

Chemistry 130, Midterm Exam 3

Instructor: Bergdahl

Spring 2019

Name: _____

Be prepared to show ID upon request.

Key

****Any use of any electronic devices is prohibited during the test** ****

Be prepared to show ID upon request.

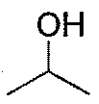
My student I.D. (red I.D.) number is:

Good Luck!!


Part A. 1-25 Questions. Each correct answer is 3 points. (Part 1 max 75 points)

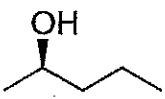
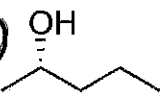
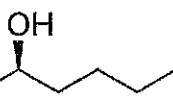
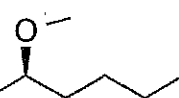
1) The oxygen in a hydroxyl group is ____ hybridized and has bond angles of ____

- A) sp , 180
- ☒ B) sp^3 , 109.5
- C) sp^2 , 120
- D) sp^3 , 120

2) The IUPAC name of  is:

- A) isopropanol
- B) 1-propanol
- ☒ C) 2-propanol
- D) 2-isopropanol

3) Which molecule below is *S*-2-pentanol 

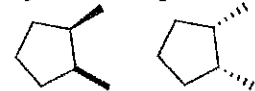
- A) 
- ☒ B) 
- C) 
- D) 

4) The compounds below are



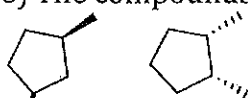
- A) Constitutional Isomers
- B) Enantiomers
- ☒ C) Diastereomers
- D) Geometric Isomers
- E) the same molecule

5) The compounds below are



- A) Constitutional Isomers
- B) Enantiomers
- C) Diastereomers
- D) Geometric Isomers
- ☒ E) the same molecule

6) The compounds below are



- ☒ A) Constitutional Isomers
- ☐ B) Enantiomers
- ☐ C) Diastereomers
- ☐ D) Geometric Isomers
- ☐ E) the same molecule

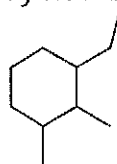
7) Enantiomers are

- ☐ A) Superposable mirror images
- ☒ B) Non-superposable mirror images
- ☐ C) Molecules that have the same connectivity but a different orientation of atoms in 3-dimensional space
- ☐ D) Molecules that have the same molecular formula but a different connectivity.

8) The physical properties of enantiomers are identical except for

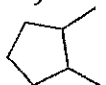
- ☐ A) Boiling point
- ☒ B) how they rotate light
- ☐ C) melting point
- ☐ D) polarity

9) How many possible stereoisomers does the compound below have?

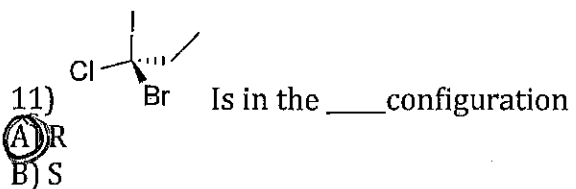


- ☐ A) 2
- ☐ B) 6
- ☒ C) 8
- ☐ D) 12

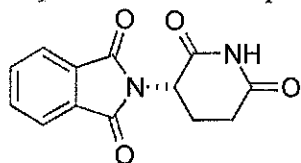
10) How many actual stereoisomers exist for the below molecule



- ☐ A) 4
- ☒ B) 3
- ☒ C) 2
- ☐ D) 1



12) The below compound is the ____ enantiomer of thalidomide

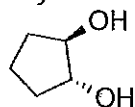


- A) R
☒ B) S
☐ C) E
☐ D) Z

13) enantiomers of drugs

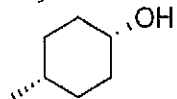
- A) behave the same
☒ B) behave like completely different drugs

14) The stereocenters in the below molecule are in the ____ configuration



- A) S,S
☒ B) R,R
☐ C) R,S
☐ D) S,R
☐ E) none of the above because molecule is not chiral

15) The stereocenters in the below molecule are in the ____ configuration

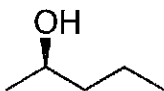
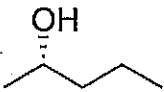
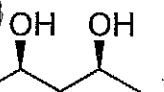
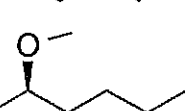


- A) S,S
☐ B) R,R
☐ C) R,S
☐ D) S,R
☒ E) none of the above because molecule is not chiral

16) Alcohols have higher boiling points than comparably sized alkanes because:

- A) the lone pairs of electrons on the oxygens repel each other
- B) alcohols are more polar (But C is the major reason)
- ☒ C) alcohols form attractive H-bonding interactions with each other
- D) alcohols form more vanderwaal interactions

