

Group Work Assignment #2

September 29 2009

20 points

- **Work in a group of 3-4 only.** Each person completes must complete assignment/ fill in paper.
- When you have completed your assignment, please show it to me and I will record your name for credit.

Name (Print)	Signature

Polymer Structure Questions

Complete all "blanks" in the following chart. When asked to give a value for T_g , select from list of possible choices:

T_g Choices: 61 °C -127 °C 100 °C 36 °C 117 °C -41 °C 150 °C -10 °C

Polymer Name	Structure-draw structure if not listed	Morphology Highly crystalline, Semi-crystalline, or amorphous	T_g (°C)
Polycarbonate (PC)		amorphous	150
Poly(ethylene terephthalate) PET		Semi-crystalline	61
Polydioxanone (PDS)		Semi-crystalline	-10
Polystyrene	 What is the tacticity? ATACTIC	amorphous	100

Which polymer(s) are degradable? **PDS**

Molecular Weight Calculation-1

Assume you have a polymer sample characterized by information in the table below. Calculate \bar{M}_n , \bar{M}_w , and PDI.

Fraction	moles	molecular weight (g/mol)
A	5	75,000
B	2	150,000
C	4	90,000

$$\bar{M}_n = \frac{\sum N_i M_i}{\sum N_i}$$

$$\bar{M}_n = \frac{(5\text{mols} \times 75,000\text{ g/mol}) + (2\text{mols} \times 150,000\text{ g/mol}) + (4\text{mols} \times 90,000\text{ g/mol})}{5\text{mols} + 2\text{mols} + 4\text{mols}}$$

$$= 94,091\text{ g/mol}$$

$$\bar{M}_w = \frac{\sum N_i M_i^2}{\sum N_i M_i}$$

$$\bar{M}_w = \frac{[5\text{mols} \times (75,000\text{ g/mol})^2] + [2\text{mols} \times (150,000\text{ g/mol})^2] + [4\text{mols} \times (90,000\text{ g/mol})^2]}{(5\text{mols} \times 75,000\text{ g/mol}) + (2\text{mols} \times 150,000\text{ g/mol}) + (4\text{mols} \times 90,000\text{ g/mol})}$$

$$= 101,957\text{ g/mol}$$

$$PDI = \frac{\bar{M}_w}{\bar{M}_n} = \frac{101,956}{94,091} = 1.08$$

Molecular Weight Calculation-2

Assume you have a polymer sample characterized by information in the table below. Calculate \bar{M}_w , \bar{M}_n , and PDI.

Fraction	g	molecular weight (g/mol)
A	2	300,000
B	5	100,000
C	3	40,000

$$\bar{M}_n = \frac{\sum w_i}{\sum N_i} = \frac{(2+5+3)g}{(2g \div 300,000g/mol) + (5g \div 100,000g/mol) + (3g \div 40,000g/mol)}$$
$$= 75,949 \text{ g/mol}$$

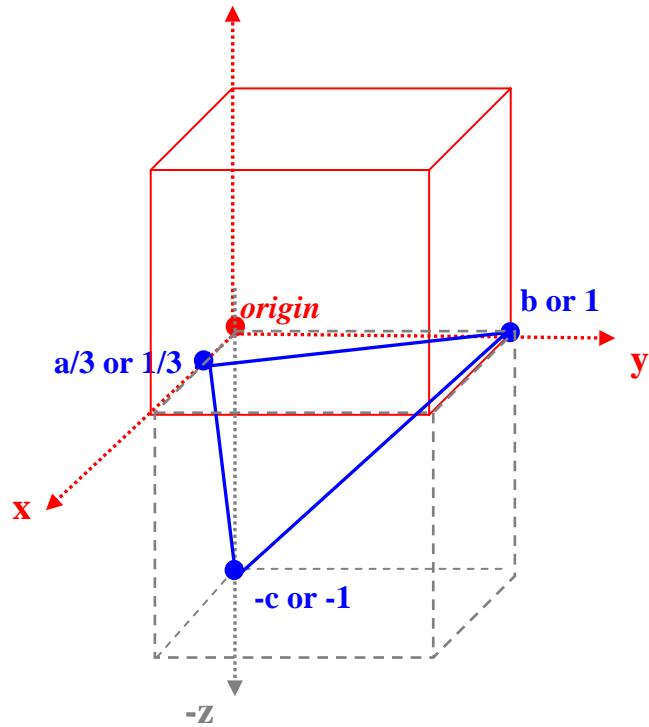
$$\bar{M}_w = \frac{\sum w_i M_i}{\sum w_i} = \frac{(2g \times 300,000g/mol) + (5g \times 100,000g/mol) + (3g \times 40,000g/mol)}{(2+5+3)g}$$
$$= 122,000 \text{ g/mol}$$

$$PDI = \frac{\bar{M}_w}{\bar{M}_n} = \frac{122,000}{75,949} = 1.61$$

Metal Structure Questions

1. Sketch within a cubic unit cell the plane $(3\bar{1}\bar{1})$

Label x, y, z axes, intercepts, and origin. If plane extends out of the cubic unit cell, draw the adjacent unit cell with a dashed line and label and label any negative axes if plane extends along that direction.



Notes:

Remember that the Miller Indices are the reciprocals of the axial intercepts.

1. Complete the table to determine intercepts.
2. Find each intercept by moving FROM THE ORIGIN along each designated axis the appropriate distance.
3. If plane extends outside of original unit cell, be sure you clearly draw the adjacent unit cell (e.g. with a dashed line) so that your intercepts and plane drawings are clear.

	x axis	y axis	z axis
Intercepts	a/3	a	-a
Intercepts in terms of a	1/3	1	-1
Reciprocals of intercepts	3	1	-1
Reduction	Not necessary (all integers)		
Enclosure	(3	1	$\bar{1}$)