CHE 102 - Extra Practice - Stereoisomers - S22 - ver 1 Score: _____/0

Name: _____ Class: _____ Date: _____

Read each question carefully. Some questions have multiple parts. Answer all questions with complete sentences.

1. Why is the study of stereoisomers important? Explain using complete sentences.

2. Define plane-polarized light. How is plane-polarized light different then ordinary (unpolarized) light?

3. What are the requirements for a atom to be considered chiral? Draw a example of a chiral atom.

4. What are the requirements for a molecule to be considered chiral?

5. Define the term 'meso compound'? Why are they important? Draw an example of one. Why don't meso compounds rotate plane polarized light?

6. If a molecule had 5 chiral carbons in it, how many possible stereoisomers would there be?

7. What is a racemic mixture? Why don't racemic mixtures rotate the plane of polarized light?

8. Why don't solutions of meso compounds rotate the plane of polarized light?

9. What is one major difference between the chemical synthesis of optically active molecules and the biological synthesis of optically active molecules?

10. Define the following terms:
    (a) Optically Active:

    (b) Dextrorotatory:

    (c) Levorotatory:

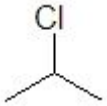
11. Draw an example of each of the following molecules. Answer any additional questions given.
    (a) An example of molecule with a chiral atom. What are the requirement to have a chiral atom?

    (b) An example of a Meso compound. What makes it Meso?

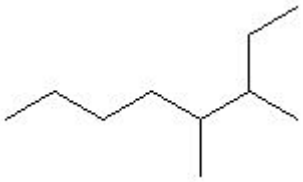
12. Draw an example of the following:
    (a) Structural Isomers

    (b) Cis/Trans Isomers (make sure to label them)

13. Circle the chiral atom(s) in each molecule. If no chiral atoms exist, place the word "NONE" in the answer blank.

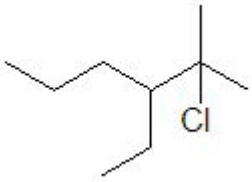
(a) 

13(a) _____

(b) 
13(b) _____

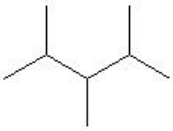
(c) 
13(c) _____

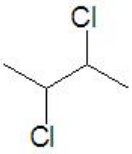
(d) 
13(d) _____

(e) 

13(e) _____

14. Circle the chiral atom(s) in each molecule. If no chiral atoms exist, place the word "NONE" in the answer blank.

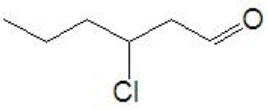
(a) 
14(a) _____

(b) 

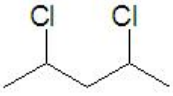
14(b) _____

(c) 

14(c) _____

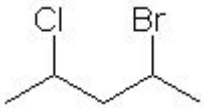
(d) 

14(d) _____

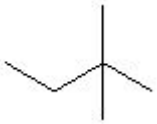
(e) 

14(e) _____

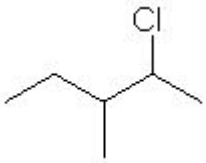
15. Circle the chiral atom(s) in each molecule. If no chiral atoms exist, place the word "NONE" in the answer blank.

(a) 

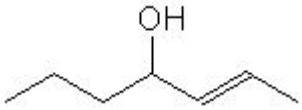
15(a) _____

(b) 

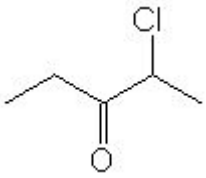
15(b) _____

(c) 

15(c) _____

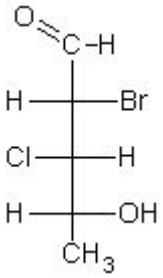
(d) 

15(d) _____

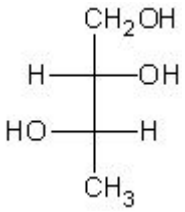
(e) 

