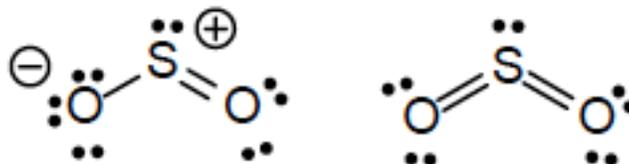


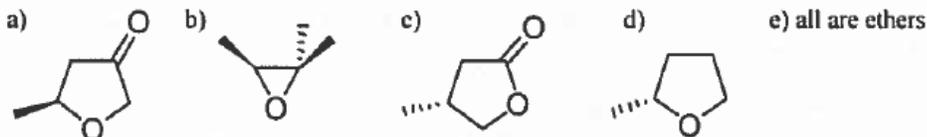
CHEM 1315 READING DAY STUDY SESSION WORKSHEET
PROBLEMS

1. Given the two Lewis structures for sulfur dioxide, which of the statements below is correct?

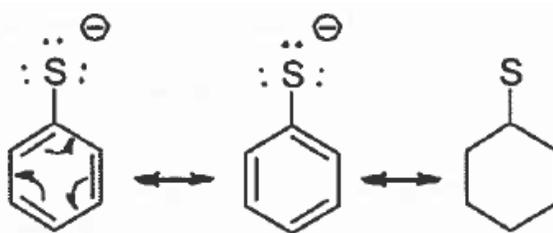


- Both structures are based on three electron pairs in σ -type orbitals.
 - The bond angle in either structure will be less than the ideal 120 degrees expected for sp^2 hybridization.
 - Both structures predict the molecule to have a dipole moment.
 - Neither structure requires the use of a d-orbital by sulfur.
 - None of these are correct.
2. Which of the following should be most soluble in water? Molecular weights are in parentheses.
- CH_3CH_2F (48)
 - $CH_3CH_2CH_2OH$ (60)
 - CH_3CH_2Cl (64)
 - $CH_3CH_2OCH_3$ (60)
 - CH_3CH_2Br (109)

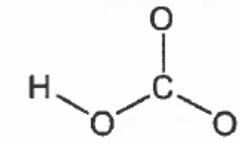
3. Which of the following molecules is not an ether?



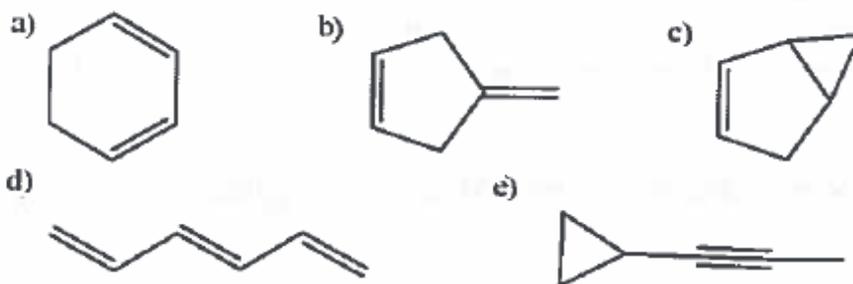
4. Draw a third resonance structure for the thiophenolate anion, using arrows to indicate the movement of electron pairs as appropriate.



5. Draw resonance structures for the bicarbonate anion, HOCO_2^- , which are consistent with it having two carbon-oxygen bonds that are equivalent. For the first structure, complete the partial Lewis structure provided, adding electrons and formal charges as appropriate. Then draw additional resonance structures as necessary. Do not include arrows indicating movement of electron pairs.

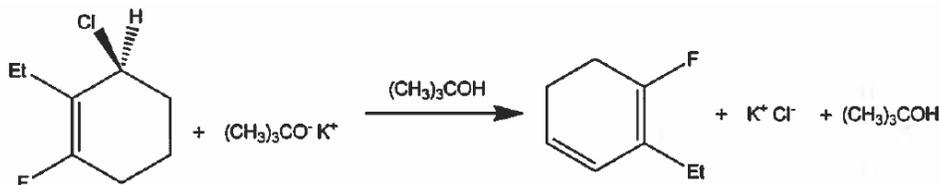


6. A compound of composition C_6H_8 reacts with molecular hydrogen in the presence of a catalyst to produce a new compound of composition C_6H_{10} . Which one of the following C_6H_8 constitutional isomers is consistent with this datum?

