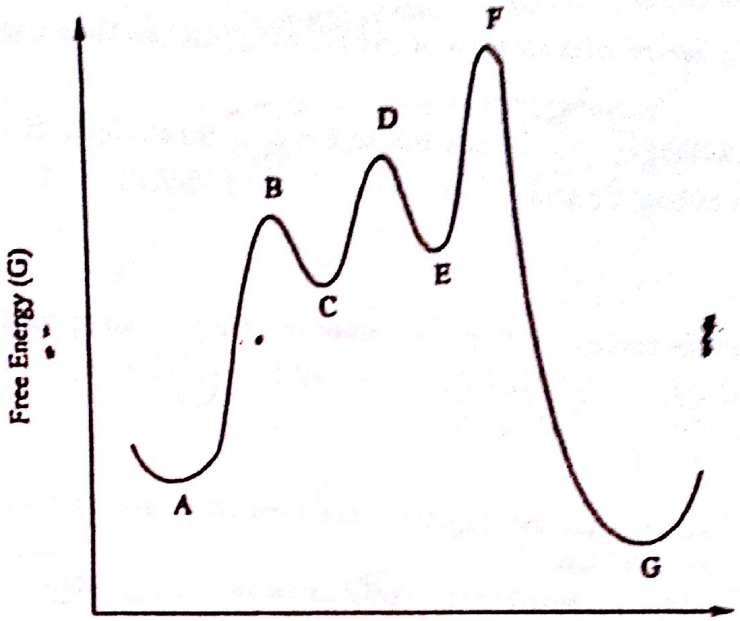
CHM 138H Second Term Test Apr

Part I (*10 marks*) – Multiple Choice (*3 marks each*).

Use the reaction energy diagram below to answer Questions 1-4.



1. At which point(s) on the reaction energy diagram are the products found?

   (a) A
   (b) G ✓
   (c) C and E
   (d) A and G
   (e) C, E and G

2. At which point(s) on the reaction energy diagram are intermediates found?

   (a) A and G
   (b) C and E ✓
   (c) B, D and F
   (d) A, C, E and G
   (e) C, E and G

3. The reaction depicted in this energy diagram can best be described as:

   (a) consisting of one step. ✗
   (b) exothermic.
   (c) endothermic.
   (d) exergonic. ✓
   (e) endergonic.

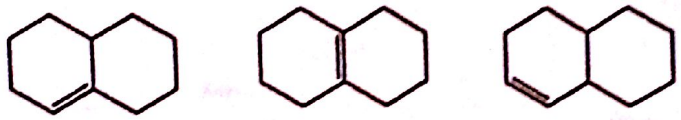
4. At which point(s) on the reaction energy diagram are transition states found?

(a) A
(b) C and E
(c) B, D and F
(d) A, C, E and G
(e) C, E and G

5. The molecular formula of diazepam (Valium) is $C_{16}H_{13}N_2OCl$. Calculate its degree of unsaturation.

(a) 8
(b) 9
(c) 10
(d) 11
(e) 12

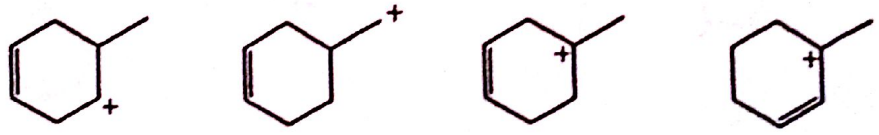
6. Arrange the following bicyclic alkenes in order of increasing stability (least stable to most stable).



I [2] II [1] III [3]

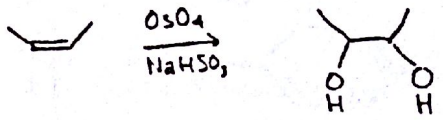
(a) III < II < I
(b) II < III < I
(c) I < III < II
(d) I < II < III
(e) III < I < II

7. Arrange the following carbocations in order of increasing stability (least stable to most stable):



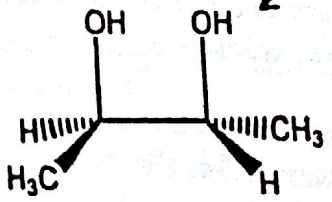
I [3] II [4] III [2] IV [1]

(a) III < II < I < IV
(b) I < II < IV < III
(c) II < I < III < IV
(d) II < IV < III < I
(e) I < III < IV < II

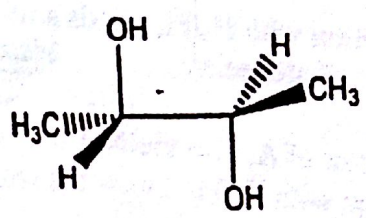


8. Hydroxylation of Z-2-butene with OsO_4 yields which of the following as the major product?

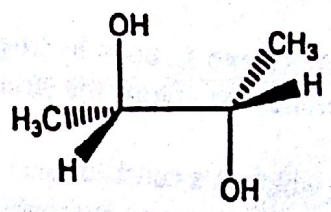
(a)



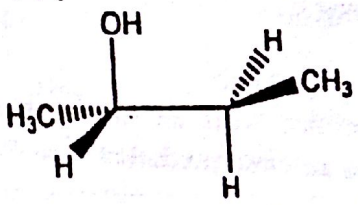
(b)



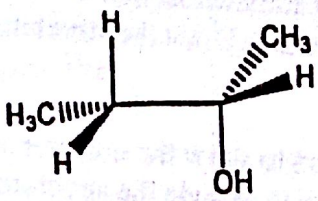
(c)



(d)

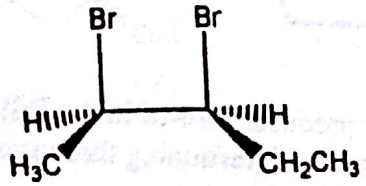


(e)

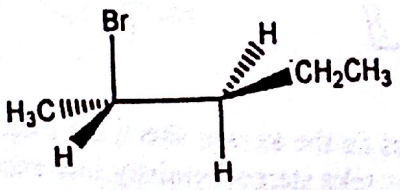


9. Which of the following represents the major product in the reaction of *E*-2-pentene with a solution of Br_2 in CCl_4?

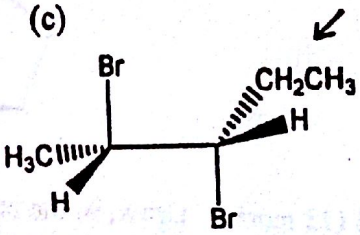
(a)



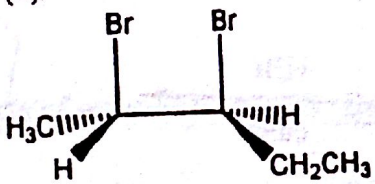
(b)



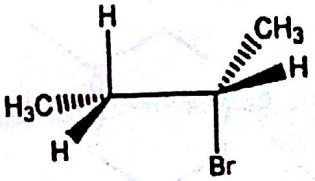
(c)

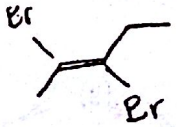


(d)



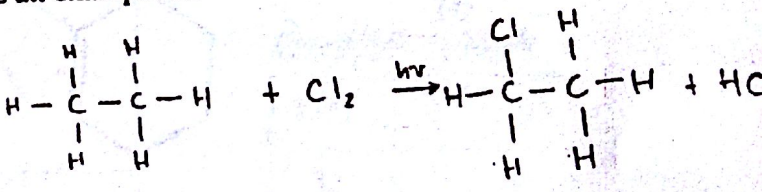
(e)





10. The reaction of ethane, C_2H_6, with chlorine is an example of:

(a) a radical addition reaction.
(b) a polar addition reaction.
(c) a radical substitution reaction.
(d) a polar substitution reaction.
(e) a regioselective reaction.



- END OF MULTIPLE CHOICE QUESTIONS -

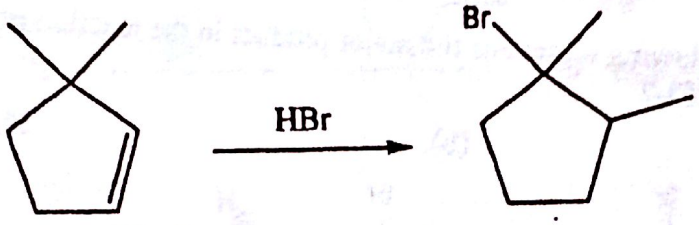
Part II – Short Answer Questions

1 (*9 marks*). (a) Alkene **A**, upon hydrogenation with H_2/Pt, yields a mixture of *cis*- and *trans*-1,4-dimethylcyclohexane. Draw the structure of alkene **A**.

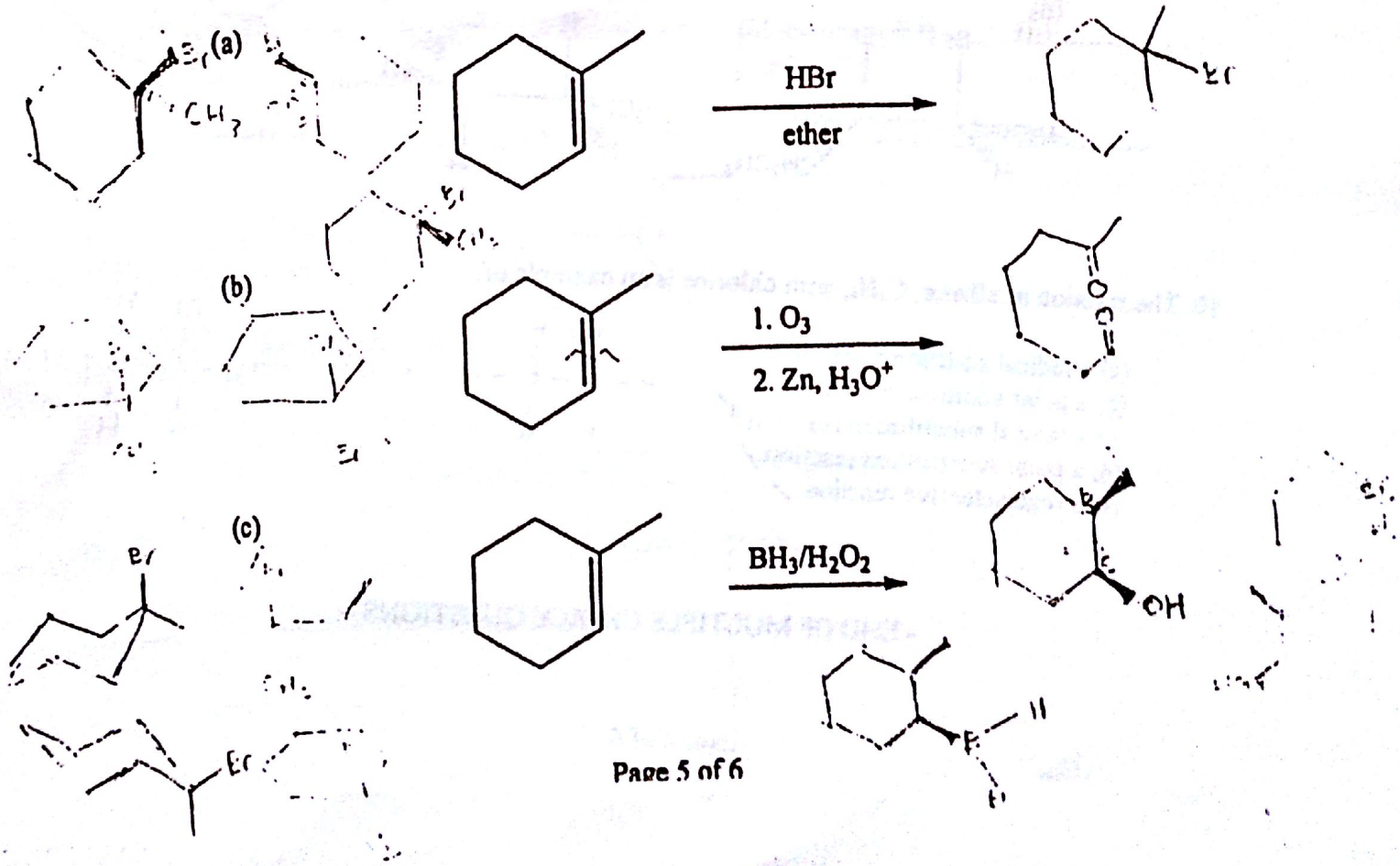
(b) Alkene **B**, which is a constitutional isomer of **A**, also yields a mixture of *cis*- and *trans*-1,4-dimethylcyclohexane upon hydrogenation with H_2/Pt. Draw the structure of this alkene.

(c) Alkene **C** is also a constitutional isomer of **A**. Upon hydrogenation with H_2/Pt, it yields only *cis*-1,4-dimethylcyclohexane. Draw the structure of alkene **C**.

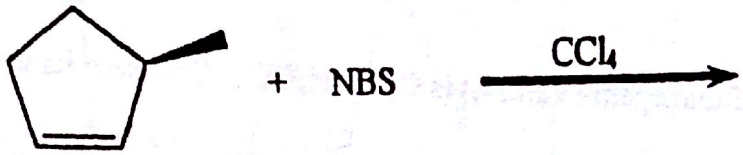
2 (*10 marks*). Using arrows to show the movement of electrons, write the mechanism for the reaction below. Be sure to include the structures of two key intermediates. Do not draw the structures of transition states.



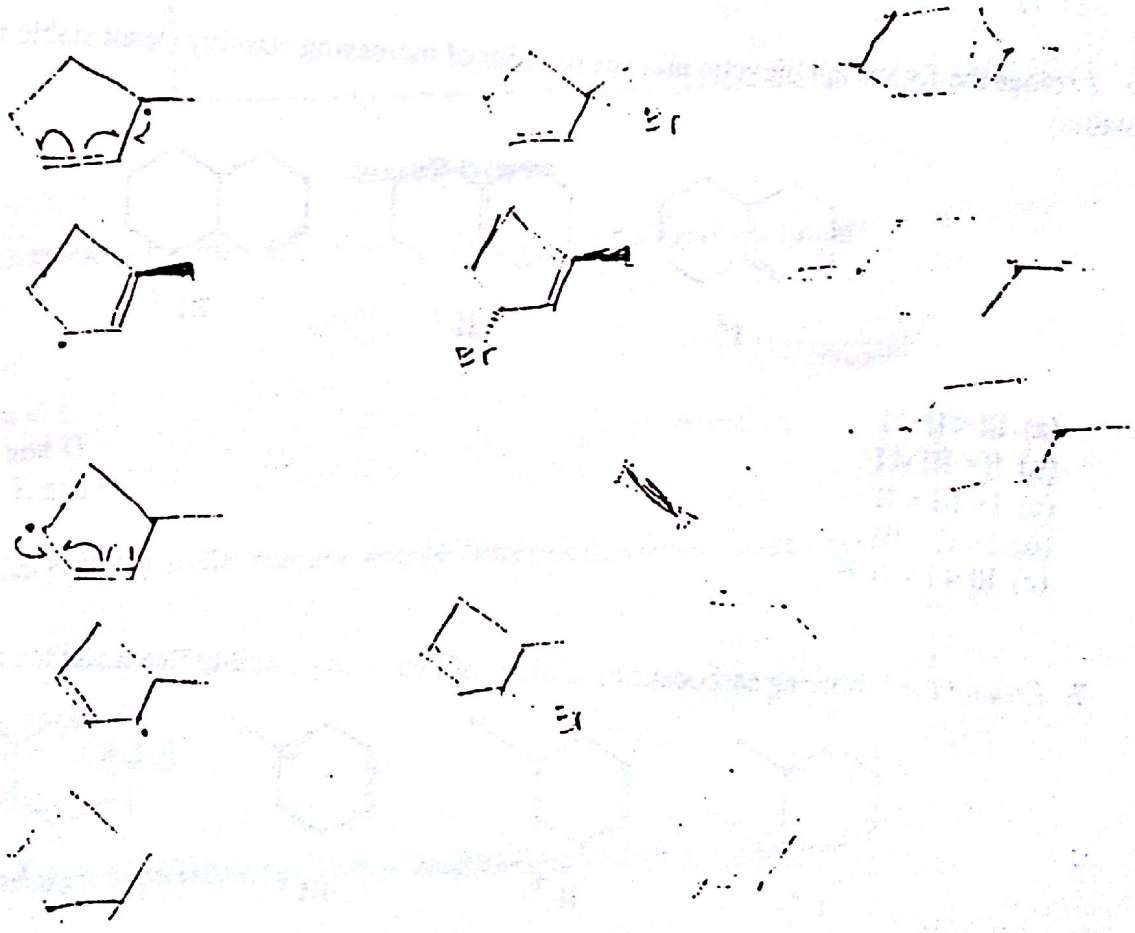
3 (*13 marks*). Draw, in the boxes on the answer sheet, the major products formed in the following reactions. Where appropriate, take stereochemistry into account in determining these products.



4 (*8 marks*). Draw only the expected products of the monobromination reaction shown below that are consistent with the templates provided on the answer sheet. Be sure to take product stereochemistry into account in drawing the products. Not all of the templates may be needed – **draw a diagonal line through any templates not used.**



- END OF TEST –



CHM 138H Term Test 2 Answer Sheet

NAME: [redacted] #: [redacted] p.: 322

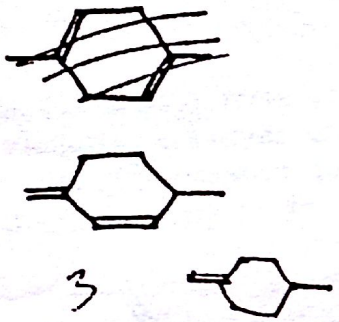
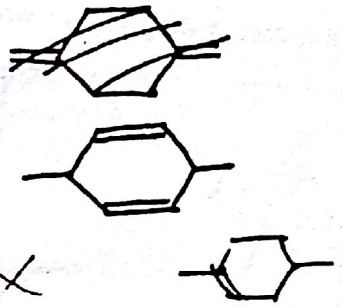
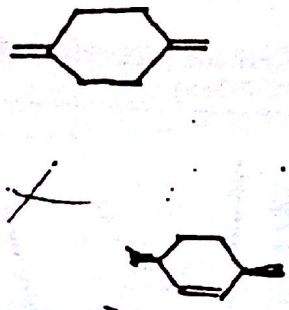
I. (*10 marks*) Multiple choice answers:

Question	1	2	3	4	5	6	7	8	9	10
Answer	B	B	D	C	D	E	C	A B	C A	C

24

II. Short answers:

1. (*9 marks*)

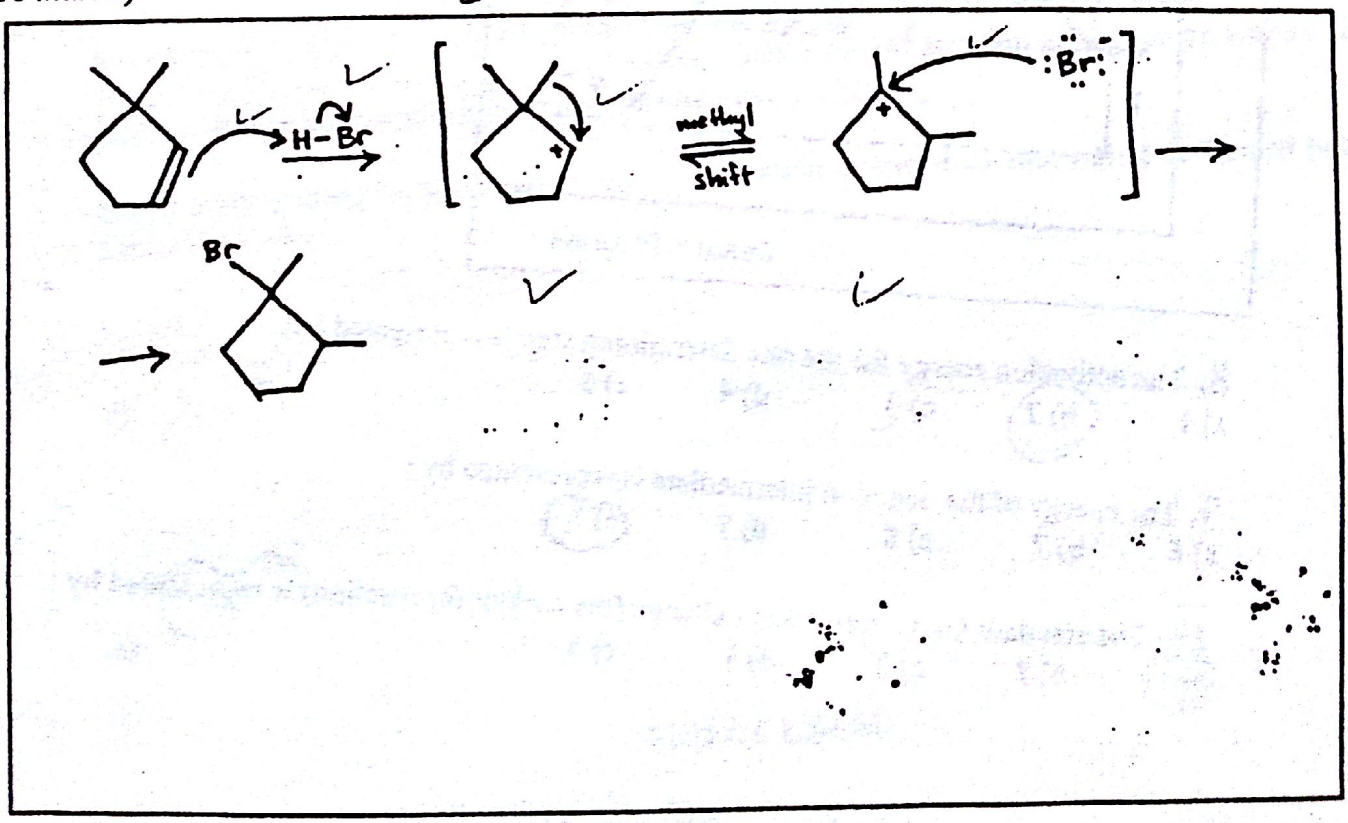
(a) Structure of alkene A	(a) Structure of alkene B	(a) Structure of alkene C
		