17) Which of the compounds below will have the highest boiling point

- A) 
- B) 
- ☒ C) 
- D) 

18) What conditions would be needed for the following transformation

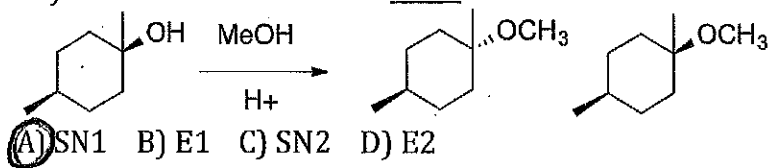


- A) HCl
- ☒ B) $\text{H}_2\text{SO}_4/\text{H}_2\text{O}$, Heat
- C) $\text{H}_2\text{SO}_4/\text{H}_2\text{O}$,
- D) HBr

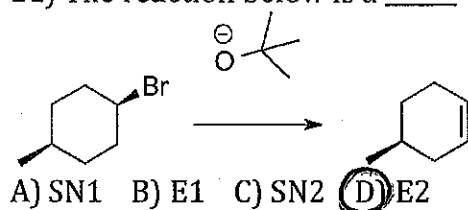
19) How many steps are there in the mechanism of a $\text{S}_{\text{N}}1$ nucleophilic displacement reaction?

- A) 1
- ☒ B) 2
- C) 3
- D) 4

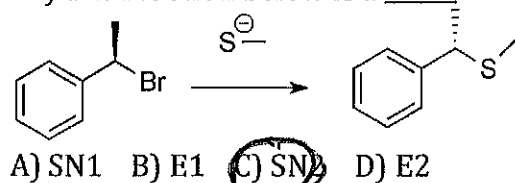
20) The reaction below is a _____



21) The reaction below is a _____



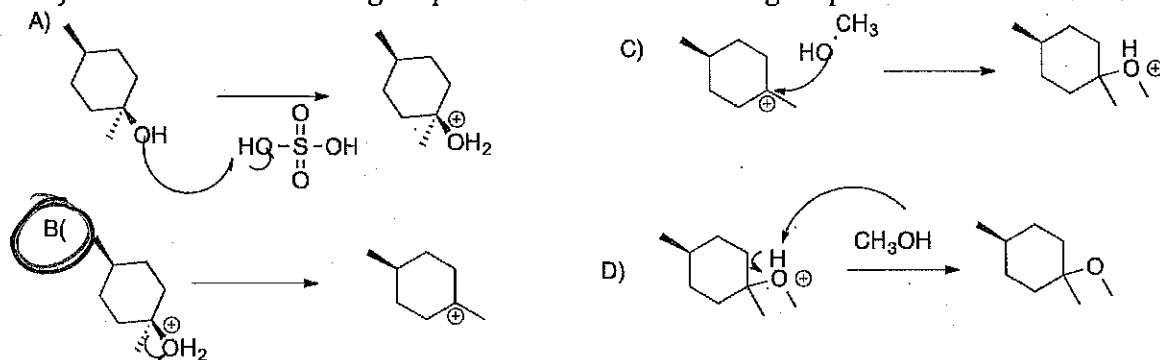
22) The reaction below is a _____



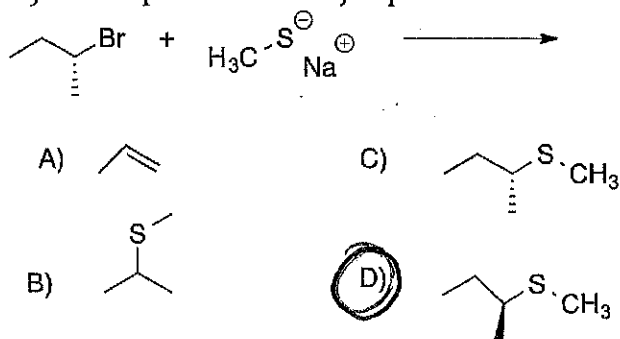
23) Which of the below is the worst leaving group

- A) I- B) Br- C) Cl- **D) F-**

24) Which of the following steps is the rate determining step of an SN1 reaction is



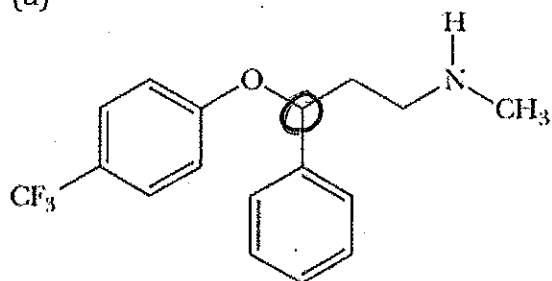
25) Please predict the major product form the below reaction