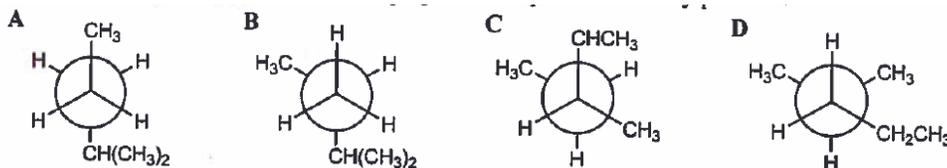


7. What is the approximate dihedral angle between the two carbon-fluorine bonds in the most stable conformation of trans-1,2-difluorocyclohexane?
- 0°
 - 60°
 - 109°
 - 120°
 - 180°
8. The C-C-C bond angles in the most stable conformation of cyclohexane are approximately
- 60°
 - 120°
 - 109°
 - 180°
 - none of these
9. Which of the following statements is correct?
- Ethylene (ethene) is a stronger Brønsted-Lowry acid than acetylene (ethyne)
 - Acidity increases as the $\text{p}K_a$ becomes more positive
 - The acidity of H-X (where X is a halogen) decreases as you go down the halogen column in the periodic table
 - HF etches glass but it is none-the-less a weaker acid than HI, which does not etch glass
 - none of the above are correct

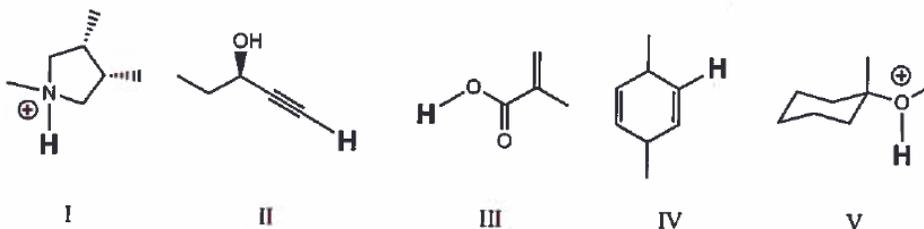
10. The following reaction is an example of:
- an elimination reaction
 - an addition reaction
 - a substitution reaction
 - a rearrangement
 - a combination of elimination and rearrangement



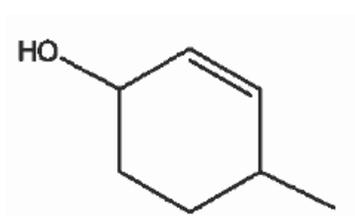
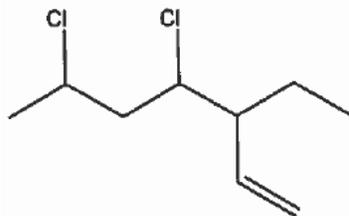
11. Assuming that the absolute magnitudes of ΔH° and ΔS° are the same, which combination will result in the largest equilibrium constant at a given temperature?
- ΔH° negative, ΔS° negative
 - ΔH° positive, ΔS° negative
 - ΔH° negative, ΔS° positive
 - ΔH° positive, ΔS° positive
 - There is no direct relationship between ΔH° and ΔS° and K_{eq} at any temperature.
12. Which of the following Newman projections represent 2-methylpentane?



- A & B
 - C & D
 - A only
 - D only
 - A & D
13. The ionization constants (K_a) for $\text{CF}_3\text{CO}_2\text{H}$ and HF in water are 6.6×10^{-1} and 6.3×10^{-4} , respectively. However, in liquid ammonia both acids are completely ionized. Which of the following is not correct?
- The acidities are not differentiated in ammonia because ammonia is a stronger base than water.
 - NH_4^+ ion is the strongest acid that can exist in liquid ammonia.
 - The acidities of the acids are indistinguishable in ammonia because they are leveled to the acidity of NH_4^+ .
 - The conjugate bases CF_3CO_2^- and F^- are both stronger than the conjugate base of ammonia.
 - None of the above statements are correct.
14. Rank the **bold-faced** hydrogens for the following compounds from the most acidic to the least acidic.



