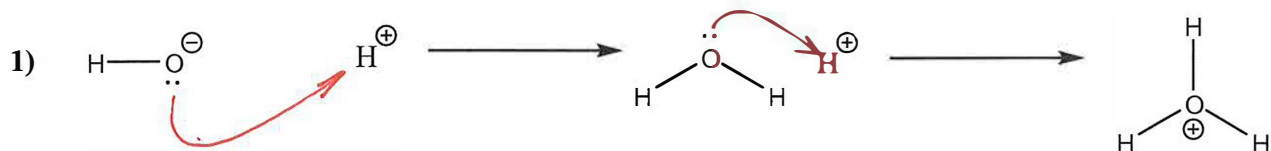


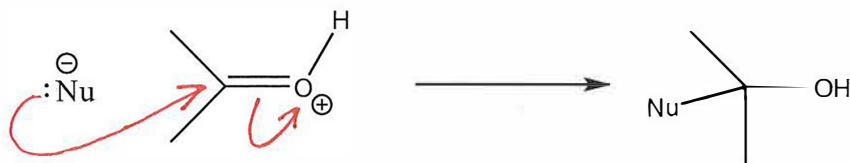
Principles of organic synthesis worksheet answers

Name: _____

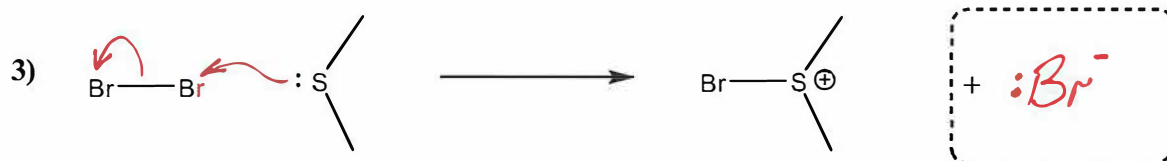
For each reaction in questions 1–3, add curly arrows to show the movement of electron pairs to produce the products shown. In question 3 add the other product of the reaction into the box.



(2 marks)



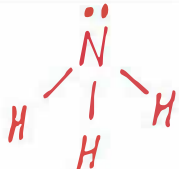
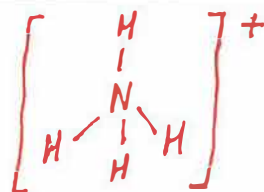
(5 marks)



(3 marks)

4) Ammonia is able to act as a nucleophile. When it reacts with a H^+ ion it forms an ammonium ion.

(a) Draw the shape of ammonia and of the ammonium ion. Indicate the bond angle(s)

	Ammonia	Ammonium ion
Shape		
Bond angle(s)	107°	109.5°

(4 marks)

(b) State how ammonia is able to act as a nucleophile

Lone pair of electrons on nitrogen which can be donated to another atom

(2 marks)

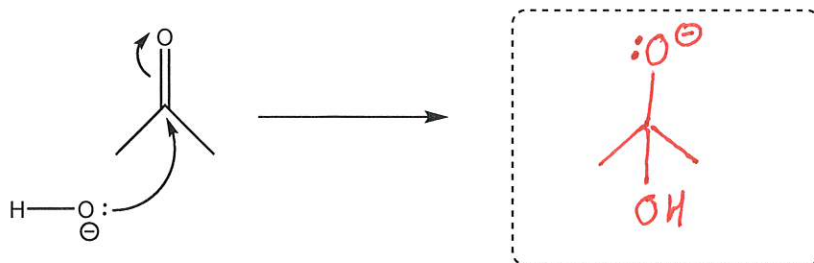
(c) Outline the mechanism by which ammonia reacts with a H^+ ion to form the ammonium ion



(2 marks)

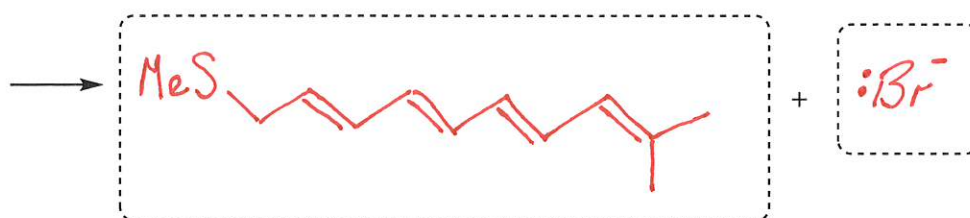
For questions 5-8 draw the structures of the products formed in the boxes.

5)



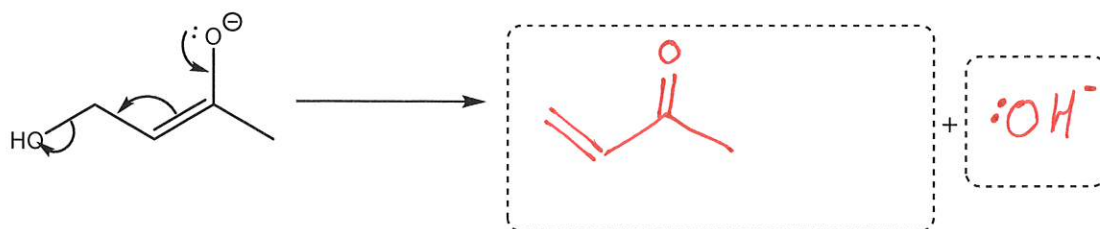
(2 marks)

6)



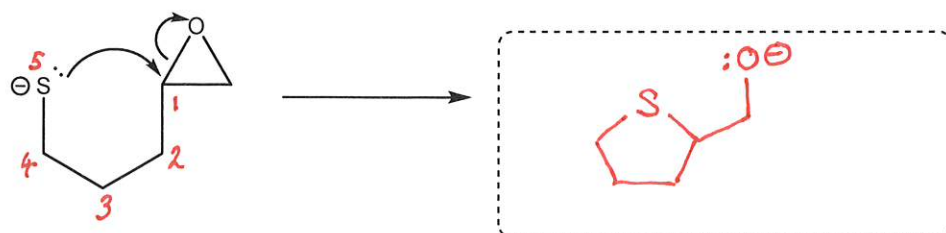
(4 marks)

7)



(3 marks)

8)



(3 marks)