MULTIPLE CHOICE QUESTIONS

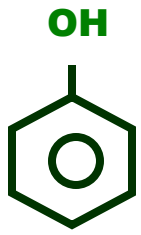
1. Styrene is almost a unique monomer, in that it can be polymerized by practically all methods of chain polymerization.

   A. Free radical
   B. Anionic
   C. Cationic
   D. Co-ordination (i.e., with a catalyst)

   Which of these methods is used to make commercial atactic polystyrene?

2. Consider the following monomers or pairs of monomers:

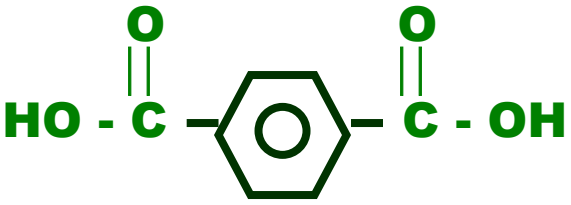
   A.



   and CH_2O

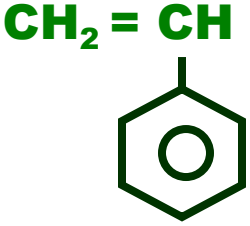
   (phenol) (formaldahyde)

   B.



   and $HO - CH_2 - CH_2 - OH$

   C.



   and $CH_2 = CH - CH = CH_2$

   (styrene) (butadiene)

D. $CH_2 = CH_2$ with CH_3 branch

E. $CH_2 = CH_2$

Which of the monomers (A-E) listed above gives a densely cross-linked network when polymerized under the appropriate conditions?

Which of the above monomers is polymerized free radically at high pressures to give a polymer containing some short chain branches?

3. Which monomers form a polyester?

4. Which of the monomers containing a C = C double bond cannot be polymerized free radically?

5. Which pairs of monomers would you use to make an ethylene/propylene random copolymer?

   A. Pair (A) above
   B. Pair (B) above
   C. Pair (C) above
   D. Monomers (D) and (E) above

6. I mentioned in class that you don't need to know the difference between a racemic and meso diad. I lied!

   All right, I suppose that's not fair. Below is a figure showing these diads.

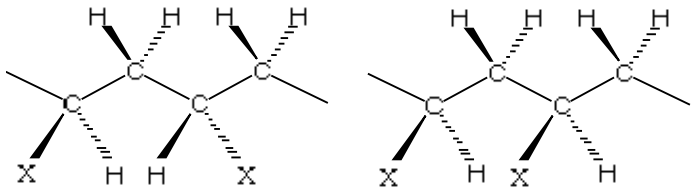


Figure 1.5 Schematic diagram depicting racemic and meso diads

An NMR analysis of a polystyrene sample showed that it had close to 100% racemic diads. the sample would be

A. Isotactic polystyrene
B. Syndiotactic polystyrene
C. Atactic polystyrene

7. A second sample had about 50% meso diads and 50% racemic. What is the most probable tacticity of this sample (A – C in Q1).

8. Consider the properties of the following two polyethylene samples. Sample 1 was produced by a high pressure process while sample 2 was synthesized using a catalyst.

	Polyethylene 1	Polyethylene 2
Mol wt.	200,000	200,000
Density (g/cm^3)	0.92	0.96
Crystalline melting pt.	108°C	133°C
Stiffness ($lb/in^2 x 10^3$)	25	125
Hardness (Shore D)	45	65

Which of the following statements is true?

A. Sample 2 is more branched than sample 1
B. Sample 1 is more branched than sample 2
C. Sample 1 is more atactic
D. Sample 1 is more isotactic
D. Painter shouldn't set such easy gift questions
E.