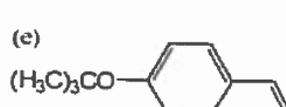
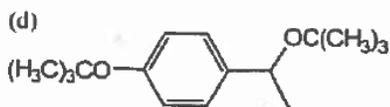
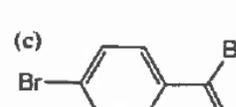
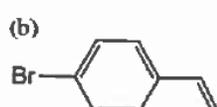
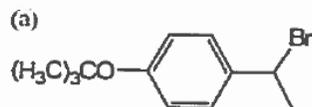
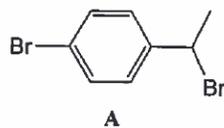
15. Which of the following four acid-base reactions would not have a $K_{eq} > 1$?
- $CH_3Li + CH_3CH_2OH = CH_4 + CH_3CH_2OLi$ (in hexane)
 - $CH_3CH = CH_2 + NaOH = CH_3CH = CHNa + H_2O$ (in water)
 - $CH_3C \equiv CNa + H_2O = CH_3C \equiv CH + NaOH$ (in water)
 - $(CH_3)_2CHOH + NaH = (CH_3)_2CHONa + H_2$ (in isopropyl alcohol)
 - all would have $K > 1$
16. Give IUPAC acceptable names for the following compounds.



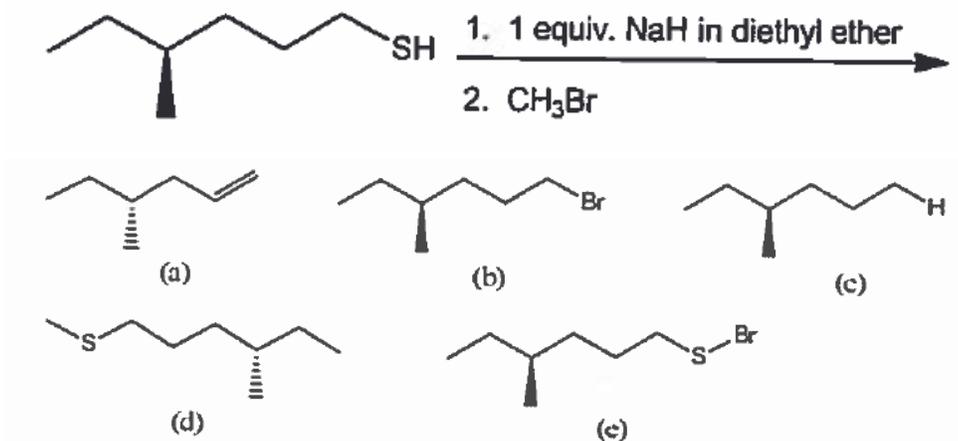
17. Draw a bond-line structure of product **A** expected based on the indicated movement of electron pairs and the other products of the reaction.



