ANSWER GUIDE

Polymer Chemistry – Level 5

CHU 3238 / CHU 5238

ASSIGNMENT TEST II (2008/2009)

Part A

01).2	02).4	03).5	04).4
05).2	06).4	07).1	08).3
09).5	10).3	11).4	12).4
13).3	14).2	15).4	16).3
17).5	18).2	19).5	20).3

Part B

01. a) i. Latex contains carotenoids type pigments which are yellowish colour. Therefore, rubber sheets produced out of such latex will be yellow in colour.

ii. 1. Fractionation – Carotenoids can be separated by the reduction of pH. By adding sodium bisulphate & stirring continuously will render these carotenoids. These carotenoid clusters can be removed. This fraction in latex is collected & removed.

2. Bleaching – Adding thiols to the fractionated or unfractionated latex. Thiols can be added as pure thiols or aqueous solutions of sodium salts of thiols.

b). Natural rubber has cis isoprene units whereas synthetic rubber has cis & trans. Synthetic rubber is a mixture of 1,2 or 1,4 or 3,4 addition polymers.

c).

Thermoplastics	Thermosets
1. Formed by addition polymerisation	Formed by condensation polymerisation
2. Long chain linear polymers	Cross linked 3 dimensional network polymers
3. Can be soften by heating	Cannot be soften by heating
4. Flexible	Inflexible
5. Soluble in some organic solvents	Insoluble in any solvent
6.Can be reused	Cannot be reused

d). i. After coagulation of rubber latex, it can be milled & dried. According to their colour, appearance we can grade these dried sheets or blocks.

ii. 1. Ribbed Smoked Sheets (RSS) – Rubber latex is coagulated & squeezed off the water to produce rubber sheets. These sheets are further dried by hanging in smoked rooms. They are brown in colour. Qualities of sheets are described on the visual appearance.

2. Latex crape thick & thin – sheets are thoroughly washed & pressed to produce thick crape sheets.

3. Block rubber – small coagulated crumbs are pressed to form block rubber.

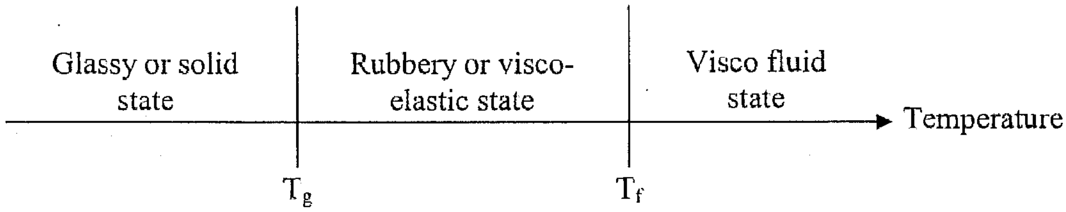
02). a. i. The temperature at which this transition from soft, flexible rubbery state to hard, brittle glassy state takes place is called glass transition temperature (T_g).

ii. Using Dilatometry method. But there are many methods eg: DTA, DSC, IR & NMR.
Dilatometry:

- The bulb of the instrument containing the sample with a confined liquid can be heated or cooled to measure change in volume of the sample with temperature.
- Volume change is measured in a graduated capillary tube.
- Plot the graph of volume change Vs temperature. As shown in the graph we can find out T_g.

(You should draw the graph and dilatometer which are illustrated in the CHU 3238 Unit III book.)

iii.



As temperature increases glassy, solid state changes to rubbery state at T_g. After T_f it becomes visco fluid state.

b). 1. Symmetry of polymer molecules.

- The symmetry of the chain increases both T_m & crystallinity. Molecules are arranged regularly when they have symmetry. Therefore molecules are close packed. For example trans isomers have high T_g & T_m values than cis isomers.

2. Inter molecular bonding.

- Some polymers achieve close packed regular structure by inter molecular bonding which increases the stability so increases the T_m & crystallinity.

3. Chain flexibility & steric factor.

- Inflexible groups reduce the free rotation of the molecule. Therefore T_m will go up.

4. Helical structure.

- Due to the helical structure molecules are close packed & give extra stability so higher the T_m & crystallinity.

5. Tacticity.

- Syndiotactic & isotactic polymers have regular arrangements therefore higher the T_m & crystallinity..

6. Branching & molar mass.

- Branching in the polymer chain tends to stiffen the chain so higher the T_m value. Branching decreases the packing efficiency so lowers crystalline percentage. When molar mass is high T_m is also high.