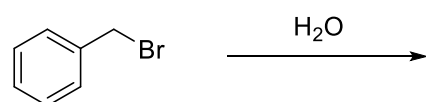
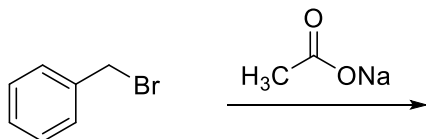
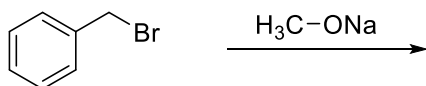


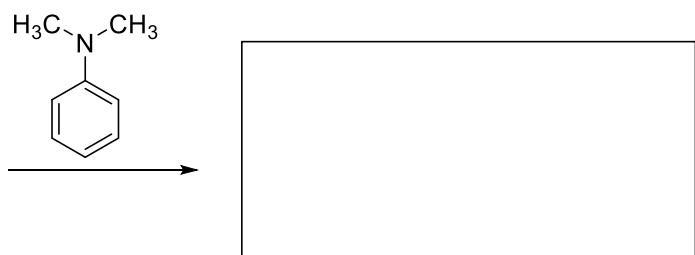
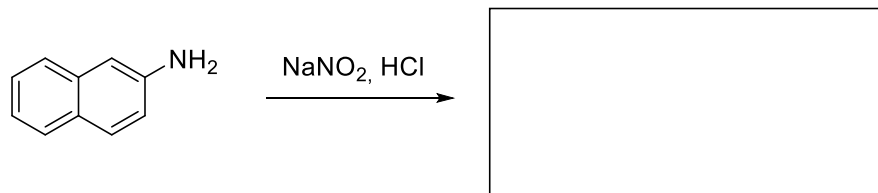
## Self-assessment test with focus on SynCat subjects (1)

### Part 1 – Organic Chemistry

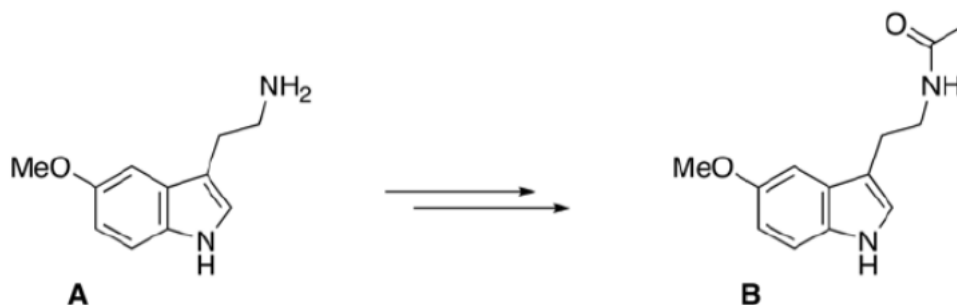
1. Define the following terms and give one specific example for each term.
  - a) stereoisomers
  - b) diastereomers
  - c) enantiomers
2. How do diastereomers and enantiomers differ in their physical and chemical properties?
3. Give the products of the following transformation with benzyl bromide and a nucleophile as starting material. Which of these three reactions is the fastest one? All reaction conditions stay the same the only difference is the nucleophile used. Hint: Identify the best and the worst nucleophile first!



4. Draw the intermediate and the product of the following transformation.



5. You want to transform compound **A** into compound **B** with the help of acetic acid. Why won't this reaction work if you simply apply acetic acid to **A**? Come up with an alternative pathway to accomplish the transformation.



## Part 2 – Inorganic Chemistry

6. Draw the complete molecular orbital scheme for  $O_2$ . What is the chemical bond order in this molecule?
7. Potassium's second ionization energy ( $IE_2 = 3051 \text{ kJ/mol}$ ) is seven-times higher than its first ionization energy ( $IE_1 = 419 \text{ kJ/mol}$ ). If you compare this to calcium, the second ionization energy ( $IE_2 = 1145 \text{ kJ/mol}$ ) is only twice as high as its first one ( $IE_1 = 590 \text{ kJ/mol}$ ). Why is there such a big difference between K and Ca?
8. Give the suitable quantum numbers  $n$  and  $l$  for the following orbitals.
- a) 3d-orbital:  $n =$      $l =$                       b) 4s-orbital:  $n =$      $l =$
9. Which bond angle and which hybridization do the central atoms show in the following molecules?
- a)  $BeF_2$  (gas phase)                      b)  $BeF_3^-$                       c)  $BeF_4^{2-}$                       d) azide ion,  $N_3^-$