Part B. Short answer questions, 26-32, each problem is worth 5-12 points (total 61 points)

Problem 26. Following are structural formulas for three of the most widely prescribed drugs used to treat depression. Label all stereocenters in each compound and tell how many stereoisomers are possible for each compound. (9p)

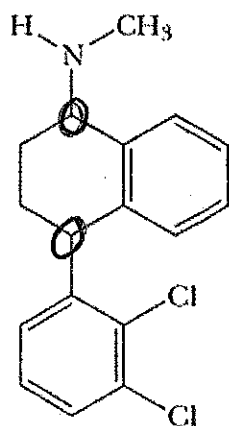
(a)



Fluoxetine
(Prozac®)

2

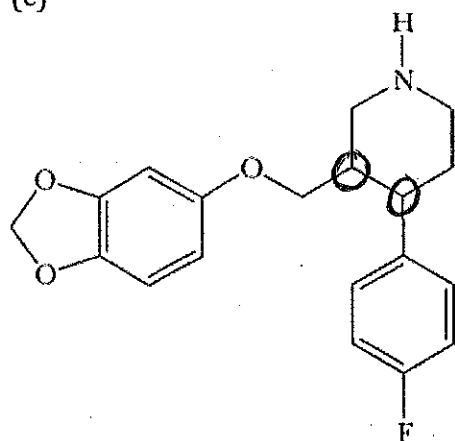
(b)



Sertraline
(Zoloft®)

4

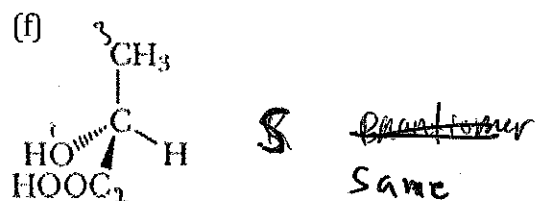
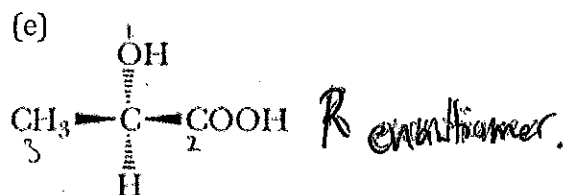
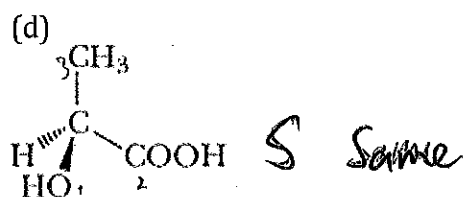
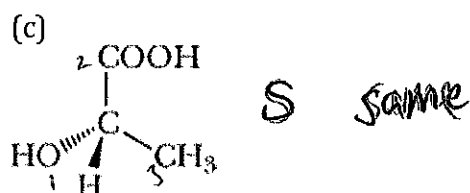
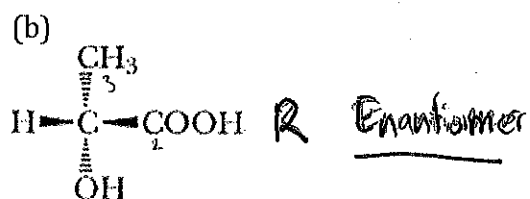
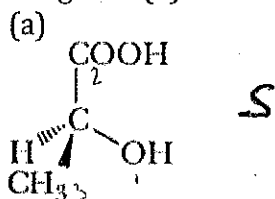
(c)



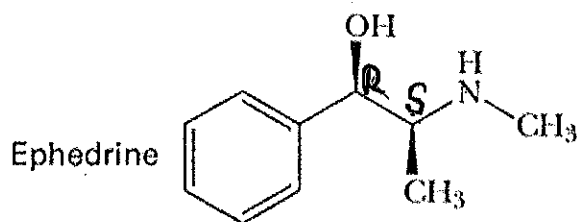
Paroxetine
(Paxil®)

4

Problem 27. (12p) Following are eight stereo representations of lactic acid. Take (a) as a reference structure. Which stereo representations are identical with (a) and which are mirror images of (a)?



Problem 28. For centuries, Chinese herbal medicine has used extracts of *Ephedra sinica* to treat asthma. Investigation of this plant resulted in the isolation of ephedrine, a potent dilator of the air passages of the lungs. The naturally occurring stereoisomer is levorotatory and has the following structure.

