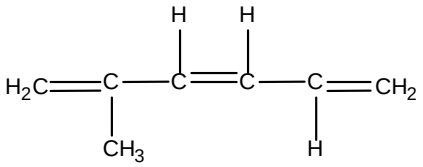
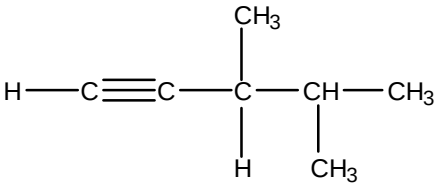
Answers to Sample Midterm Examination

1. Structure of compounds:

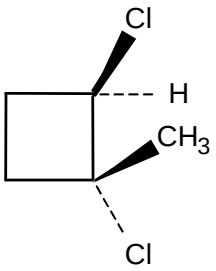
   a. 2-methyl-1,3,5-hexatriene



   b. 3,4-dimethyl-1-pentyne



   c. *trans*-1,2-dichloro-2-methylcyclobutane



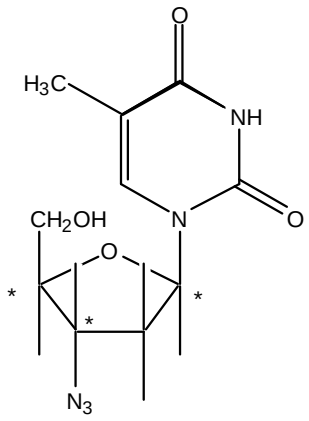
2. a. The compound has a *Z* configuration.

   b. The compound has an *E* configuration.

3. **Markovnikov's Rule:** In the addition of an acid (HX) to an alkene, the acid hydrogen (H) becomes bonded to the carbon with more hydrogens originally.

   Example

4. Chiral carbon atoms:



5. a. Reaction *B* is endergonic.

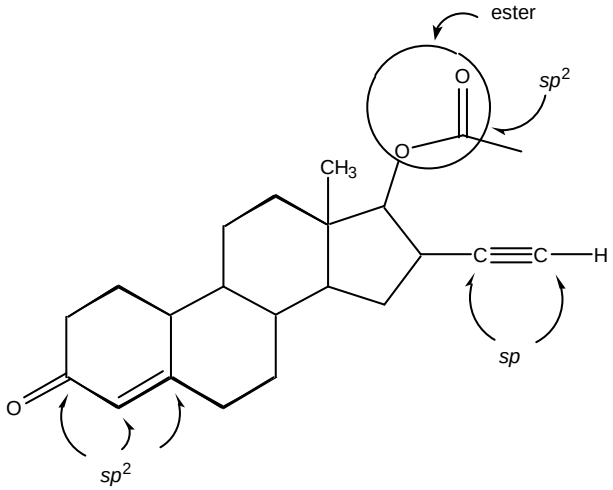
   b. Reaction *A* is expected to be faster.

   c. Reaction *A* would have the more stable intermediate.

6. Enantiomers present:
   (+)-2-butananol 37.4%
   (-)-2-butananol 62.6%

7. The centre formula is most stable. Remember, Br is larger than Cl and therefore sterically more bulky. The centre formula has two Br—Cl interactions, while the others both have one Br—Cl and one Br—Br interaction.

8. Norethindrone acetate:



9. Boiling points:

   $C(CH_3)_4$[b.p. 10°C], $CH_3(CH_2)_3CH_3$[b.p. 36°C],
   $CH_3(CH_2)_4CH_3$[b.p. 69°C]

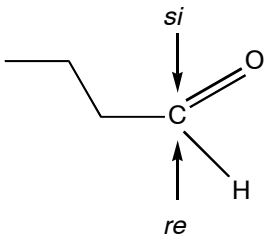
   i. Heavier alkanes (more carbons) have higher boiling points.

   ii. Increased branching in alkanes lowers boiling points.

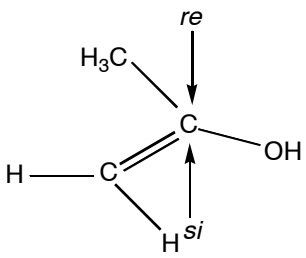
   Note that you are only required to arrange the above alkanes in order of boiling points. You need not memorize the boiling points. They have only been listed above for your information.

10. Fischer projection:

a.

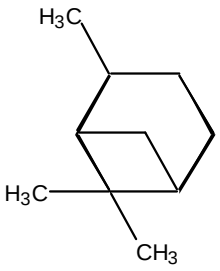


b.

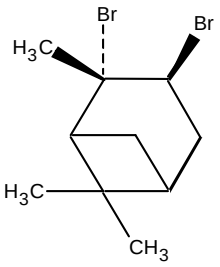


11. Product structures:

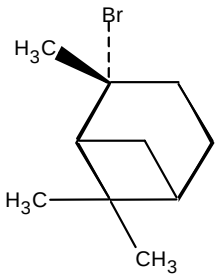
a.



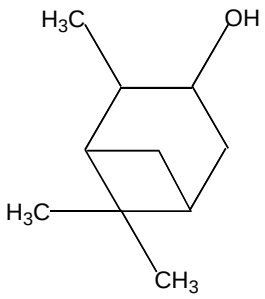
b.