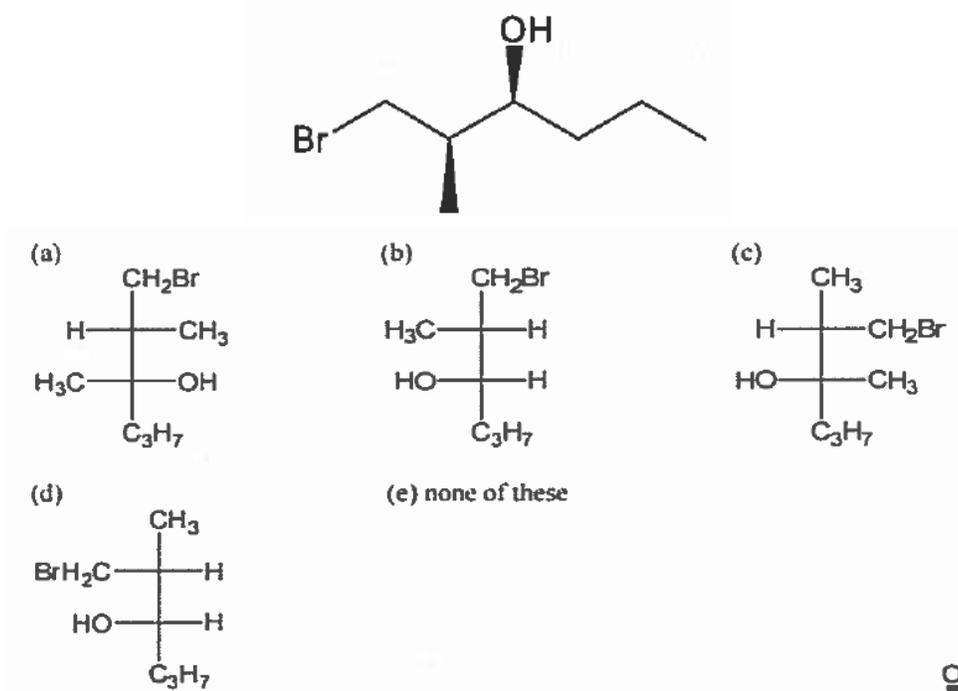
18. Which is the strongest nucleophile, i.e., most nucleophilic?
- H_2O
 - CH_3O^-
 - $CH_3CO_2^-$
 - CH_3OCH_3
 - OH^-
19. What is the major product from treatment of compound **A** with $(CH_3)_3CO^-K^+$ in $(CH_3)_3COH$ at $60^\circ C$?



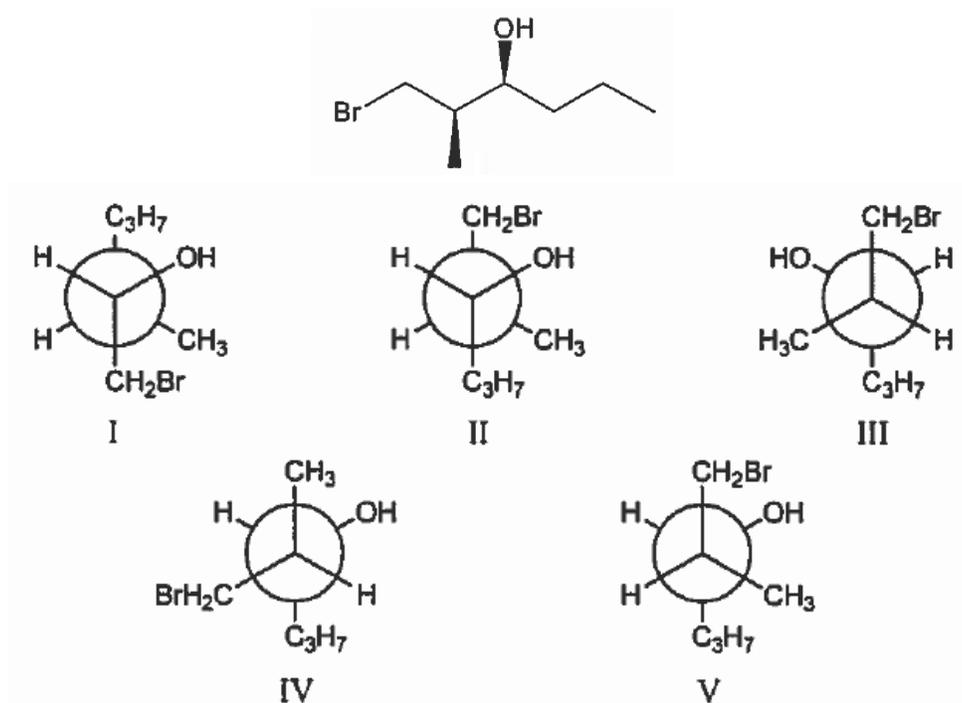
20. The product of the following two-step reaction sequence, which involves an acid-base reaction and an S_N2 reaction, is?



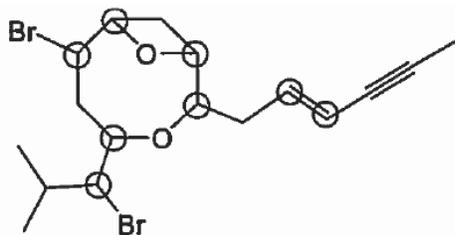
21. Which of the following is a polar, aprotic solvent?
- diethyl ether
 - chloroacetic acid
 - hexane
 - ethanol
 - none of these
22. Which of the Fischer projections below correctly represent the molecule below?



