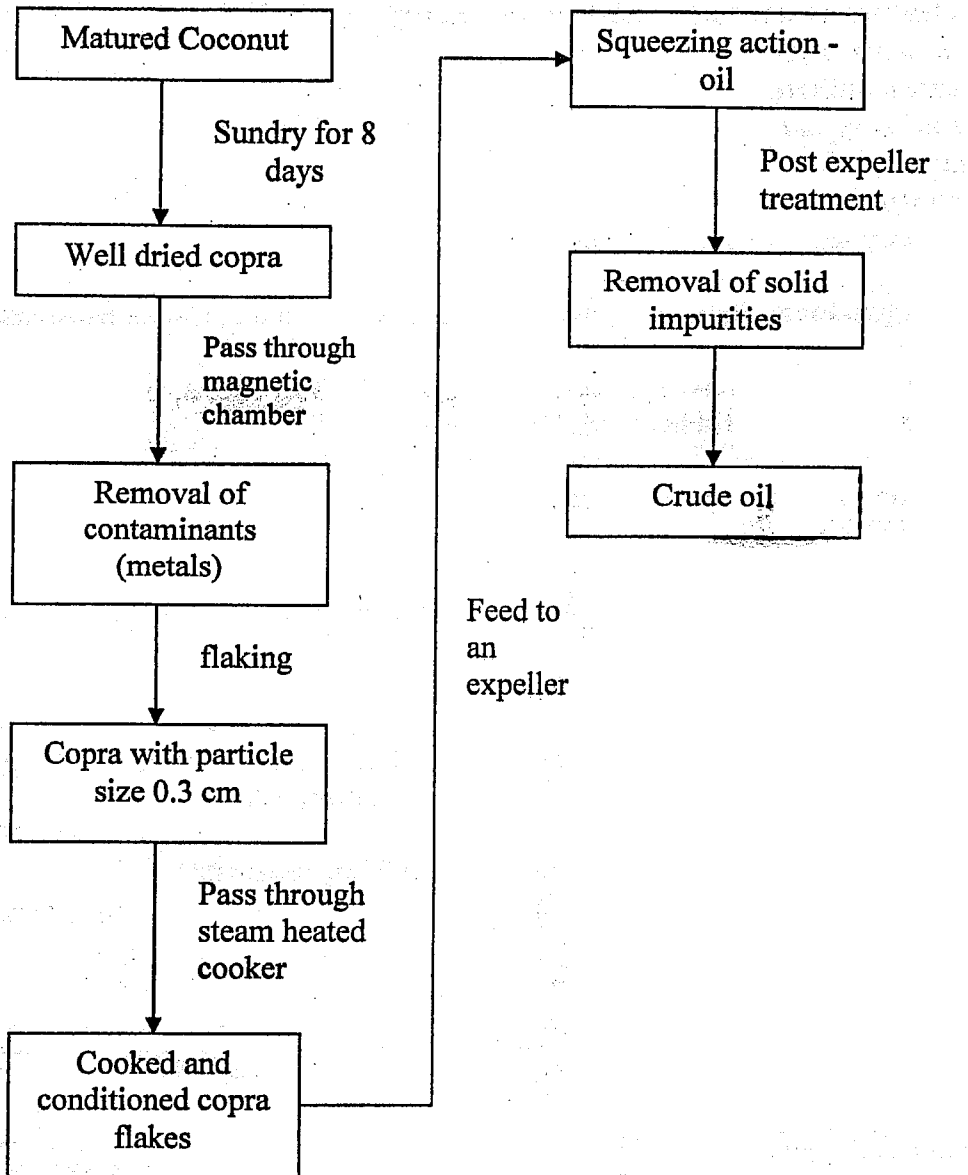
**Secondary metabolites:** Not essential. Serves specific function like protecting plants from herbivores etc.

(ii)

	<b>Fixed oils</b>	<b>Essential oils</b>
1	Non volatile oils	Volatile oils
2	Composed of triglycerides	Hydrocarbons and other oxygenated derivatives of volatile mono + sesquiterpenes
3	Can not be distilled without being decomposed	Can be easily distilled

2. a. (i) Mechanical extraction  
 Solvent extraction

(ii)



b. (i) Acid value is defined as the number of milligrams of KOH required to neutralize the free acids in one gram of the oil sample.

(ii) It is a measure of the amount of free acid present in the oil.

$$\text{(iii) Number of moles of KOH} = \frac{0.1 \text{ mol} \times 50.0 \text{ ml}}{1000 \text{ ml}}$$

$$\text{Weight of treated KOH} = \frac{0.1 \text{ mol} \times 50.0 \text{ ml} \times 56.1 \text{ gmol}^{-1}}{1000 \text{ ml}}$$

$$\begin{aligned} \text{Weight of KOH in mg/g} &= \frac{0.1 \text{ mol} \times 50.0 \text{ ml} \times 56.1 \text{ gmol}^{-1} \times 10^3}{1000 \text{ ml}} \\ &= 28.05 \text{ mg} \end{aligned}$$

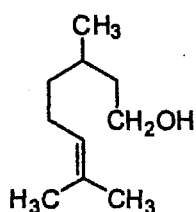
(iv) Acid value tells that this sample is spoiled or contained free acids.

c. (i) Food, Perfumery, Cosmetic, Toiletry and Pharmaceutical industries.

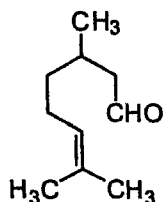
- (ii) **Cinnamon bark** – Water distillation
- Lemon grass (leaves)** – Steam and water distillation
- Citronella leaves** – Steam distillation
- Lavender flowers** – Hydrodiffusion method
- Clove buds** – Supercritical CO<sub>2</sub> extraction

(iii) Value addition is the process by which natural isolation are converted by chemical means to aroma chemicals of high unit value.

(iv) Citronellol



Citonallal



3,7-dimethyloctan-1-ol

