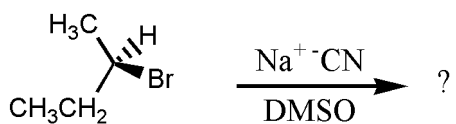


1. What would be the major product of the following reaction?

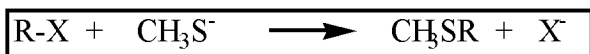


- A) $\begin{array}{c} \text{H}_3\text{C} \\ | \\ \text{CH}_3\text{CH}_2\text{C} \begin{array}{l} \nearrow \text{H} \\ \searrow \text{CN} \end{array} \end{array}$
- B) $\begin{array}{c} \text{H}_3\text{C} \\ | \\ \text{CH}_3\text{CH}_2\text{C} \begin{array}{l} \nearrow \text{H} \\ \searrow \text{N}\equiv\text{C} \end{array} \end{array}$
- C) $\begin{array}{c} \text{H}_3\text{C} \\ | \\ \text{CH}_3\text{CH}_2\text{C} \begin{array}{l} \nearrow \text{CN} \\ \searrow \text{H} \end{array} \end{array}$
- D) $\begin{array}{c} \text{H}_3\text{C} \\ | \\ \text{CH}_3\text{CH}_2\text{C} \begin{array}{l} \nearrow \text{N}\equiv\text{C} \\ \searrow \text{H} \end{array} \end{array}$
- E) $\begin{array}{c} \text{H}_3\text{C} \\ | \\ \text{CH}_3\text{CH}=\text{C}-\text{H} \end{array}$

2. Which of the following would you expect to react fastest with the nucleophile I^- (iodide)?

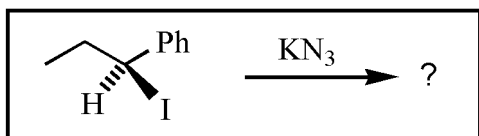
- A) $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$
 B) $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$
 C) $(\text{CH}_3)_2\text{CHCH}_2\text{Br}$
 D) $(\text{CH}_3)_2\text{CHCH}_2\text{Cl}$
 E) $(\text{CH}_3)_3\text{CCH}_2\text{Br}$

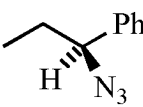
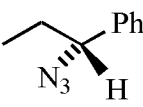
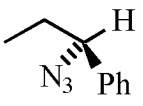
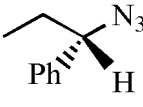
3. Which of the following haloalkanes would **not** undergo the reaction below?



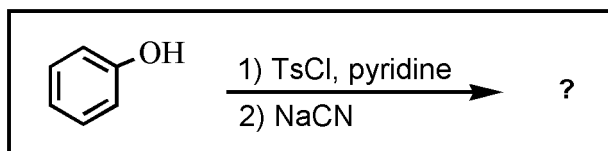
- A) $(\text{CH}_3)_2\text{CHI}$
 B) CH_3Cl
 C) $(\text{CH}_3)_3\text{CBr}$
 D) $\text{CH}_3\text{CH}_2\text{Br}$
 E) $\text{CH}_3\text{CH}_2\text{CH}_2\text{I}$

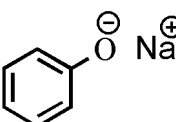
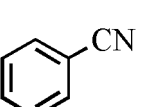
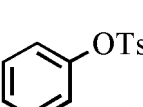
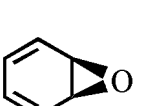
4. Predict the major product of the following reaction:



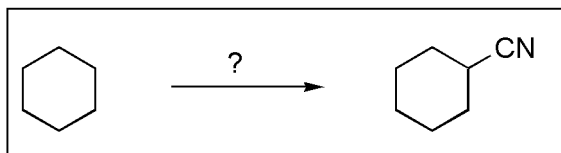
- A) 
 B) 
 C) 
 D) 
 E) no reaction occurs

5. What is the major product of the following two-step reaction?



- A) 
 B) 
 C) 
 D) 
 E) No reaction occurs.

