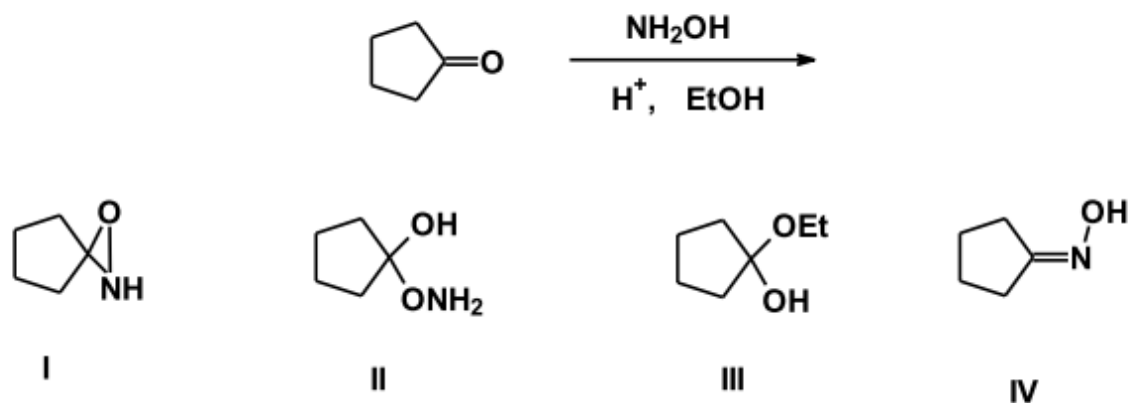


3. Indicate the major product in the following reaction.

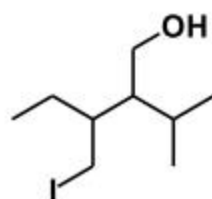


- A. I;
- B. II;
- C. III;
- D. IV.

9. Which of the compounds listed below is chiral?

- A. *Trans*-1,2-dibromocyclohexane;
- B. *Cis*-1,2-dibromocyclohexane;
- C. *Cis*-1,4-dibromocyclohexane;
- D. *Trans*-1,4-dibromocyclohexane;
- E. All of these.

13. What is the name of the following compound according to the IUPAC rules?



- A. 3-(iodomethyl)-2-isopropyl-pentan-1-ol;
- B. 4-iodo-3-ethyl-2-isopropyl-butan-1-ol;
- C. 1-iodo-2-ethyl-3-isopropyl-butan-4-ol;
- D. 1-(iodomethyl)-2-isopropyl-pentan-5-ol;

22. Indicate the pair of molecules / ions of planar square symmetry:

- A.  $\text{BeF}_4^{2-}$ ,  $\text{Ni}(\text{CN})_4^{2-}$ ;
- B.  $\text{AlCl}_4^-$ ,  $\text{HgI}_4^{2-}$ ;
- C.  $\text{Pt}(\text{H}_2\text{O})_4^{2+}$ ,  $\text{HgI}_4^{2-}$ ;
- D.  $\text{Ni}(\text{CN})_4^{2-}$ ,  $\text{XeF}_4$ .

28. Concentrations of  $\text{Ag}(\text{NH}_3)^+$  and  $\text{Ag}(\text{NH}_3)_2^+$  complexes are equal for excess concentration of  $\text{NH}_3$  equal to (summary stability constants for complexes of  $\text{Ag}^+$  with  $\text{NH}_3$ :  $\beta_1 = 10^{3.4}$ ,  $\beta_2 = 10^{7.4}$ ):

- A.  $10^{-1}$  M;
- B.  $10^{-2}$  M;
- C.  $10^{-3}$  M;
- D.  $10^{-4}$  M.

34. The total energy (relativistic) of a particle with mass equal to the rest mass of proton is circa (velocity of light in vacuum: 300 000 km/s):

- A.  $10^{-10}$  J;
- B.  $10^{-6}$  J;
- C.  $10^{-2}$  J;
- D.  $10^2$  J.

43. Nitrogen,  $\text{N}_2$ , has the following properties (marked with a, b, c and d characters):

- a. melting point (for pressure =  $10^5$  Pa) : 63.2K
- b. boiling point (for pressure =  $10^5$  Pa) : 77.4 K
- c. triple point :  $0.127 \times 10^5$  Pa, 63.1 K
- d. critical point :  $33.5 \times 10^5$  Pa, 126.0 K

45. The equilibrium constant of the esterification reaction proceeding between the acetic acid and ethanol at the temperature T is equal to 4.0. How many grams of water should be added to a mixture of 1.0 mol of acetic acid and 2.0 moles of ethanol if the yield of this reaction is equal to 50%:

- A. 99;
- B. 9.0;
- C. 19.8;
- D. 36.

58. Which group of hydrogen atoms (in the following compound) should appear at a highest ppm in the  $^1\text{H}$  NMR spectrum?

A. I;

B. II;

C. III;

D. IV.

