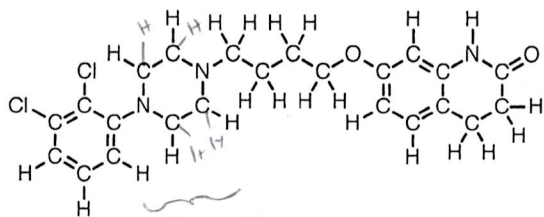
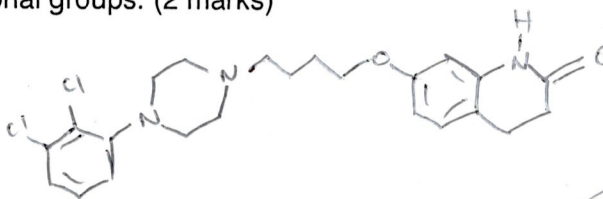


1. **Abilify** (below) is an atypical antipsychotic. It is recommended and primarily used in the treatment of schizophrenia and bipolar disorder. In 2014, Abilify was the 2nd highest grossing drug worldwide at \$7.2 billion. Redraw Abilify in the skeletal form, careful to preserve the appropriate bond angles and functional groups. (2 marks)



ignore errors here



2. Other than alkanes, what other functional groups are present in the drug above?

List up to 4 of the unique functional groups present. (4 marks)

amide aromatic (benzene) halide ether amine

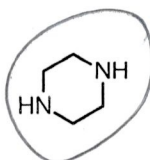
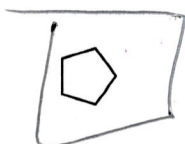
3. How many sp^2 hybridized carbons are present in the drug above? (1 mark)

13

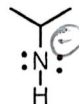
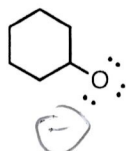
4. How many secondary carbons are present in the drug above? (1 mark)

4

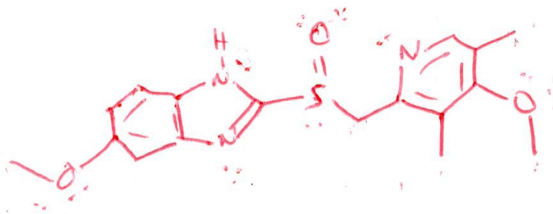
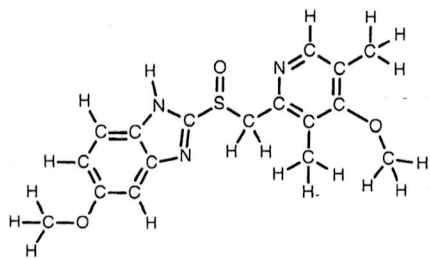
5. The following precursors are all used in the synthesis of the pharmaceutical above. Circle the molecule that has the highest boiling point and draw a rectangle around the molecule that you expect has lowest boiling point (2 marks).



6. The intermediates below are present during the synthesis of the drug above. Lone pairs have been added where needed. Show the formal charge on the appropriate atoms below (4 marks).



1. **Esomeprazole** sold under the brand name **Nexium**, is a proton-pump inhibitor which reduces stomach acid in patients. In 2014, Nexium was the 3rd highest prescribed drug worldwide at 13.2 million prescriptions. Redraw Esomeprazole (below) in the skeletal form, careful to preserve the appropriate bond angles and functional groups. (2 marks)



2. Other than alkanes, what other functional groups are present in the drug above? List up to 3 of the unique functional groups present. (3 marks)

ether, amine, benzene

3. How many sp^2 hybridized carbons are present in the drug above? (1 mark)

12

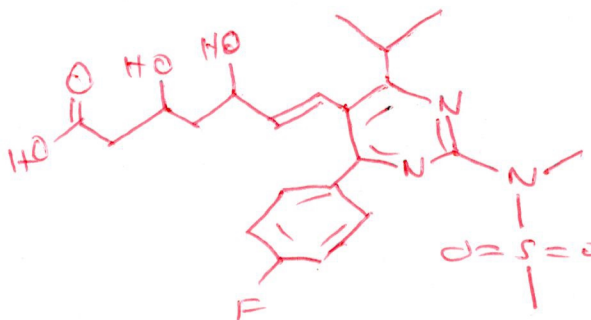
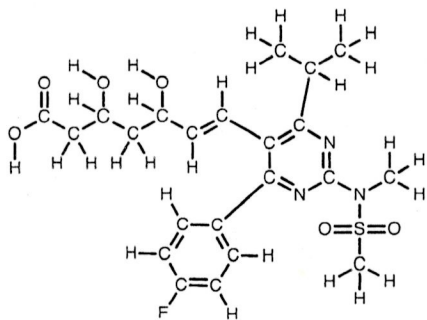
4. How many lone pairs are present in the drug above (1 mark)?

9 (+1) 18 (or 20)

5. How many primary carbons are present in the drug above? (1 mark)

3

6. **Rosuvastatin**, marketed as **Crestor**, is a member of the drug class of statins, used to treat high cholesterol and prevent cardiovascular disease. In 2013 Crestor was the fourth-highest selling drug in the United States, at \$5.2 billion in sales. Redraw Crestor (below) in the skeletal form, careful to preserve the appropriate bond angles and functional groups. (2 marks)



7. Other than alkanes, what other functional groups are present in the drug Crestor above? List up to 4 of the unique functional groups present. (4 marks)

carboxylic acid, alcohol, fluoride
aromatic, (amine, alkene)