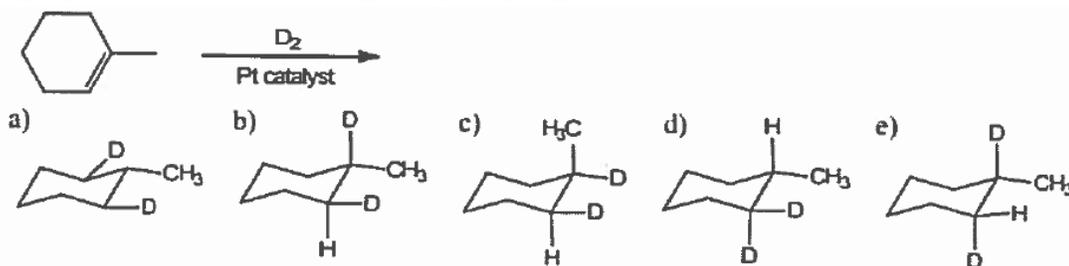
23. Which staggered Newman projection(s), looking down the C2-C3 bond (C2 in front and C3 in back), illustrates the compound below?



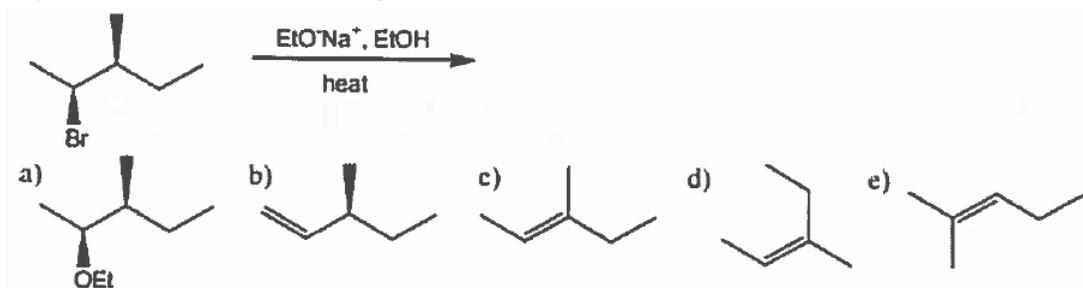
24. How many compounds, including stereoisomers, could be referred to as dichlorocyclopropane?
25. How many stereogenic centers does the molecule below have?



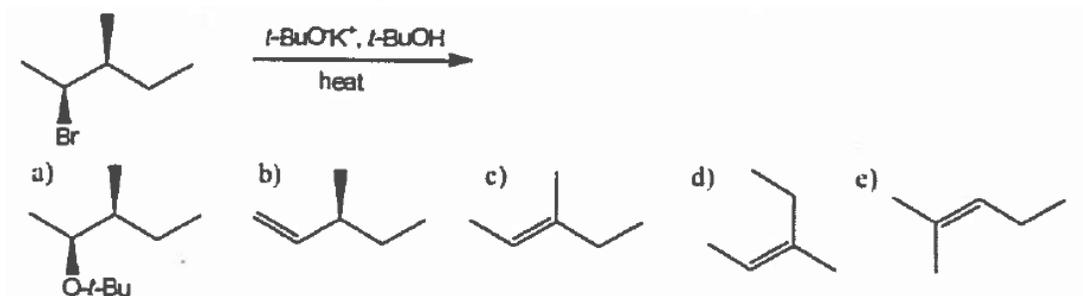
26. The major product from the following catalytic hydrogenation reaction is?