6. What reactants are required to achieve the following transformation?



- A) $\xrightarrow{1. \text{PBr}_3}$
 $\xrightarrow{2. \text{NaCN}}$
- B) $\xrightarrow{1. \text{NaCN}}$
 $\xrightarrow{2. \text{H}_2\text{SO}_4}$
- C) $\xrightarrow{1. \text{Br}_2, h\nu}$
 $\xrightarrow{2. \text{HCN}}$
- D) $\xrightarrow{1. \text{SOCl}_2}$
 $\xrightarrow{2. \text{KCN}}$
- E) $\xrightarrow{1. \text{Br}_2, h\nu}$
 $\xrightarrow{2. \text{KCN}}$

7. To which side (if any) would the following equilibrium lie?

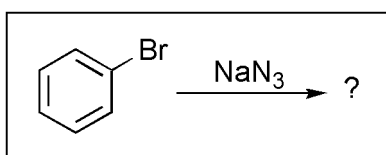


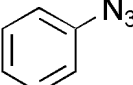

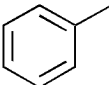

- A) to the left
B) to the right
C) equally to the right and left
D) there is no way to tell
E) only $\text{S}_{\text{N}}2$, $\text{S}_{\text{N}}1$ and E2 reactions are possible
8. Which of the following is **not** normally a good leaving group on carbon?
- A) Br
B) OCH_3
C) Cl
D) OSO_2R
E) I

9. Several alkyl halides, including iodomethane, are known carcinogens or cancer-suspect materials. To destroy these materials by conversion to non-electrophilic species, you can react them with nucleophiles. Which of the following would be the best for rapidly destroying methyl iodide (iodomethane)?

- A) CH_3OH
- B) NH_3
- C) H_2O
- D) NaI
- E) $\text{CH}_3\text{CO}_2\text{H}$

10. Predict the major product of the following reaction:



- A) 
- B) 
- C) 
- D) 
- E) no reaction occurs

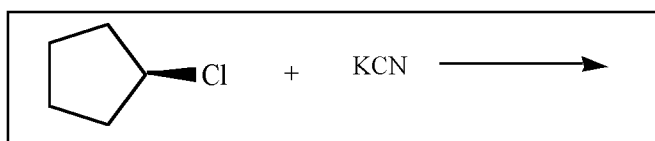
11. Which of the following reagents would best accomplish a typical $\text{S}_{\text{N}}2$ reaction?

- A) CH_3OH
- B) H_2O
- C) HCN
- D) KCN
- E) KO^tBu

12. Which of the following is the best leaving group?

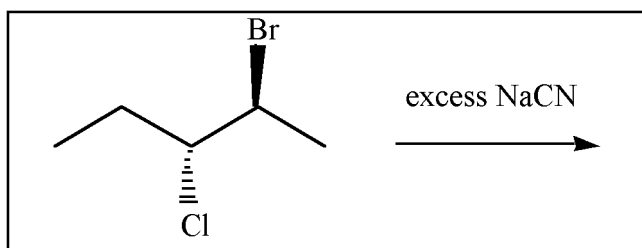
- A) I^{\ominus}
- B) NH_2^{\ominus}
- C) HO^{\ominus}
- D) F^{\ominus}
- E) $\text{CH}_3\text{O}^{\ominus}$

13. If the reaction rate of the following reaction is x , doubling the concentration of KCN would give what rate?



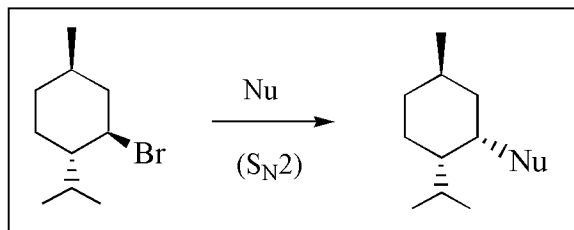
- A) $2x$
- B) $x/2$
- C) x^2
- D) $x^2/2$
- E) No change in reaction rate

14. What is the correct stereochemistry of the product of the following reaction:

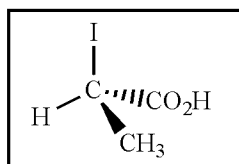


- A) $3R,4S$
- B) $2S,3R$
- C) $2R,3S$
- D) $2R,3R$
- E) $3R,4R$

15. S_N2 substitution at secondary halides and sulfonates is often complicated by competing $E2$ elimination. Which of the nucleophiles below would you choose to obtain the highest yield in an S_N2 reaction with menthyl bromide?

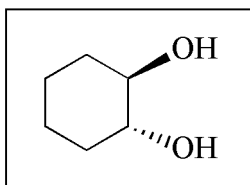


- A) CH_3ONa
 B) $\text{CH}_3\text{CO}_2\text{Na}$
 C) $(\text{CH}_3)_3\text{N}$
 D) $(\text{CH}_3)_3\text{COK}$
 E) $\text{C}_6\text{H}_5\text{SNa}$
16. How would you name the following compound?