15(e) _____

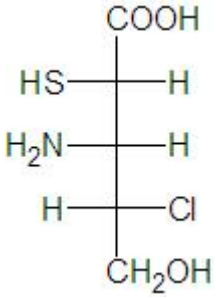
16. Draw all of the enantiomers for the following compound:



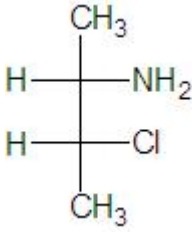
17. Draw all of the diastereomers for the following compound:



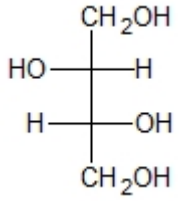
18. Draw all of the enantiomers for the following compound:



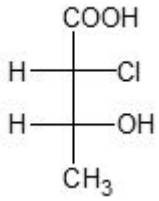
19. Draw all of the diastereomers for the following compound:



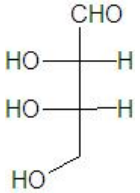
20. Draw all of the stereoisomers for the following compound. Label them A, B etc, and identify which ones are Enantiomers, Diastereomers and Meso.



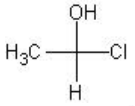
21. Draw all of the stereoisomers for the following compound. Label them A, B etc, and identify which ones are Enantiomers, Diastereomers and Meso.

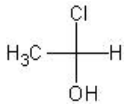


22. Draw all of the epimers for the following compound:

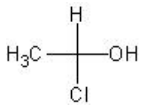


23. Are the following molecules the (S)ame or (D)ifferent from the molecule shown at the top. Explain your answers in the space provided.

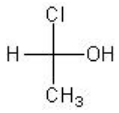


(a)


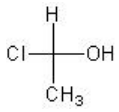
23(a) _____

(b)


23(b) _____

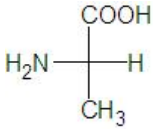
(c)


23(c) _____

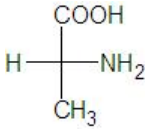
(d)


23(d) _____

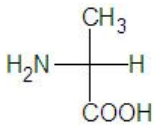
24. Identify each projection formula below as representing (+)-alanine or (−)-alanine.



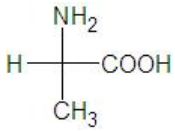
(+)-alanine



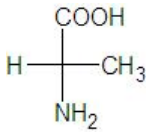
(−)-alanine.

(a)


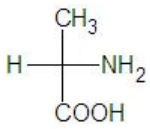
24(a) _____

(b)


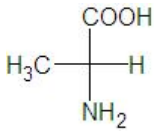
24(b) _____

(c)


24(c) _____

(d)


24(d) _____

(e)


24(e) _____

25. Complete the following table with (S)ame or (D)ifferent.

Property	**Structural**	**Cis/Trans**	**Enantiomers**	**Diastereomers**
Chemical Formula				
Structure				
Geometry				
Physical Properties				
Chemical Properties				
Biological Properties				
Optical Rotation				

26. Define the term "Enantiomer" and complete the chart below by placing an X in the appropriate boxes.

Property	**Same**	**Different**
Chemical Formula		
Structure		
Geometry		
Physical Properties		
Chemical Properties		
Biological Properties		
Optical Rotation		

27. Define the term "Diastereomer" and complete the chart below by placing an X in the appropriate boxes.

Property	**Same**	**Different**
Chemical Formula		
Structure		
Geometry		
Physical Properties		
Chemical Properties		
Biological Properties		
Optical Rotation		

28. (+)-2-methyl-1-butanol has the following properties: specific rotation = +5.76°, boiling point = 129 ℃, melting point = 54 ℃, density = 0.819 g/mL, and molecular weight = 88 g/mol. What are the corresponding physical properties for (−)-2-methyl-1-butanol?

    specific rotation :