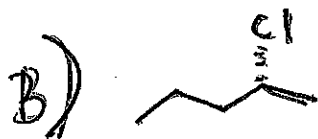


Assign an R or S configuration to each stereocenter. (8p)

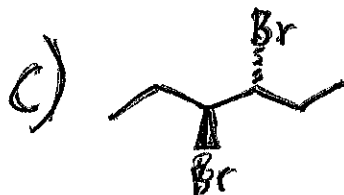
See above

Problem 29. Draw a structural formula for each compound (given are IUPAC names). (6p)

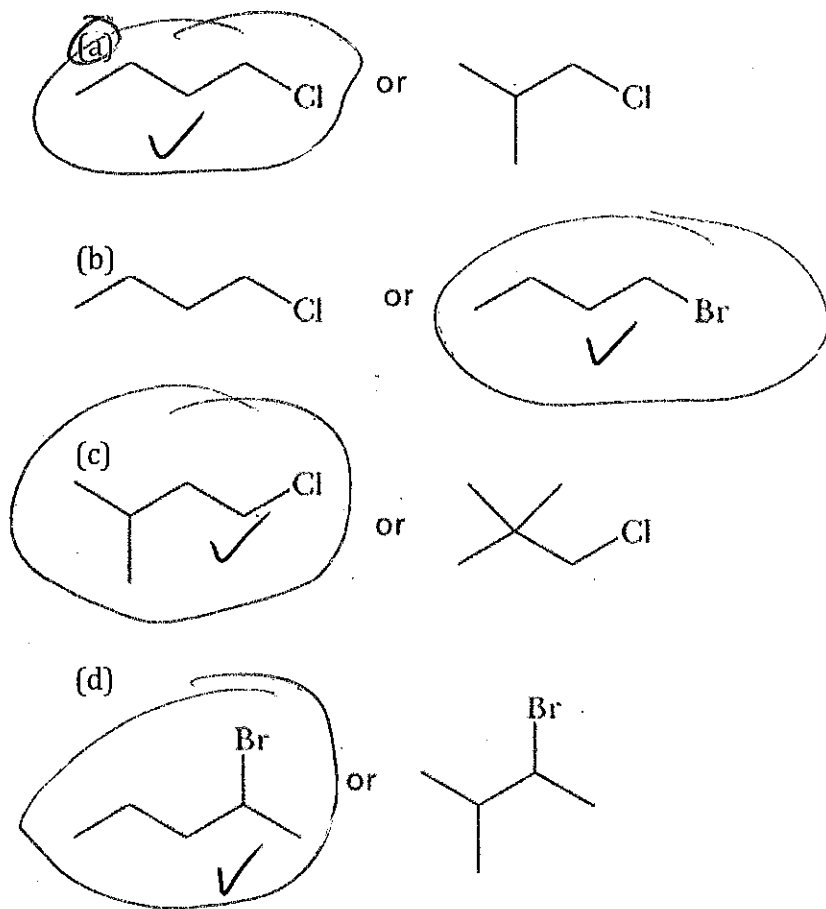
(a) 3-Bromopropene



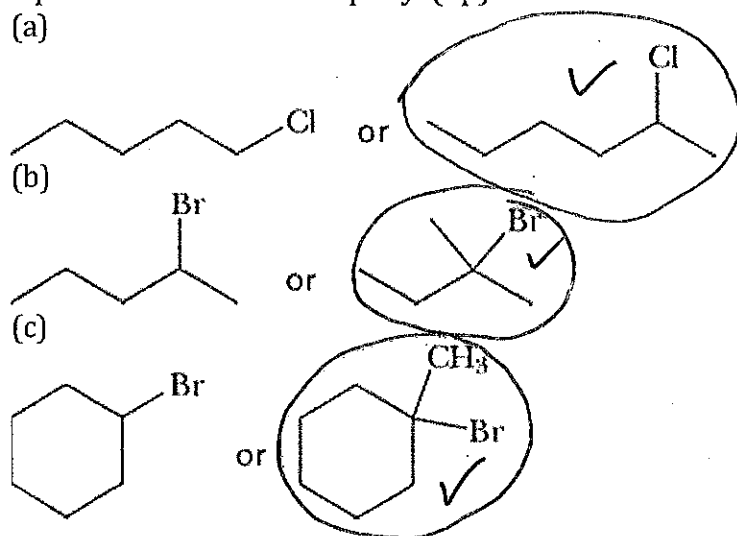
(c) meso-3,4-Dibromohexane



Problem 30. Select the member of each pair that shows the greater rate of S_N2 reaction with KI in acetone. (8p)



Problem 31. Select the member of each pair that undergoes nucleophilic substitution in aqueous ethanol more rapidly. (6p)



Problem 32. Complete these S_N2 reactions. (12p)