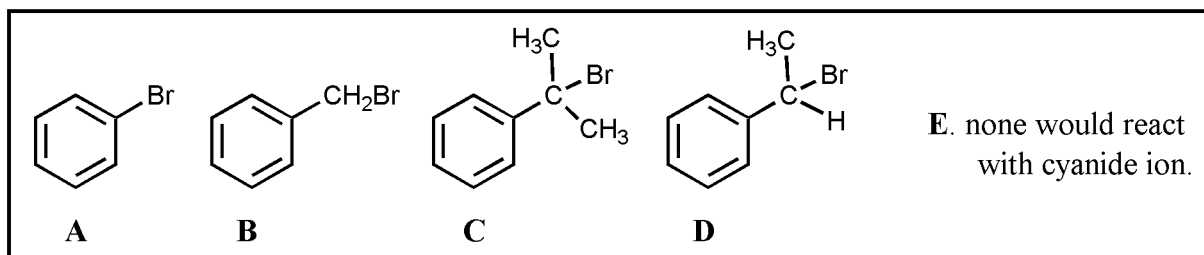
- A) (*S*)-2-iodo-2-methylethanoic acid
 B) (*R*)-2-iodo-2-methylethanoic acid
 C) (*S*)-2-iodopropanoic acid
 D) (*R*)-2-iodopropanoic acid
 E) None of these.
17. The Walden Inversion (inversion of configuration) is associated with which of the following?
- A) $E1$ reaction
 B) free-radical halogenation
 C) S_N1 reaction
 D) S_N2 reaction
 E) none of these

18. What would be the proper name of the following?



- A) (1*R*,2*R*)-trans-1,2-cyclohexanediol
- B) (1*R*,2*S*)-trans-1,2-cyclohexanediol
- C) (1*S*,2*R*)-trans-1,2-cyclohexanediol
- D) (1*S*,2*S*)-trans-1,2-cyclohexanediol
- E) (1*S*,2*R*)-cis-1,2-cyclohexanediol

19. Which of the haloalkanes shown below would react most rapidly with cyanide ion?

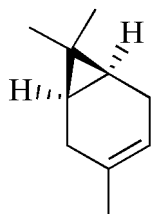


- A) A
- B) B
- C) C
- D) D
- E) E

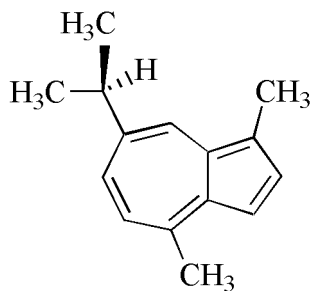
20. Which of the following can be used to synthesize (*R*)-2-cyanopentane from (*R*)-2-bromopentane?

- A) NaBr
- B) NaCN
- C) NaI followed by KCN
- D) NaCN followed by HI
- E) This reaction cannot occur

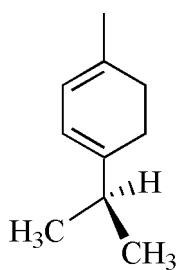
21. An unknown compound has been isolated in pure form and found to exhibit $[\alpha]_D = +15^\circ$ ($c = 4, \text{CH}_2\text{Cl}_2$). Which of the following **might** be the structure of the compound?



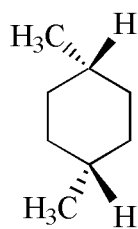
A)



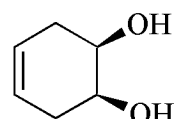
B)



C)

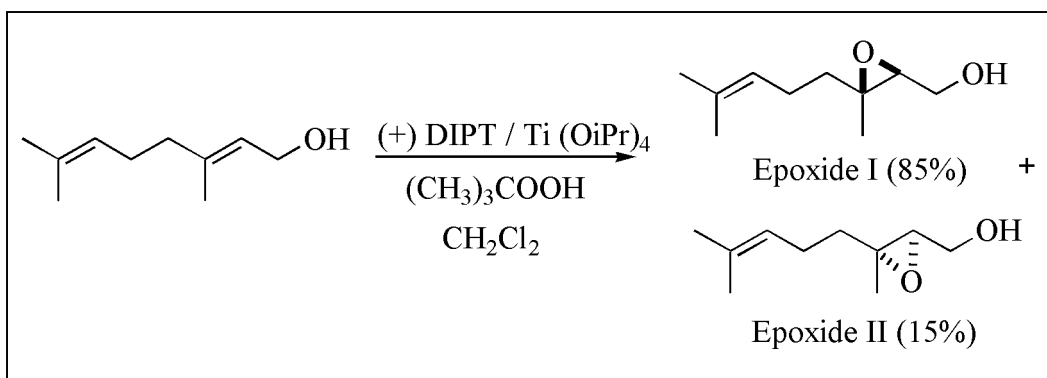


D)



