Uva Wellassa University, Sri Lanka
Faculty of Science and Technology
Science and Technology Degree program
1st Semester Examination – March/ April 2013
SCT 443-2 Polymer Technology

Uva Wellassa University

Instructions to candidates

Number of questions: Five (05)

Answer Four (04) questions only

Time allocation: Two (02) hours

Total marks allocated: 400

1. a. List out three quality testing parameters carried out for dry natural rubber and briefly discuss their technical importance in relation to the value addition process of dry natural rubber?

(30 Marks)

b. With an appropriate sketch/s, explain the determination of Mooney viscosity of raw rubber.

(30 Marks)

c. What do you understand by the term "compounding" as applied to rubber industry? and as a rubber technologist, list out main factors to be considered in preparation of a rubber compound?

(20 Marks)

d. "Mastication is a process which should be carried out very carefully". Express your views on this statement.

(20 Marks)

2. a. Account for the following, giving suitable chemical reactions

i. Ozone can lead to a degradation of natural rubber.

(20 Marks)

ii. Treatment of filler having hydroxide groups with a suitable coupling agent before compounding improves the properties of a natural rubber vulcanizates.

(20 Marks)

b. Consider the following rubber compound.

	Part by weight	Relative Density
Natural Rubber	100.0	0.92
Zinc Oxide/ Stearic acid mixer	6.0	3.0
Antioxidant	1.2	1.2
Sulphur	2.0	2.0
Whiting	60.0	3.0

(i) Find the relative density of the above rubber compound.

(20 Marks)

(ii) Identity the most essential missing ingredient in the above receipe and list out four advantages offered by it to the rubber compound.

(20 Marks)

(iii) Suggest a suitable method to meet each of the following requirements for the above rubber compound.

I. Increase hardness

II. Improve thermo stability

(20 Marks)

3. a. Describe briefly the steps involved in production of dipped articles starting from concentrated natural rubber latex and other suitable ingredients.

(30 Marks)

b. A typical formulation of a latex compound for household gloves is given below.

	Wet Weight	Dry Weight
Centrifuged NR latex (60%)	167	-
10% Potassium hydroxide	5	-
10% Potassium oleate	X	5
50% Sulphur dispersion	2.5	-
50% Zinc diethyldithiocarbamate	2	-
50% ZnO dispersion	2	-
50% Phenolic antioxidant	2	-

i. Ball mill is a commonly used machine to prepare dispersions of water insoluble power ingredients. Explain the operation of a ball mill and list out four factors affecting ball mill efficiency.

(20 Marks)

ii. Calculate value for X.

(10 Marks)

iii. Calculate the ZnO requirement in kilograms to produce one million gloves? (weight of a glove is 10.5 g)

(20 Marks)

iv. If 10 parts of a 10% softener is added to this latex, state the effect on the following:

I. modules

II. mxtensibility

(20 Marks)

4. a. Explain the meaning of engineering thermoplastics (explanation on the processing techniques is not necessary).

(20 Marks)

b. Give the respective monomers and repeating units of following thermoplastics?

I. Nylon 6

II. Nylon 6:10
III. Polycarbonate

(30 Marks)

c. (i) Explain briefly why thermosetting plastics are not generally processed by extrusion.

(10 Marks)

(ii) With the aid of simple diagrams, explain briefly the transfer molding process used for thermoplastics.

(20 Marks)

(iii) Give the pre-polymers of following thermosetting materials.
(a) Phenol-formaldehyde resin
(b) Urea – formaldehyde

(20 Marks)

(5). a. Give a labelled sketch diagram of an injection moulding machine that is used to manufacture an item using thermoplastic polymer compound.

(30 Marks)

b. List the function of all the important components.

(10 Marks)

c. Outline the main steps in the injectin molding cycle.

(20 Marks)

d. Outline a simple test that can be carried out in a factory to asses the quality of thermoplastic material.

(10 Marks)

e. Giving the repesting units, name two types of commadity plastics of your interest and write a brief account on processing them into a product.

(30 Marks)

10