SECTION I: MULTIPLE CHOICE

Each question is followed by 4 options. Select the option that best answers / fits. Using an HB or #2 pencil, mark the appropriate space on the multiple choice answer sheet. (NB *constitutional isomers are also known as structural isomers*

1. What is the maximum number of covalent bonds that an atom of carbon can form?

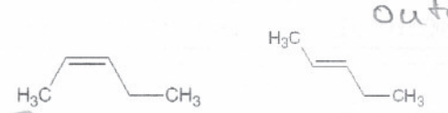
   A. 1 B. 2 C. 3 D. 4

   Carbon always forms 4 bonds in stable molecules. 4 bonds mean a full outer shell.

2. The molecular formula for butene is

   A. C_2H_6 B. C_4H_{10} C. C_4H_8 D. C_3H_6

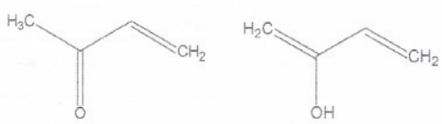
3. What is the relationship between these molecules?



   These are cis- + trans- forms.

   A. Identical structures B. Geometric isomers C. Enantiomers D. Constitutional isomers

4.



   These have different functional groups.

   The molecules **above** may be classified as

   A. Identical structures B. Geometric isomers C. Enantiomers D. Constitutional isomers

5. What is the systematic name of the structure shown ?

   highest priority groups

   A. (2E)-3-methylhex-2-ene B. (2Z)-3-methylhex-2-ene C. (4E)-2,3-dimethyhex-4-ene D. Cis-2-heptene

6. Which term best describes the light catalyzed reaction that occurs between methane and chlorine to form chloromethane and hydrogen chloride?

   A. Electrophilic addition B. Nucleophilic substitution C. Free radical substitution D. Radical addition

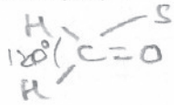
7. An sp^3 hybrid orbital consists of what percent s-character?

   3x p-orbitals + 1x s-orbital divided by 4 since there are 4x sp^3 hybrid orbitals

   A. 75% B.33% C. 25% D. 0%

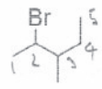
8. What is the approximate H-C-O bond angle in methanal H_2CO (formaldehyde) ?

   sp^2 hybridised



   A. 180 B. 120 C. 109 D. 90

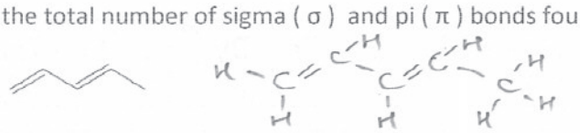
9. What is the systematic name for the compound shown?



   A. 2-bromo-3-ethylbutane B. 3-methyl-4-bromopentane

   C. 3-methyl-4-bromopentane D. 2-bromo-3-methylpentane

10. What is the total number of sigma (σ) and pi (π) bonds found in the following compound?



   — = σ-bond

   = = σ + π bonds

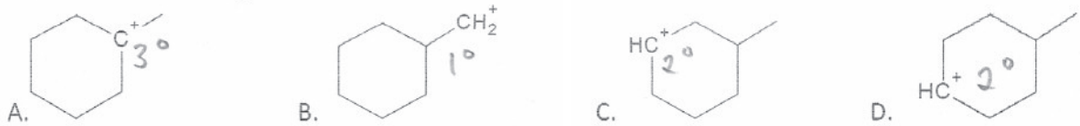
   A. 2, 4 B. 12, 2 C. 4 ,2 D. 2, 12

11. The reaction of 3-hexene with hydrogen the presence of Pt/C catalyst is described as:

   A. syn-addition B. substitution C. anti-addition D. hydration

   Check the mechanism; the H's add to the same side of the molecule

12. Which of the following carbocations is most stable?



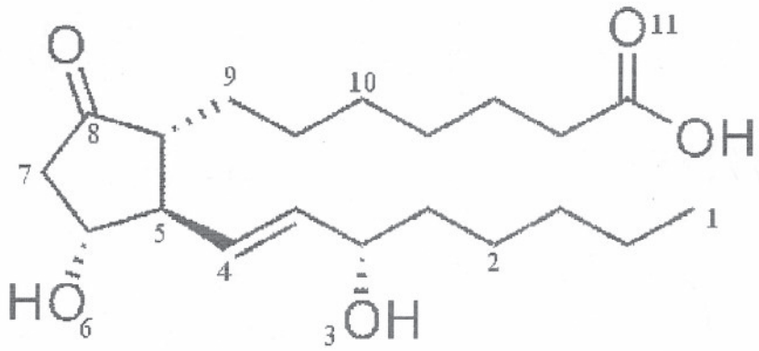
   A. B. C. D.