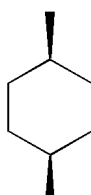
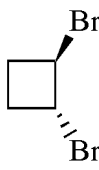
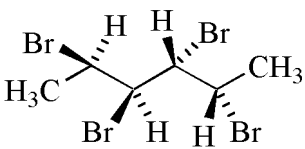
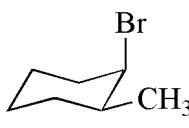
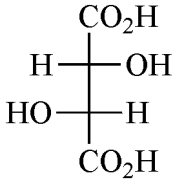
E)

22. Sharpless epoxidation of geraniol gave two products, epoxide I (85%) and epoxide II (15%). This mixture of epoxides represents what percent optical purity (or percent enantiomeric excess, % ee)?



- A) 0%
B) 15%
C) 70%
D) 85%
E) 100%

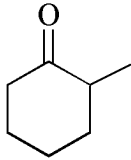
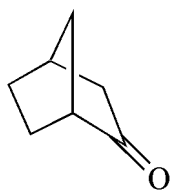
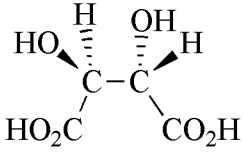
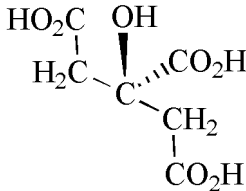
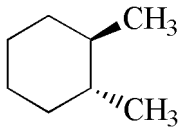
23. Which of the following molecules represents a meso compound?

- A) 
- B) 
- C) 
- D) 
- E) 

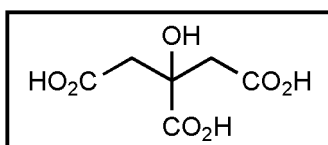
24. Optically pure (*S*)-monosodium glutamate has a specific rotation of $+24^\circ$. What specific rotation would (*R*)-monosodium glutamate of 50% optical purity have?

- A) $+24^\circ$
B) -24°
C) -18°
D) -12°
E) $+18^\circ$

25. Which of the following molecules is **not** chiral?

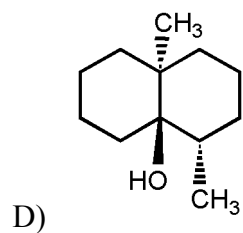
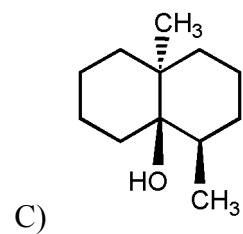
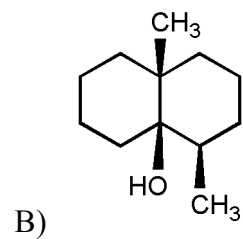
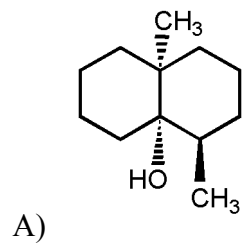
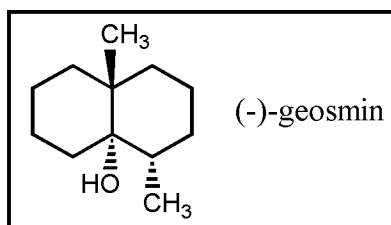
- A) 
- B) 
- C) 
- D) 
- E) 

26. How many total stereoisomers of the following are possible?



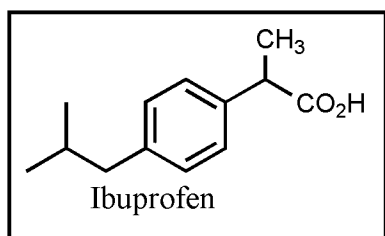
- A) 1
B) 2
C) 3
D) 4
E) 6

27. The structure of (-)-geosmin is shown below. Which structure would be that of its enantiomer, (+)-geosmin?



E) None of these.

