

Total 100 points. Each question is worth of 4 points, unless otherwise noted

1. (a) List the five general purpose plastics with the largest production volume.
(b) List the five engineering plastics with the largest production volume.
Do not list more than five. Only the first five will be counted.
2. Answer the following questions regarding PE.
 - (a) What are LDPE, HDPE, LLDPE, UHMWPE, and XLPE? Just spell out.
 - (b) How is the structure of LLDPE different from that of LDPE? How does this difference affect the physical structure and property?
3. [4 x 3 points] Answer the following questions regarding thermoplastic elastomer [TPE],
 - (a) What is the general structure a TPE, and how does it work?
 - (b) What is the structure of SBS-type TPE, and how does it work?
 - (c) What is the structure of TPU, and how does it work?
 - (d) What is the structure of polyester TPE, and how does it work?
4. (a) What is IPN, and why is it invented?
 - (a) Show the even-odd effect in nylon.
 - (c) Show the even-odd effect in LCP.
5. Answer the following questions regarding functional polymers.
 - (a) What is the general structure a hydrogel? Give one example of such structure.
 - (b) Explain the mechanism how a hydrogel function as a temperature-sensitive material?
 - (c) What is the general structure a conductive polymer? Give one example of such structure.
 - (d) Explain the mechanism how a conducting polymer can be used in a polymer actuator.
 - (e) What is the general structure a photoconductive polymer? Give one example of such structure.
 - (f) Explain the mechanism how a photoconductive polymer can be used in a copying machine.
 - (g) What is the general structure a piezoelectric polymer? Give one example of such structure.
 - (h) Explain the mechanism how a piezoelectric polymer can be used in a touch button.
 - (i) What is the general structure a negative PR polymer? Give one example of such structure.
6. Answer the following questions regarding polymer optical fiber [POF].
 - (a) A POF is consisted of three parts; core, cladding, and jacket. For each part, what is the required property and what polymer is used?
 - (b) There are two advantages and two disadvantages of POF compared with GOF. What are they?
 - (c) What efforts are being done to alleviate each of the disadvantages? You may give your own resolution.
7. Answer the following questions.
 - (a) What are four levels of recycling. Define each.
 - (b) What is upcycling? Give an example.
 - (c) Discuss the trends of polymeric materials in car industry. You may mention fuel efficiency, module, TPO, life cycle assesment, and Hyundai Motor Company. If you discuss all the issues successfully, you will get 2 bonus points.