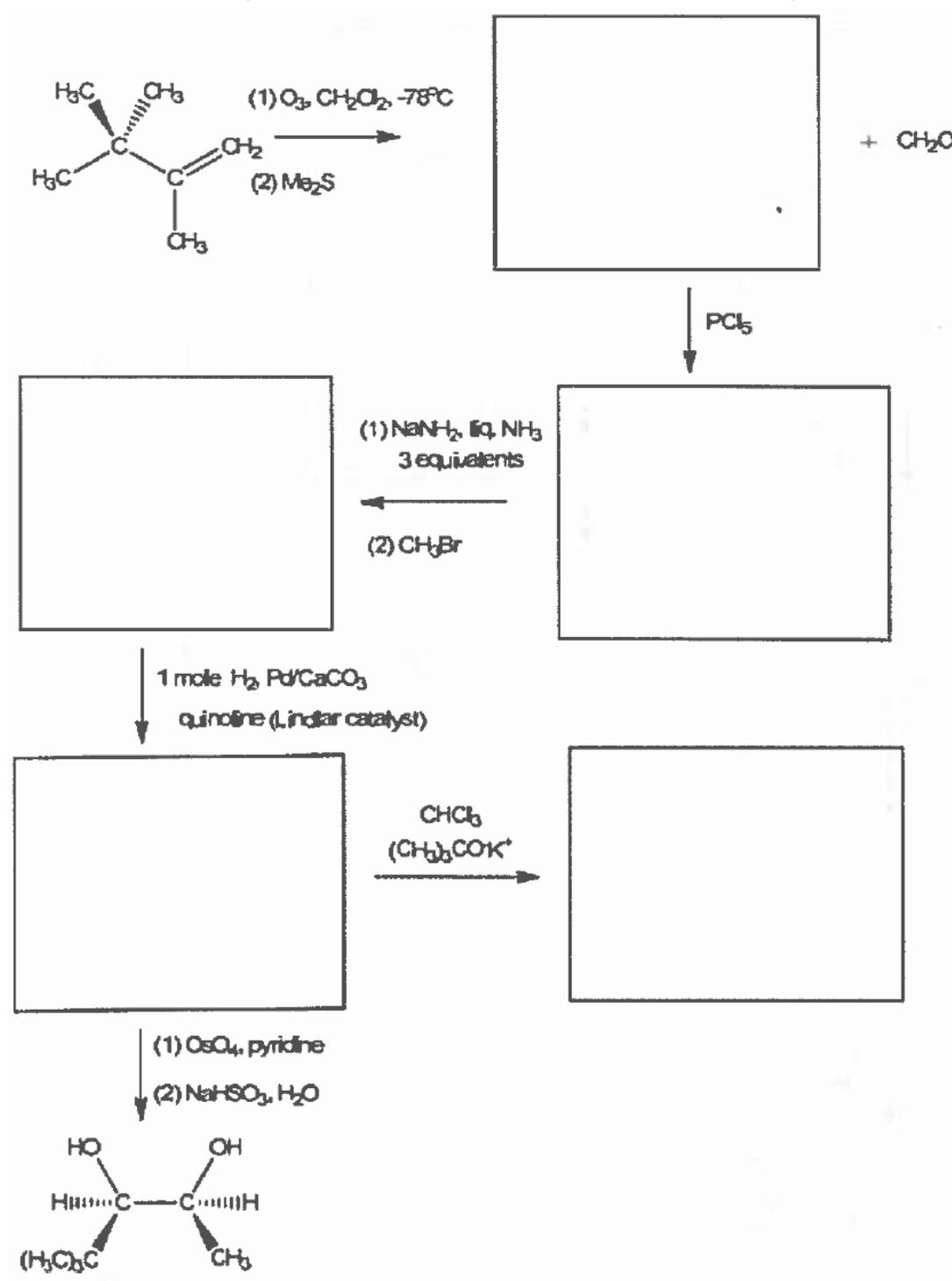
27. The major product from the following reaction is?