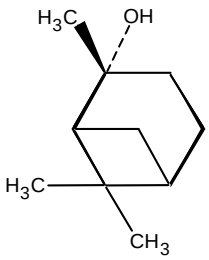
c.



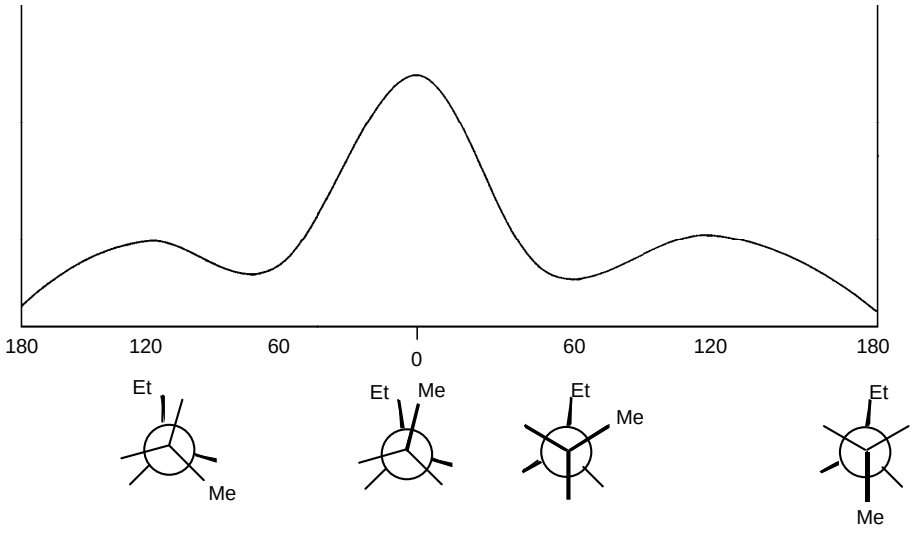
d.



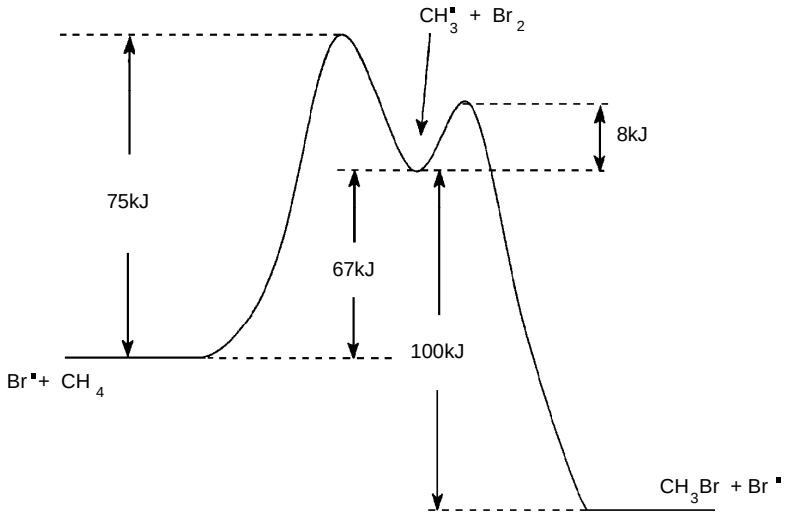
e.



12. Changes in potential energy:

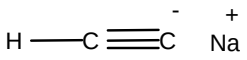


13. Reaction diagrams:

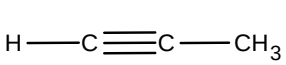


14. Missing reactants, reagents and products:

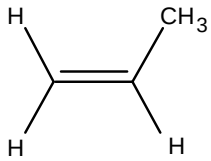
a.



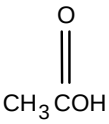
A



B



C

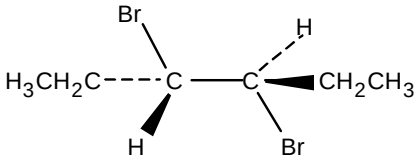


D

CO_2

E

b.



F

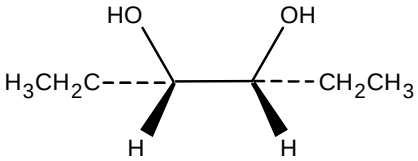
1. $2NaNH_2$, NH_3
2. NH_4Cl or H^+

G

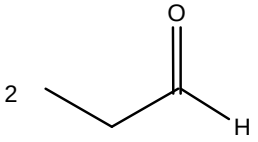
H_2, Pd, $BaSO_4$

(Lindlar's catalyst)

H



I



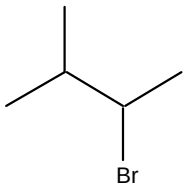
2

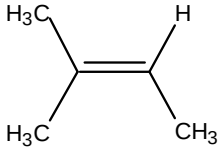
(1-propanol)

J

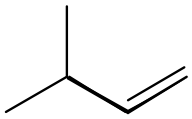
15. Identification of compounds:

V =



W = 

major

X = 

minor

Y =