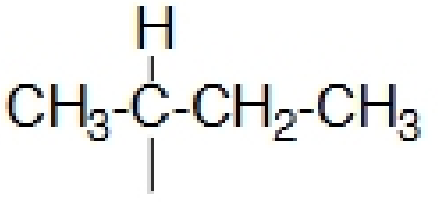
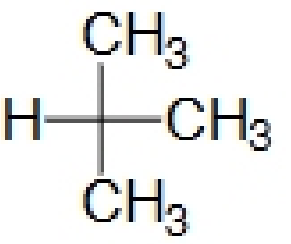
(I) Write one example of each of the following (3 pts each)

(1) A *sec*-butyl group



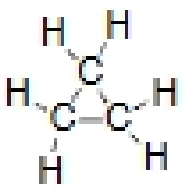
(2) A molecule with a *tertiary* carbon



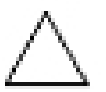
(3) The conjugate base of water

HO^-

(4) Cyclopropane



OR



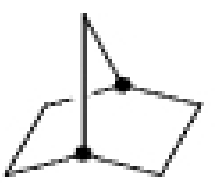
(5) A molecule which contains an *sp* hybridized nitrogen.

$H_3C-C\equiv N$

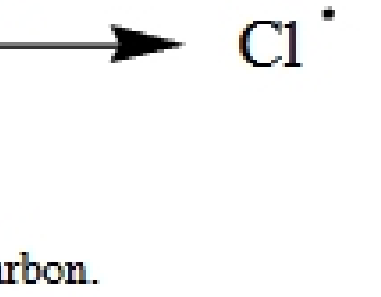
(6) A carbene

(7) An initiation reaction in free radical halogenation.

(8) A compound with a bridgehead carbon.

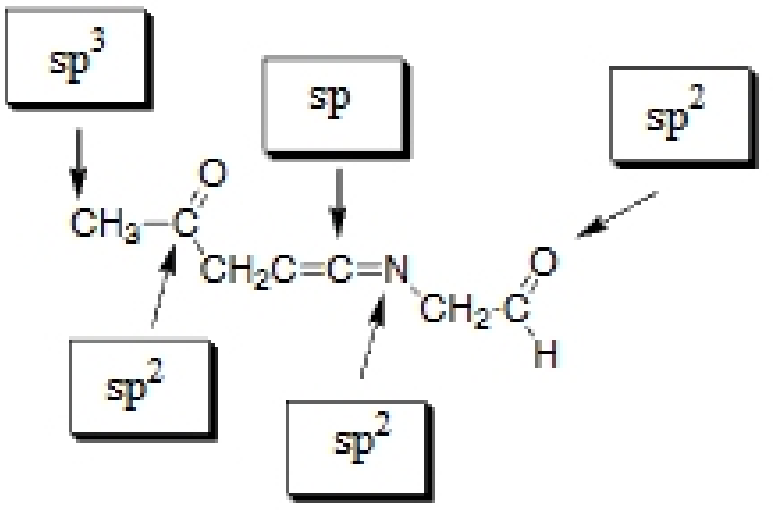


(9) *Trans*-decalin



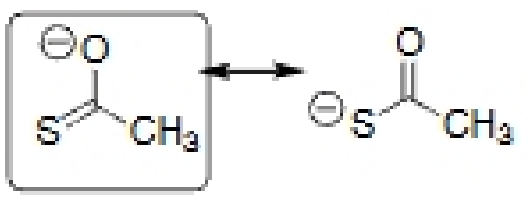
(10) An ethyl group

(II) (A) Fill in the boxes to indicate the hybridization state of the labeled heavy atoms (3 pts each).

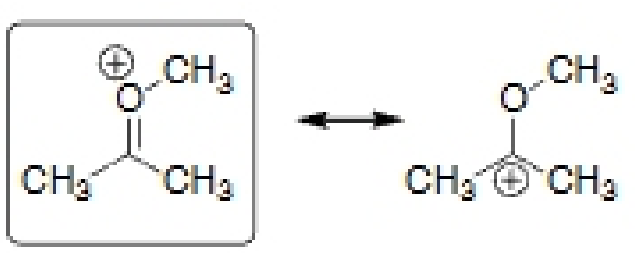


(B) For each of the following.

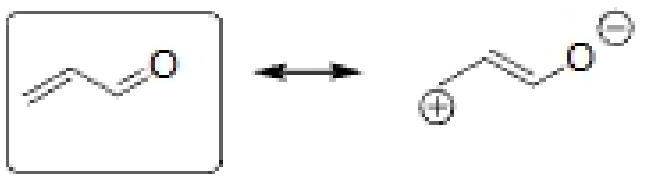
(i) Circle the contributing valence bond resonance structure that makes the largest contribution to the observed structure of the molecule (2 pts). (ii) Explain your answer (3 pts.)

(1) 

Negative charge is more highly stabilized by oxygen than by sulfur.

(2) 

The structure that places full octets of electrons at all heavy atoms is preferred.

(3) 

The structure with minimum charge separation is preferred.