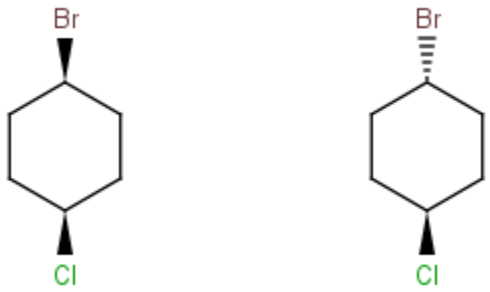
ACE Organic – Assignment 3

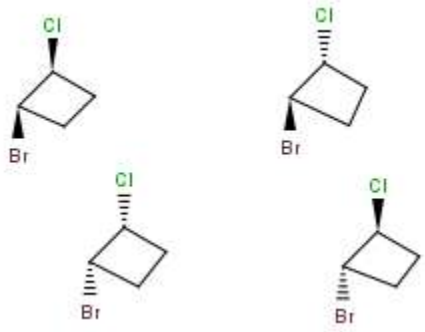
(1) Draw all stereoisomers of 1-bromo-2-chlorocyclohexane. Use bold and hashed wedges to show the stereochemistry.

(2) Draw all stereoisomers of 1-bromo-4-chlorocyclohexane. Use bold and hashed wedges to show the stereochemistry.



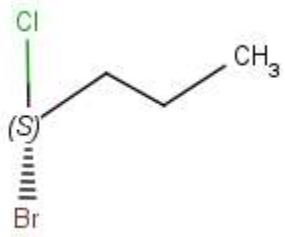
Right! This compound has a plane of symmetry so it's not chiral. It has only two geometrical isomers.

(3) Draw all stereoisomers of 1-bromo-2-chlorocyclobutane. Use bold and hashed wedges to show the stereochemistry. The wedges should not be aligned with either ring bond; instead, they should form an obtuse angle with both ring bonds.

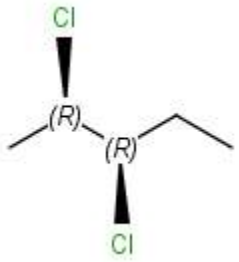


Right! This compound has two stereocenters, and there are 2^2 = four stereoisomers.

(4) Draw the structure of (*S*)-1-bromo-1-chlorobutane. Use bold or hashed wedges to indicate the configuration at stereogenic C atoms.

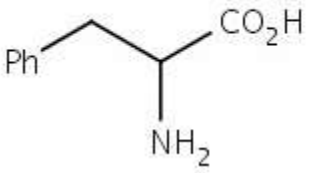


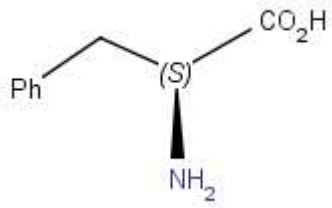
(5) Draw the structure of (2*R*,3*R*)-2,3-dichloropentane. Use bold or hashed wedges to indicate the configuration at stereogenic C atoms.



(6) Draw the S isomer of phenylalanine (the compound shown).

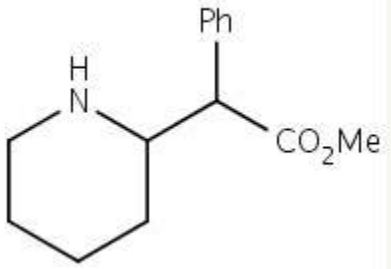
Click image to launch *MarvinView*™

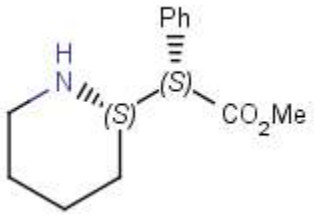




(7) Methylphenidate (also known as Ritalin) has the structure shown below with the (*S*,*S*) configuration. Draw its structure with the correct configurations indicated.

Click image to launch *MarvinView*™



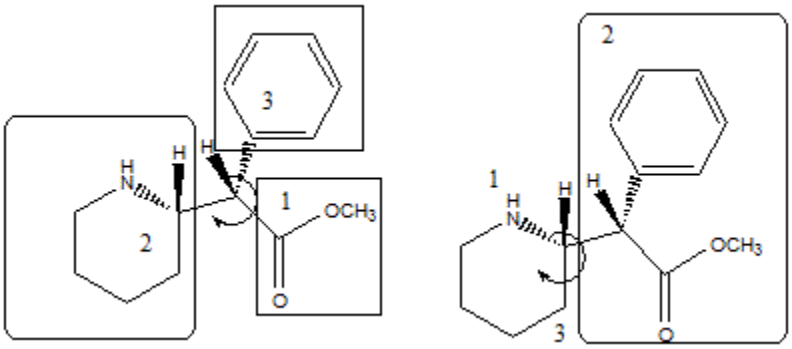


Explanation: When assigning R/S configurations, it's all about first, determining whether you have a chiral carbon (carbon bonded to 4 different groups [H, CH2, CH3 etc]). Then it's all about determining where your lowest priority group is (usually Hydrogen). The reason why this is difficult is because in line angle structures, hydrogen isn't drawn. Therefore, it matter whether the hydrogen is coming out of the plane (bold wedge) or into the plane (dashed wedge). The reason why we need to know the lowest priority group is because we need to place that group going away from our perspective, and then rank the remaining 3 groups, in either clockwise or counter clockwise fashion. Think of it as a driving steering wheel. You find the lowest priority group and make that the stem of the steering wheel going away from you. With the remainder, draw a circle in the direction of importance. So now analyze the molecule.

