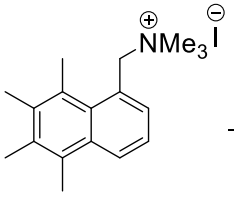
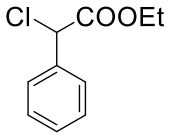
Birla Institute of Technology & Science, Pilani
CHEM G551: Advanced Organic Chemistry (Close Book)

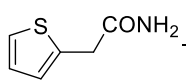
November 01, 2022 **Max. Marks: 60** **Time: 90 min.**

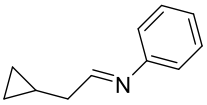
All questions are compulsory. Answer sub-parts of a question sequentially in the order given.

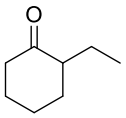
Q. No. 1. Identify the structures of final major products, **A-J** for the following chemical transformations? [10x2=20]

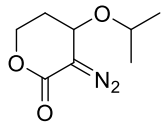
(i). 

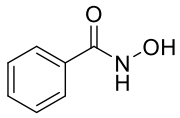
(ii). 

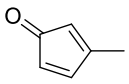
(iii) 

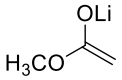
(iv). 

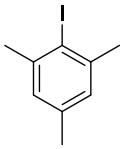
(v). 

(vi). 

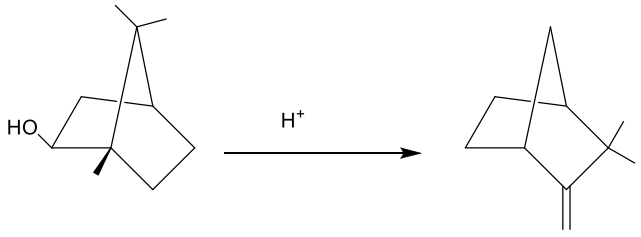
(vii). 

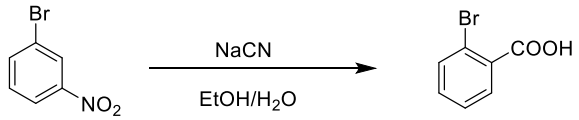
(viii). 

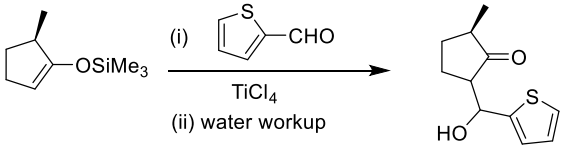
(ix). 

(x). 

Q. No. 2. **(i).** Propose a detailed mechanism for the given transformations: [3x6=18]

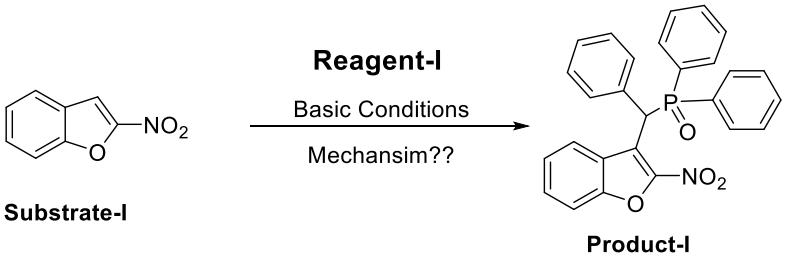
(a). 

(b). 

(c). 

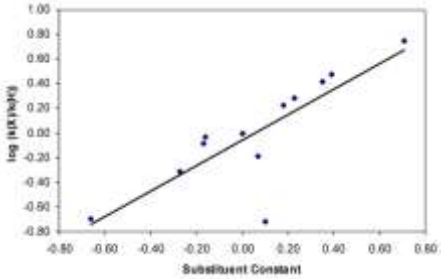
(ii). "Trapping of an intermediate is sometimes very helpful in proposing the mechanism of a reaction". Justify this statement by taking a suitable example. [2]

Q. No. 3. (i). Identify the structure of the reagent **(Reagent-I)**, which will react with the given substrate (**Substrate-I**) to produce the given product (**Product-I**) under basic conditions (*e.g.* KOH) in an appropriate solvent? Also, propose a detailed mechanism for the formation of the product. [2+4]



Substrate-I **Product-I**

(ii). The reaction constant determined from the Hammett plot for the alkaline hydrolysis of substituted benzamides is +1.05. Justifying the given information, propose a detailed mechanism for this reaction. Also, draw the energy profile diagram for the reaction. [4+2]

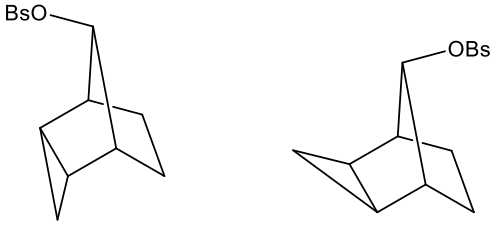


(iii). Arrange the following bases in the increasing order of basic strength [2]

n-BuLi, LDA, NaOH, *t*-BuONa, CH_3MgCl, NEt_3

(iv). What could be inferred from a concave upward and a concave downward non-linear plots regarding a reaction mechanism? [3]

(v). For the given reactions, which of the two given substrates (**Substrate-IIa** or (**Substrate-IIb**) will undergoes acetolysis faster under similar reaction conditions and why? Also, identify the major product (**Product IIa** and **Product-IIb**) that will be formed in each case? [3]



Substrate-IIa **Substrate-IIb**

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