3

3 X

correct answer

2 (*10 marks*) Reaction mechanism



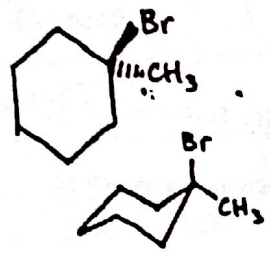
10

CHM 138H Term Test 2 Answer Sheet

NAME: [redacted] Student #: [redacted] Demo Gp.: 322

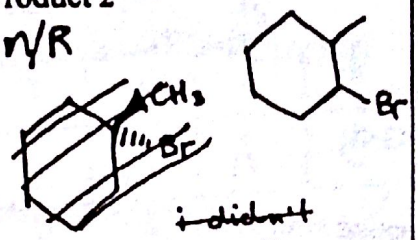
3 (*13 marks*). Major reaction products

(a) Product 1



Product 2

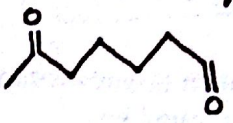
n/R



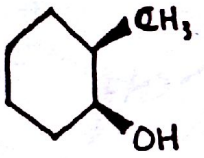
i didn't get the memo!

correct answer: n/R

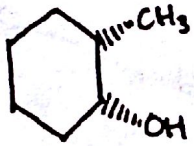
(b)



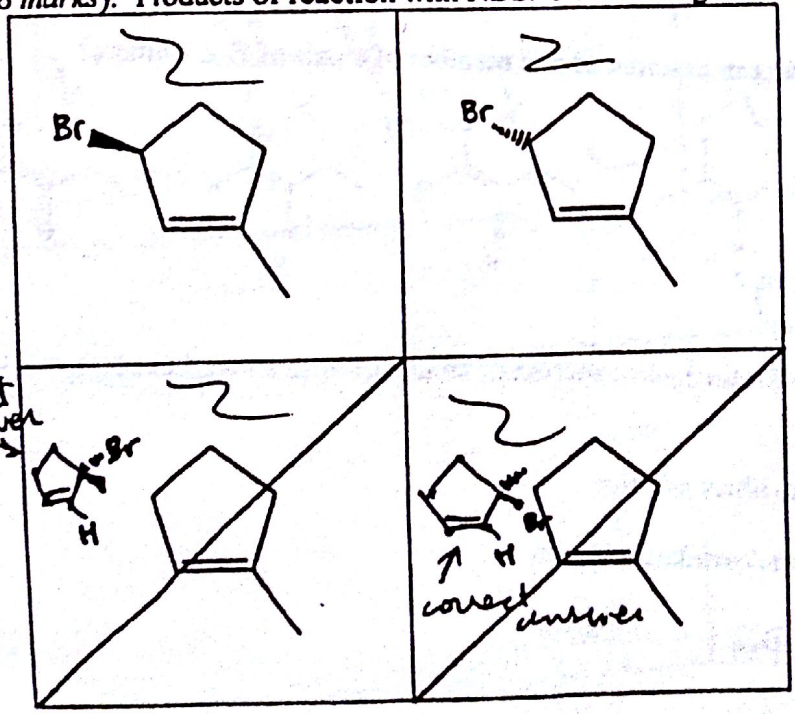
(c) Product 1



Product 2



4 (*8 marks*). Products of reaction with NBS. Draw a diagonal line through any templates not used.



correct answer

correct answer

Question	Mark
MC	24/30 ✓
1	3/9 ✓
2	10/10 ✓
3	11/13 ✓
4	8/8 ✓
Total	56/70 ✓