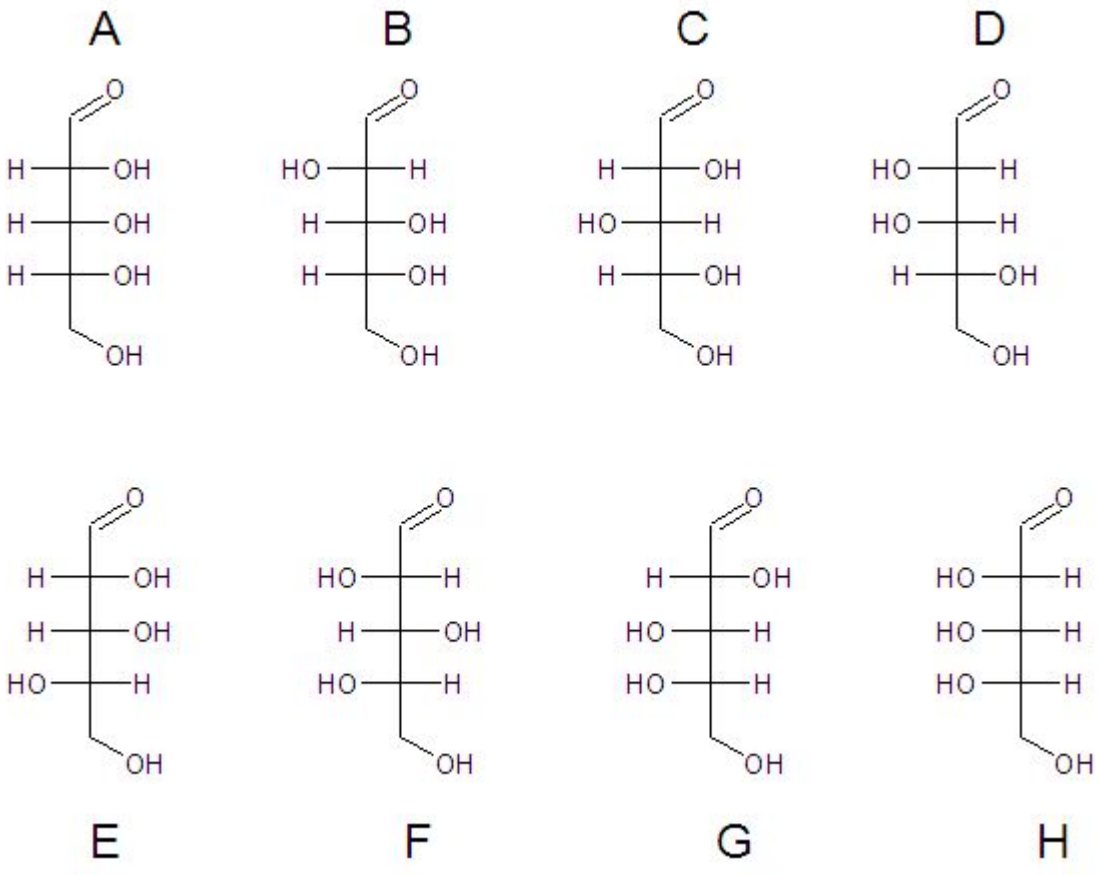
    melting point:

    boiling point:

    density:

    molecular weight:

29. Answer the following question about the stereoisomers in the figure below.



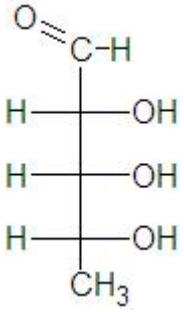
(a) Which of the molecule(s) are enantiomers of A? 29(a) _____

(b) Which of the molecule(s) are diastereomers of A? 29(b) _____

(c) Which of the molecules(s) are meso compounds of A? 29(c) _____

(d) Which of the molecule(s) are epimers of A? 29(d) _____

30. Draw all of the stereoisomers for the following compound:



31. Label the stereoisomers in the previous problem A,B,C... starting with the molecule given, and answer the following questions about them:

(a) Which of the molecule(s) are enantiomers of A? 31(a) _____

(b) Which of the molecule(s) are diastereomers of A? 31(b) _____

(c) Which of the molecules(s) are meso compounds of A? 31(c) _____

(d) Which of the molecule(s) are epimers of A? 31(d) _____