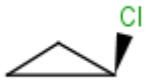
You have 2 chiral carbons. On the left one, the 4 groups are: -N-,C-CH2,Ph-CH-CO2,and H) Lowest priority group is H. Since we can't move the other 3 groups, making the H either coming out of the plane or into the plane makes a difference. So let's pick a direction and test it out.

Imagine the H going into the plane, so a dashed wedge. It is out steering wheel column, and the remaining 3 make a circular shape. In order of priority (greater electroneg. etc), -N-> Ph-CH-CO2>C-CH2 > H. So drawing a circle in the direction of priority (1-4) it goes clockwise which is R configuration. So, if you want it to become S, then you must make the H come out of the plane. Another way of looking at it, is that you should look on the other side of the molecule to reverse the direction (the priorities stay the same though).

If you look at your left hand and your thumb is pointing right, flip it over so it points left. The groups still remain the same, but the direction changes. Do the same for the other chiral carbon. You need to make both hydrogens come out of the plane to make S,S configuration.

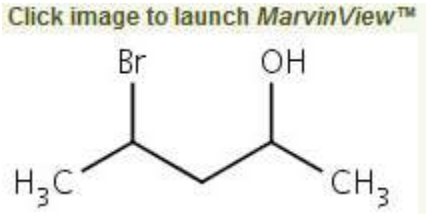


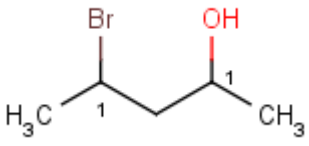
(8) Label all of the stereogenic atoms in the following compound with map number 1 by pressing select, mousing over each stereogenic atom, and typing M1. To unmap an atom, type M0.



Good! This compound contains **no stereocenters.**

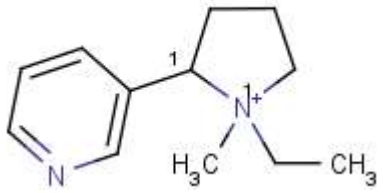
(9) Label all of the stereogenic atoms in the following compound with map number 1 by pressing select, mousing over each stereogenic atom, and typing M1. To unmap an atom, type M0.





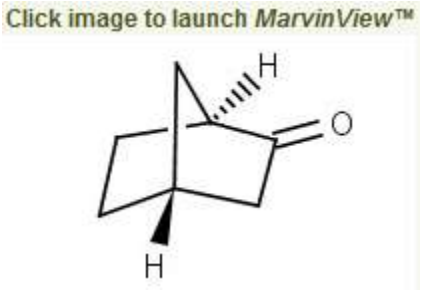
Good! C(2) and C(4) are stereogenic because each is attached to four different groups. The other atoms are not stereogenic.

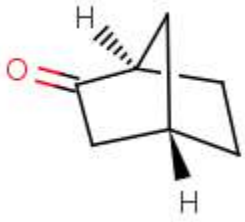
(10) Label all of the stereogenic atoms in the following compound with map number 1 by pressing select, mousing over each stereogenic atom, and typing M1. To unmap an atom, type M0.



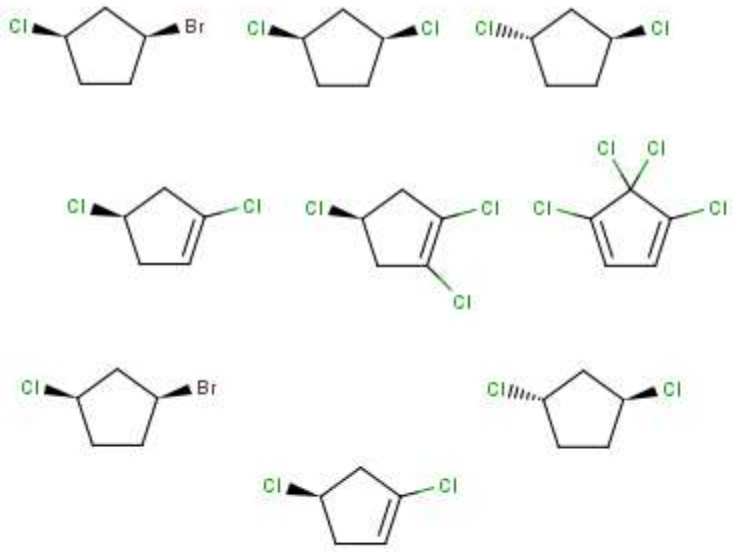
Good! Both the C atom attached to the pyridine ring and the N atom in the five-membered ring are stereogenic. The ring N atom is attached to four different groups, and it lacks a lone pair, so it cannot invert.

(11) Draw the enantiomer of the following structure.

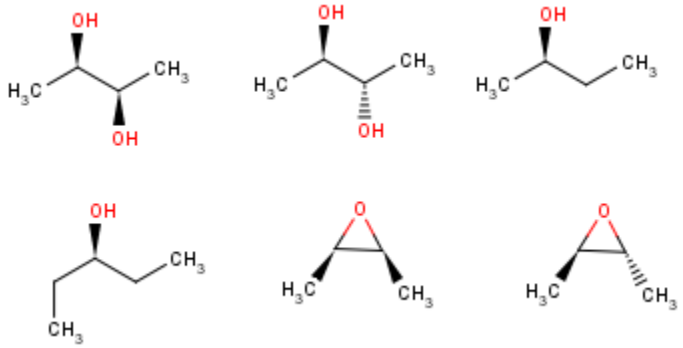




(12) Submit as your answer the structures of **all** the **chiral** molecules among the ones shown. You may find it easier to copy the structures from the picture and paste them into your answer.



(13) Submit as your answer the structures of **all** the **chiral** molecules among the ones shown. (Each of your choices should be chiral in *every* conformation, not just the one shown.)



Answer: