1. (a) *cis*-4,5-dimethyl-4-hepten-2-yne or (*Z*)-4,5-dimethyl-4-hepten-2-yne

(b) (*E*)-1,3-dibromo-4,7-dimethyl-3-octene

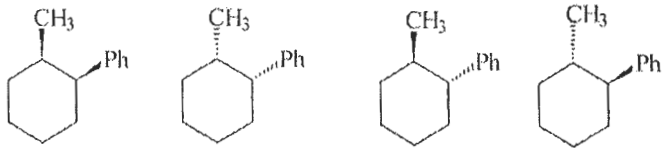
(c) (*2R, 4S*)-2,4-dichloropentane or (*2S, 4R*)-2,4-dichloropentane

(d) ~~*cis*~~-3-penten-1-ol

↳ trans -

2.

There are four stereoisomers of this compound.



Two enantiomers of the *cis*-diastereomer

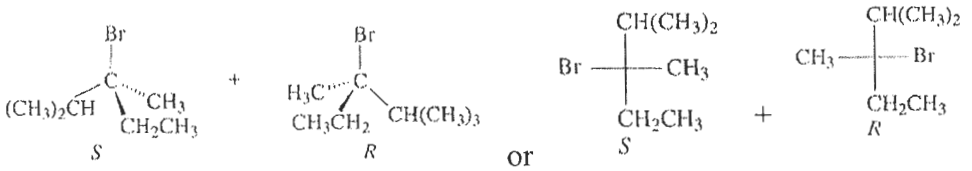
Two enantiomers of the *trans*-diastereomer

Both enantiomers of the *cis*-diastereomer are of equal stability as are both enantiomers of the *trans*-diastereomer. The *trans*-diastereomer is more stable than the *cis*-diastereomer because it has the conformation with both substituents equatorial. The methyl group is axial in the more stable conformer of the less stable diastereomer (cis) because the axial strain energy of the phenyl group is larger than that of the methyl group.

3. (a) constitutional isomers (b) enantiomers (c) identical (d) enantiomers

(e) constitutional isomers (f) diastereomers

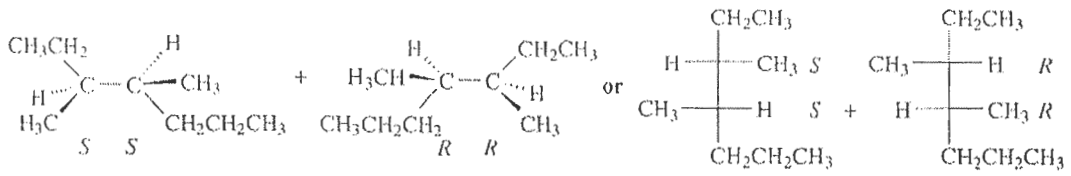
4. (a)



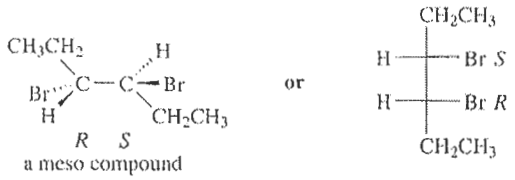
(b)

(The H and OH are added to the same side.)

(c)



(d)



5.

6.

III > II > IV > I

7.

(a)

1) $NaNH_2$
2) CH_3CH_2Br
3) $NaNH_2$
4) CH_3CH_2Br
5) excess HBr

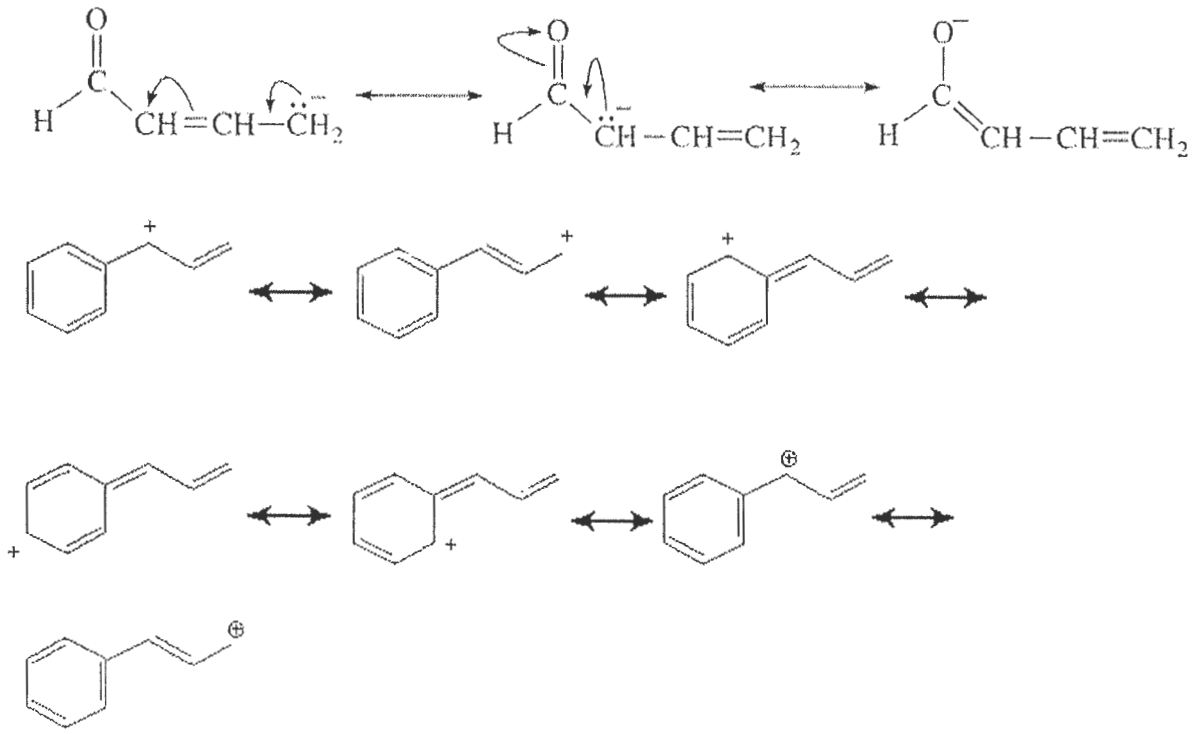
(b)

1) $NaNH_2$
2) CH_3CH_2Br
3) $NaNH_2$
4) CH_3Br
5) H_2, Lindlar's catalyst

(c)

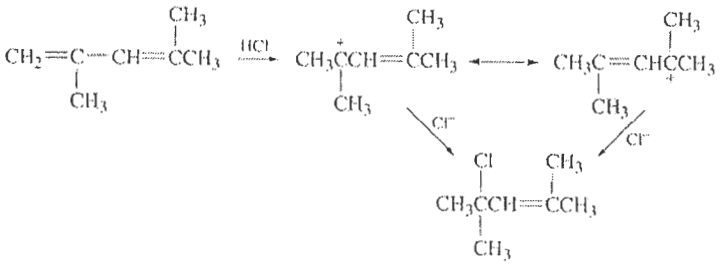
1) $NaNH_2$
2) $CH_3CH_2CH_2Br$
3) disiamylborane
4) H_2O_2, ^-OH

8.



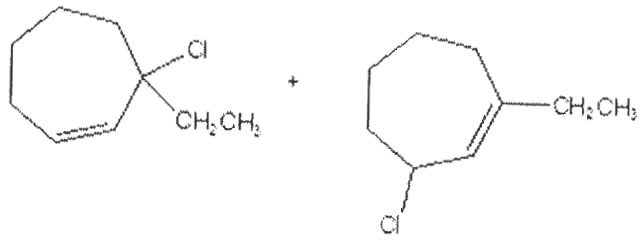
9.

(a)



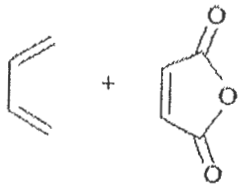
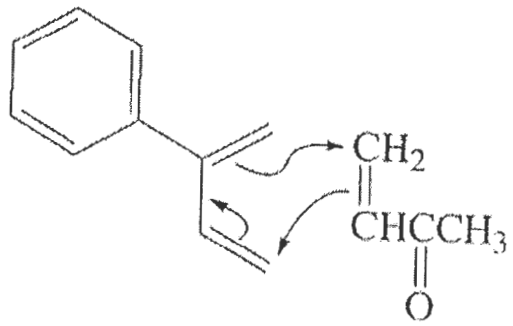
This is the only product because the carbocation is symmetrical.

(b)



10.

(a)



(b)