9. Which of these do you think would be more appropriate for use in making bottles for detergent?

A. Sample 1
B. Sample 2

10. Which would make a better film for wrapping up leftover food? (A or B in Q6).

11. Which of the following polymers is most likely to be optically transparent

A. Atactic polystyrene
B. Isotactic polystyrene
C. Linear Polyethylene
D. Nylon 6,6

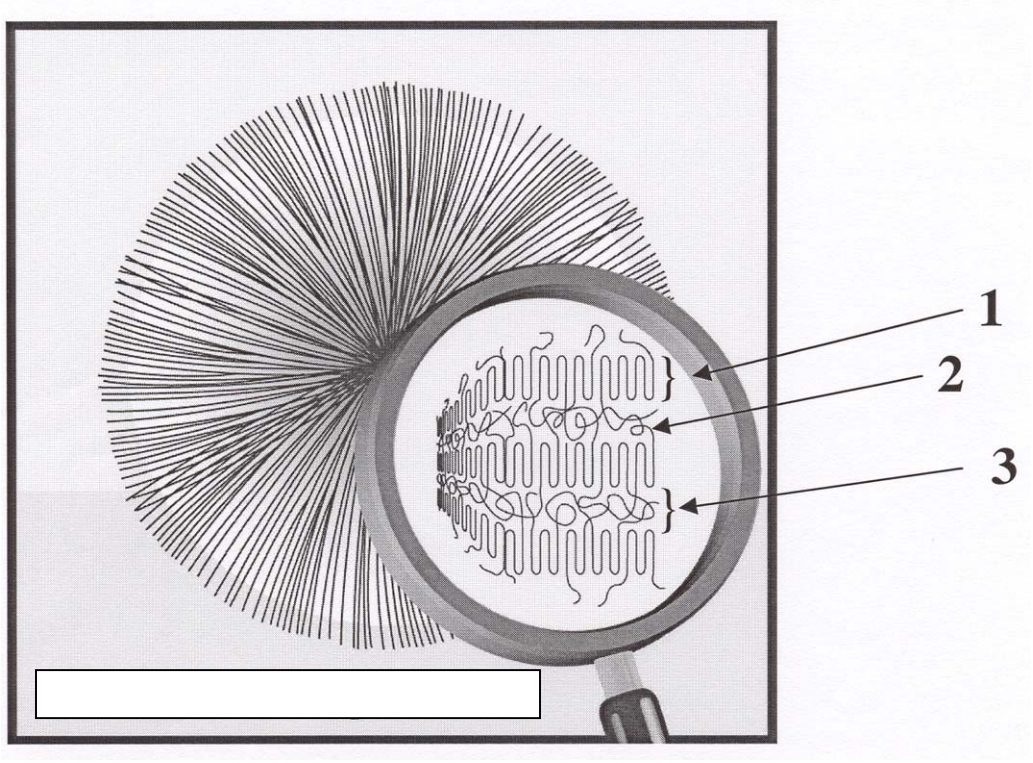
12. A polymer chain in the melt or in the rubbery state has an average end-to-end distance that is proportional to which of these (A-E) where N is the number of units in the chain?

    A. N
    B. $N^{0.75}$
    C. $N^{0.6}$
    D. $N^{0.5}$
    E. $N^{0.33}$

13. Which of the following polymers would you expect to have the best barrier properties (i.e., provide the best barrier to diffusion of a gas and hence prove most effective as a beverage container)?

    A. Atactic polystyrene
    B. A random ethylene/propylene copolymer (50/50) composition.
    C. Low density polyethylene
    D. High density polyethylene

14. Consider the following polymer crystal form:



    This is a schematic picture of

    A. A spherulite.
    B. A fringed micelle.

C. A single crystal lamellae.

15. The material marked 3 is

A. Folded chain crystals.
B. Crystalline chains.
C. Amorphous material.

16. Atactic polystyrene (Tg ~ 100°C) quenched (i.e., cooled very quickly) from 120°C to room temperature

A. Is a rubbery material.
B. Crystallizes.
C. Is a glassy material.

17. High density polyethylene cooled slowly from 160°C to room temperature

A. Is still amorphous.
B. Crystallizes.
C. Is a glass.
D. Is a mixture where some regions are rubbery and some regions are glassy.

18. When a single polymer chain is stretched, the origin of the restoring force is related to

A. The entropy of chain conformations.
B. The enthalpy of chain conformations.
C. The degree of cross-linking.
D. The elastic forces in each of the individual bonds in the chain.

19. A polymer drawn from the melt usually forms

A. Fringed micelles
B. Single crystal lamellae.
C. Spherulites.
D. Extended chain fibers.

20. A fringed micelle is

A. An exotic form of nightware that can be purchased at Victoria's Secret.
B. A model for polymer crystals where polymer chains have parts of themselves in crystal domains and parts in amorphous regions.
C. A sphere shaped crystal form obtained by cooling from the melt.
D. A flat lozenge shape crystal obtained from dilute solutions