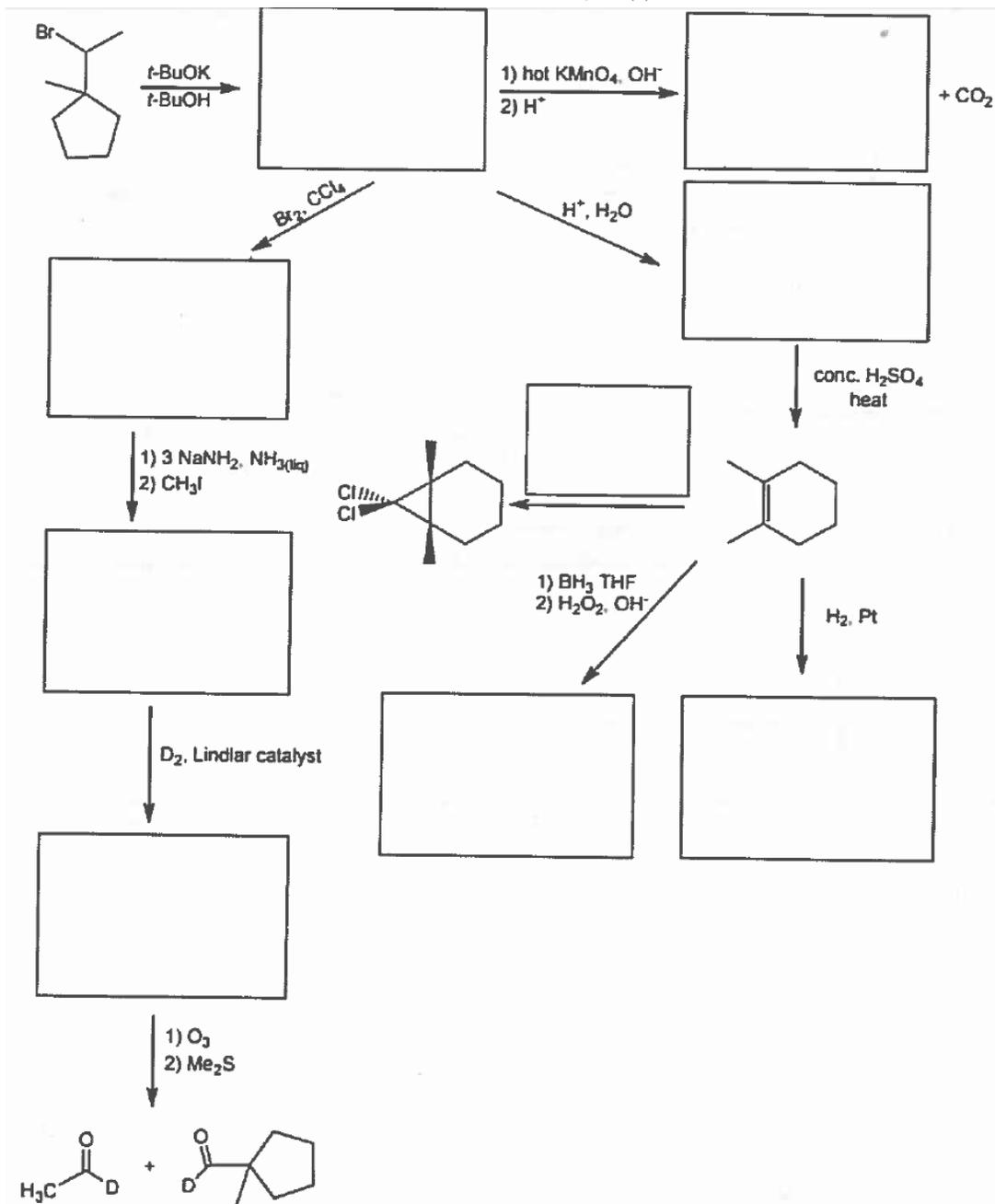
28. The major product from the following reaction is?