Learn the relative stabilities!

Course Abbreviation & Number:	CHEM230	Semester:	012015
Course Title:	Organic Chemistry		
Examination Date:	Wednesday 4th March 2015	Duration:	1.0 hour

SECTION II:
Answer questions in the spaces provided.

13. Examine the structure of ***Prostaglandin E1*** shown below.

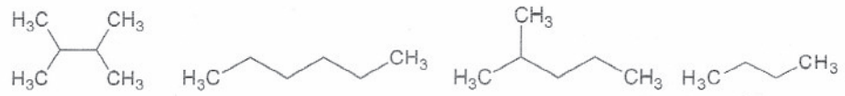


In each case select and write the number nearest to any one atom or bond which best fits the description. You may use each number once, several times or not as all, as needed. (3)

a. An sp^3 hybridized carbon _____
b. A primary carbon_____
c. An alcohol group_____
d. A chiral centre _____
e. an sp^2 hybridized carbon_____
f. A pi bond _____

14. Using the numbers 1 (highest value of property) to 4 (lowest) arrange the substances according to the property described. (2 marks each)

a. Boiling point



B.p. (m.p.) increase as London dispersion forces increase. These are larger for larger, and more linear molecules

b. CIP Priority -H -Cl $-CH_3$ $-NH_2$

CIP priority increases with increasing atomic number.

c. Angle strain

In principle, the carbons are sp^3 hybridised, and so the bond angle should be 109½°. △ has angles of 60°, □ 90°, ⬠ ~108°, ⬡ exactly 109½°.

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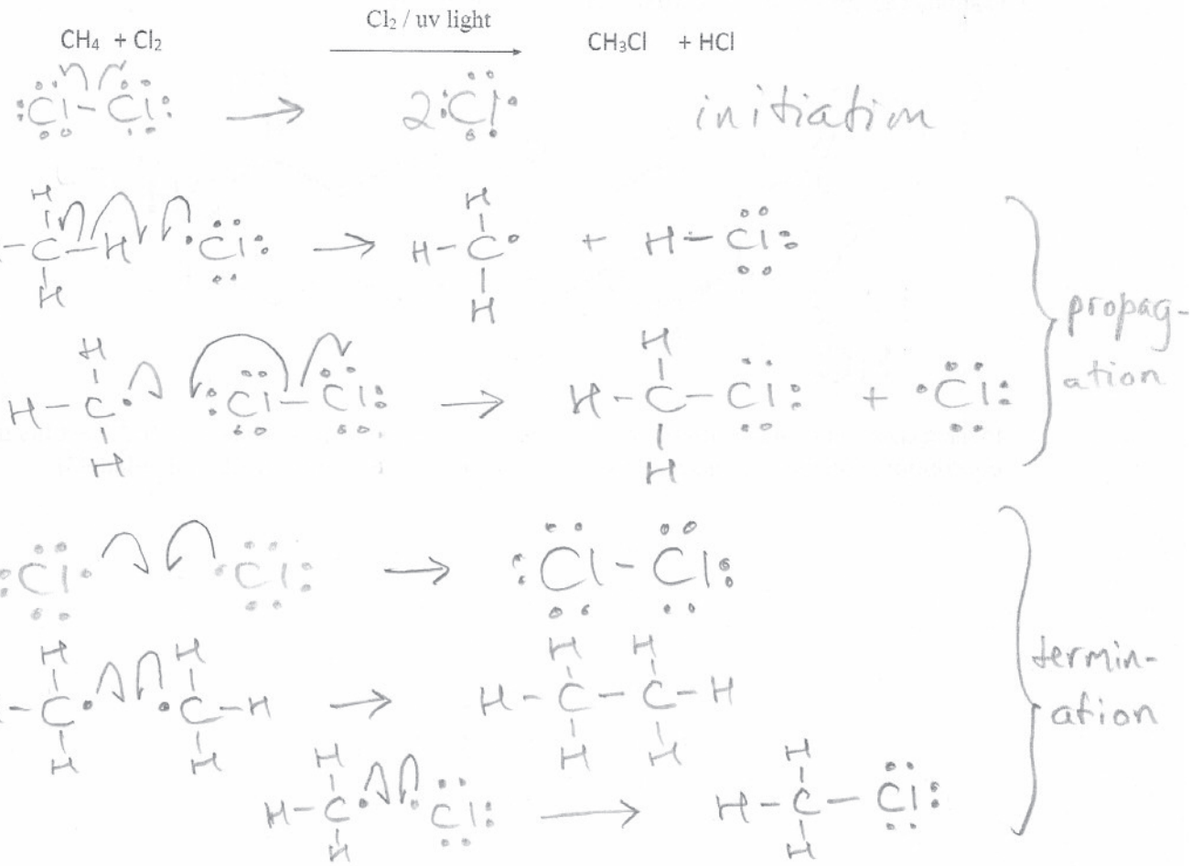
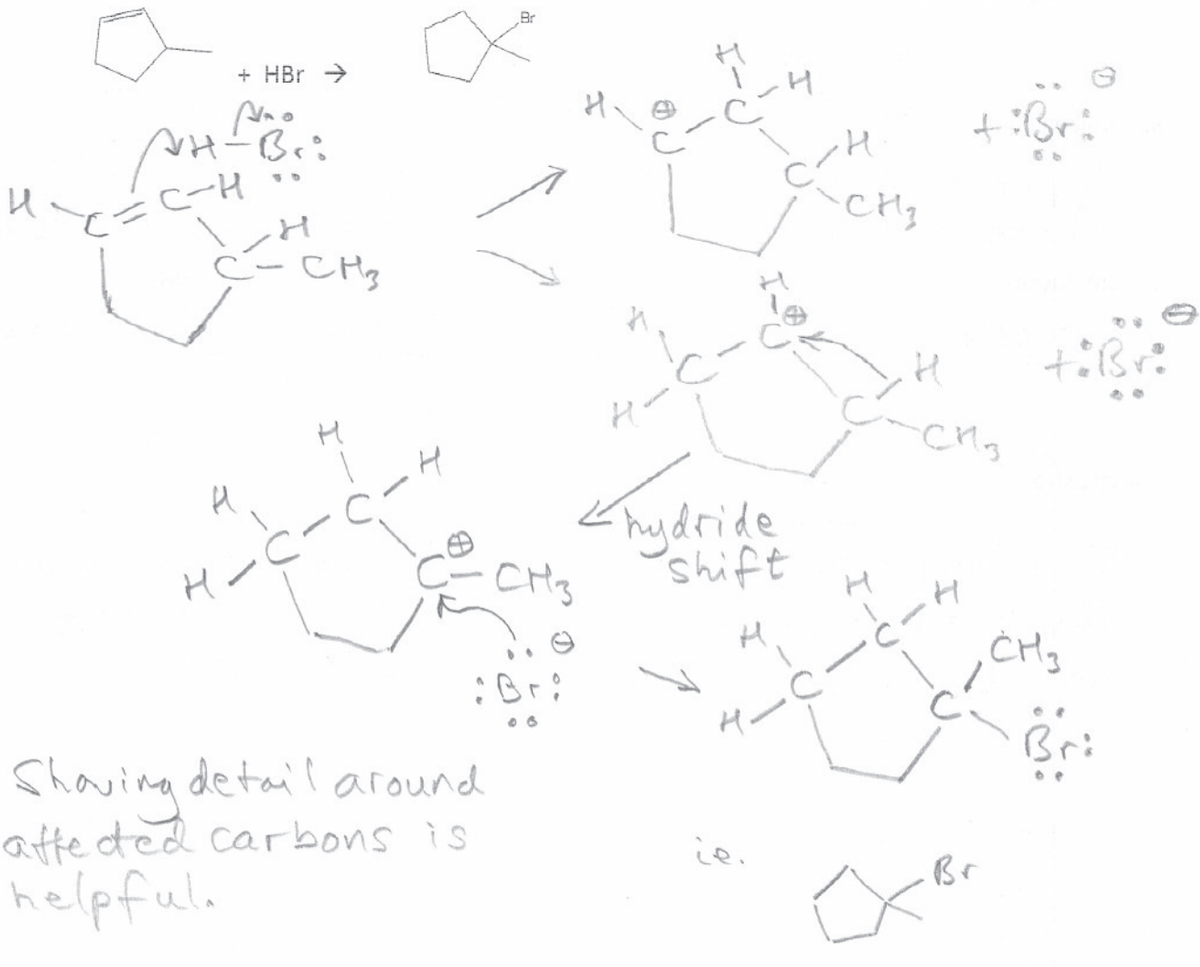
15. Use curved arrows to answer ANY TWO: (6 marks each)

A. **Illustrate mechanism for the reaction below.**

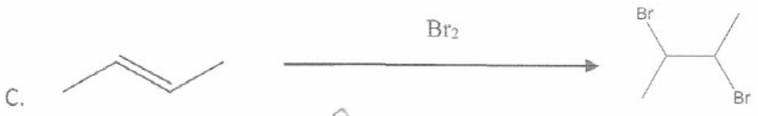


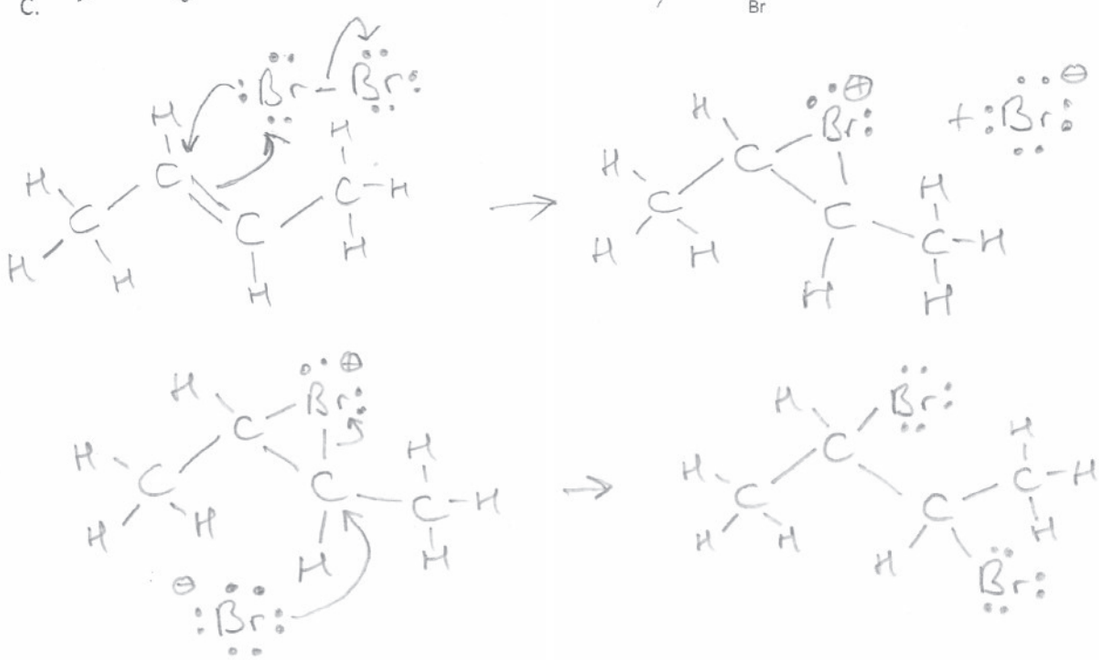
B. Provide a mechanism that leads to formation of the major product shown.



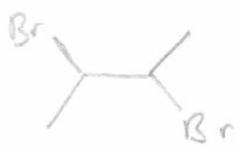
Showing detail around affected carbons is helpful.

ie.

C. 



i.e.



Putting in H's & C's is not essential, but is helpful.