HW06 - Plastics & Polymers

1 6 points

Which step of the addition mechanism both increases the length of the polymer chain AND produces a free radical to continue the reaction?

- ○ initiation
- ○ addition
- ○ perpetuation
- ○ termination
- ○ propagation

2 4 points

Which of the following properly outlines the addition mechanism?

- ○ Initiation - Propagation - Condensation - Termination
- ○ Initiation - Termination - Propagation
- ○ Hetereolytic Cleavage - Propagation - Condensation - Termination
- ○ Initiation - Propagation - Termination

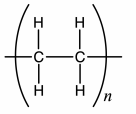
3 6 points

Two condensation reactions that we talk about in this class involve making PET and peptides. What are the functional groups involved in these two processes? Note: two answers are correct.

- ☐ carboxylic acid, alcohol
- ☐ ketone, alcohol
- ☐ aldehyde, ether
- ☐ amine, carboxylic acid
- ☐ alcohol, ester

4 6 points

Which recycle symbol (number) would you most likely find on a large milk container made from the following monomer:



- ○ 6
- ○ 5
- ○ 1
- ○ 2
- ○ 4

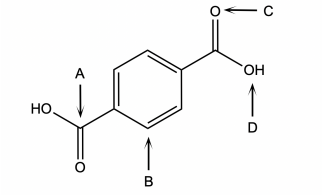
5 6 points

LDPE polymers are _____ branched than HDPE, resulting in greater _____.

- ○ more, strength
- ○ less, strength
- ○ less, flexibility
- ○ more, flexibility

6 6 points

Observe the structure below and answer the next two questions.



Which arrow is pointing to a carbonyl carbon?

- ○ A
- ○ D
- ○ B
- ○ C

7 6 points

On this same structure, which group will be **removed** in the condensation mechanism?

- ○ A
- ○ C
- ○ B
- ○ D

8 4 points

Fabrics often list their contents in generic terms, rather than proprietary ones. What might you find on the care tag of a nylon garment?

- ○ silk
- ○ polyester
- ○ polyamide
- ○ Kevlar
- ○ polystyrene

9 4 points

Which of the following polymers are made via an *addition* reaction mechanism?

- ☐ Polyethylene
- ☐ Polypropylene
- ☐ Bakelite
- ☐ Polyvinyl Chloride
- ☐ Polyethylene Terephthalate
- ☐ Polystyrene
- ☐ Nylon

10 4 points

Five of the six "Big 6" plastics are composed of nearly the same repeating monomer, but with differing functional groups substituted into a single position. What is the functional group unique to polypropylene?

- ○ amine
- ○ halide
- ○ carboxyl
- ○ methyl
- ○ alcohol

11 6 points

Which of the following functional groups is the distinguishing feature of the monomer used to manufacture styrofoam?

- ○ a benzyl group
- ○ an amine group
- ○ a phenyl group
- ○ a ester group
- ○ a halide group

12 6 points

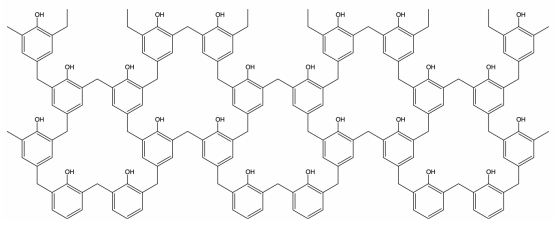
The following three common plastic items are most likely to be composed of which three Big 6 plastics? (identify the plastics by their recycling number)

- Disposable coffee cup
- Plumbing pipe
- Carbonated drink bottle

- ○ 2, 4, 6
- ○ 6, 3, 1
- ○ 5, 2, 3
- ○ 3, 1, 4

13 4 points

Below is an image of the bakelite copolymer, used back in the day for things like bowling balls, radios, telephones. Given that it is a copolymer between an alcohol and aldehyde, which of the following reaction types forms this structure?



- condensation
- rearrangement
- propagation
- elimination
- addition

14 4 points

The bakelite polymer consists of phenol and formaldehyde. In the real world, why does this polymer **not** look as organized as it does in two dimensions?

- the methylene links can rotate and branch in different directions
- the carbon-carbon bonds in the phenol groups can rotate and branch in different directions
- the methylene links are flat and rigid
- the phenol groups are flat

15 6 points

Which of the following is/are made from amino acid monomers?

- [ ] wool
- [ ] cellulose
- [ ] biological proteins
- [ ] silk
- [ ] starch
- [ ] fats

16 6 points

Which of the following can be glucose polymers?

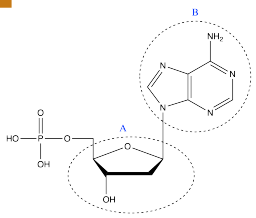
- [ ] wool
- [ ] flax
- [ ] silk
- [ ] cotton
- [ ] proteins
- [ ] carbohydrates

17 4 points

There are many different types of proteins. What makes a protein unique?

- the carboxylic acid and amine functional groups on the amino acid monomers
- the various sugar monomers that make up the protein chain
- the identity of the R-side chain on the amino acid monomers that make up the polymer
- the fact that all amino acids have the same functional groups

18 4 points



What do A and B represent on the DNA nucleotide above?

- A = deoxyribose, B = R-group
- A = ribose, B = nitrogenous base
- A = deoxyribose, B = nitrogenous base
- A = deoxyribose, B = glycosidic linkage
- A = ribose, B = polyamine

19 4 points

Consider the biological polymer of DNA. There are two monomer units (a copolymer) that make up the backbone chain - what is the repeat unit here? Hint: you can look at the previous question to see the structure.

- phosphate + deoxyfructose
- phosphate + glucose
- ester + deoxyribose
- peptide link + ribose
- phosphate + deoxyribose

20 4 points

Describe the product(s) of condensation polymerization.

- A single elongated polymer
- Two polymers split by homolytic cleavage
- A single polymer radical
- A larger copolymer and a small molecule, like water