29. Draw the structure of the organic product for each of the reactions in the following sequence.

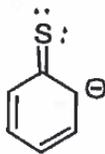


30. Fill in the boxes with the proper bond-line structure or reagent(s) as appropriate.

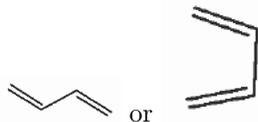


ANSWERS

1. d
2. b
3. c

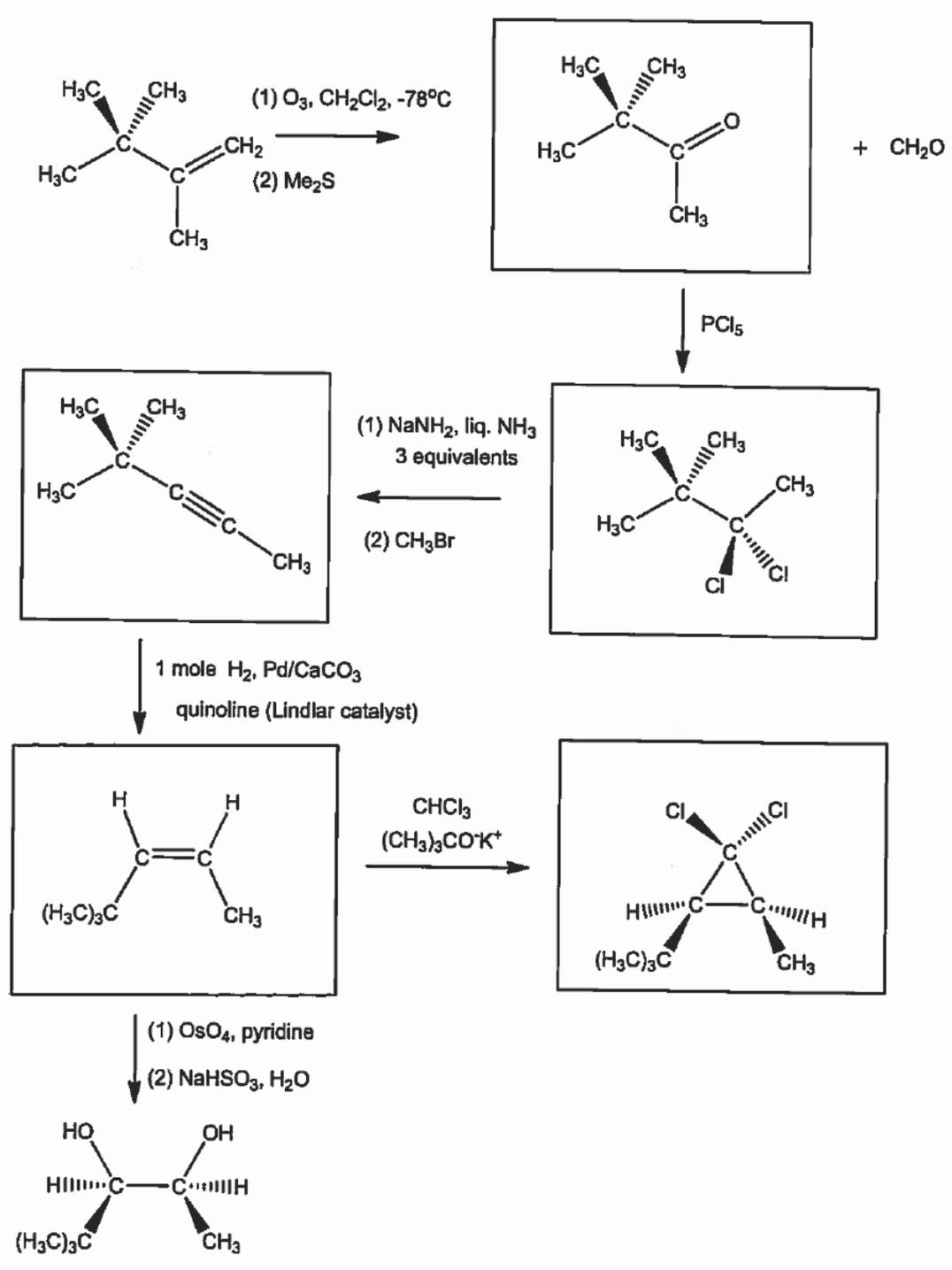


- 4.
5. -
6. c
7. b
8. c
9. d
10. a
11. c
12. e
13. d
14. V > III > I > II > IV
15. b
16. 4,6-dichloro-3-ethyl-1-heptene or 4,6-dichloro-3-ethylhept-1-ene;
4-Methyl-2-cyclohexenol or 4-Methyl-2-cyclohexen-1-ol



- 17.
18. b
19. b
20. d
21. a
22. d
23. IV and V
24. 4
25. 8
26. b
27. c
28. b

29. .



30. .