28. Which of the amines below **might** be appropriate for the resolution of racemic Ibuprofen?



- A)
- B)
(racemic)
- C)
- D)
- E)

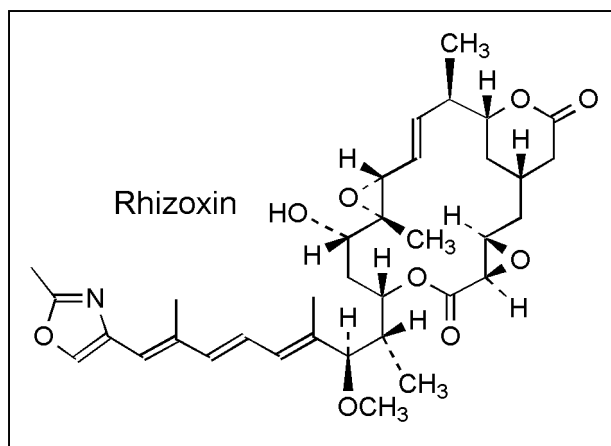
29. What technique(s) can be used to obtain non-racemic compounds from racemic material?

- A) Resolution
 B) Distillation
 C) Extraction
 D) Column chromatography
 E) Both B and C

30. Which of the following is NOT TRUE for a meso compound:

- A) It is achiral
- B) It will rotate plane polarized light
- C) It may be cyclic or acyclic
- D) It is a stereoisomer
- E) It has a mirror plane

31. How many stereogenic (chiral) centers are found in Rhizoxin?



- A) 5
- B) 7
- C) 9
- D) 11
- E) 14

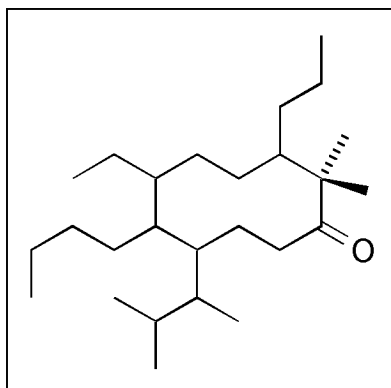
32. The **best** (most reliable) test for the presence of chirality in a molecule is

- A) carbon attached to four different groups
- B) existence of a mirror image
- C) non-superimposability on mirror image
- D) two or more isomers possible
- E) observation of optical rotation in a sample

33. Which of the following statements is **not** true?

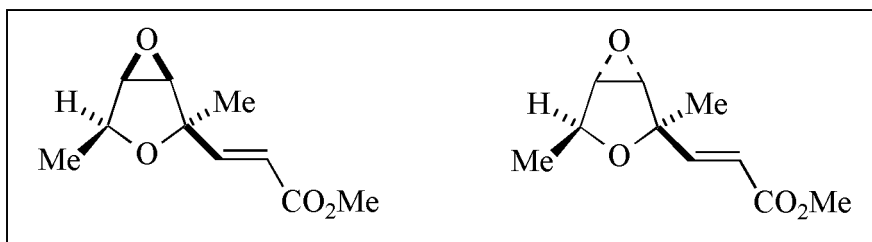
- A) Enantiomers have identical properties except in chiral environments or with plane-polarized light.
- B) Reactions involving only achiral or racemic materials must produce achiral or racemic products.
- C) Diastereomers have identical properties in all environments.
- D) Enantiomers exhibit equal and opposite optical rotations.
- E) All of the above are true.

34. The following molecule has how many possible stereoisomers?



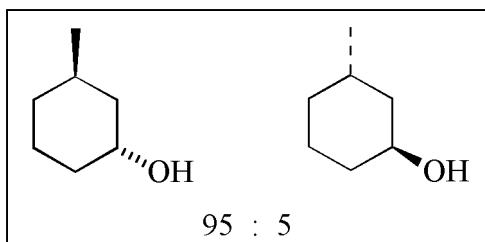
- A) 1
- B) 4
- C) 8
- D) 16
- E) 32

35. The relationship between the following two compounds is:



- A) same molecule
- B) enantiomers
- C) diastereomers
- D) mesos
- E) conformers

36. A particular reaction produces the following two alcohols in a ratio of 95 : 5.



The enantiomeric excess (% ee) is:

- A) 100
- B) 95
- C) 90
- D) 85
- E) none of these

Answer Key - Ferret:Exam:quiz3.qf.ef

1. C
2. A
3. C
4. B
5. C
6. E
7. A
8. B
9. B
10. E
11. D
12. A
13. A
14. C
15. E
16. D
17. D
18. A
19. B
20. C
21. A
22. C
23. C
24. D
25. D
26. A
27. C
28. E
29. A
30. B
31. D
32. C
33. C
34. E
35. C
36. C