

銘傳大學 95 學年度轉學生招生考試

生物科技學系

7 月 26 日 第三節

(第一頁共二頁)

有機化學試題

(限用答案本作答)

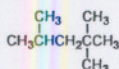
Please feel free to use your calculator (可以使用計算機).

4 pts each.

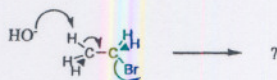
- Calculate formal charges for the non-hydrogen atoms in this molecule, $\text{H}_2\text{C}=\text{N}=\text{N}$.
- Although almost all stable organic species have tetravalent carbon atoms, species with trivalent carbon atoms also exist. Carbocations are one such class of compounds.



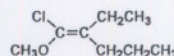
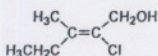
- How many valence electrons does the positively charged carbon atom have?
 - What hybridization do you expect this carbon atom to have?
 - What geometry is the carbocation likely to have?
- The O-H hydrogen in acetic acid ($\text{H}_3\text{CCO}_2\text{H}$) is much more acidic than any of the C-H hydrogens. Explain!
 - Identify the carbon atoms in the following molecule as primary, secondary, tertiary, or quaternary:



- Predict the products of the following polar reaction by interpreting the flow of electrons as indicated by the curve arrows:

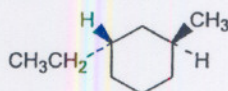


- Assign *E* or *Z* configuration to the following alkenes:

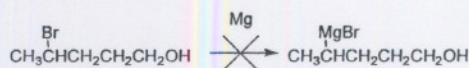


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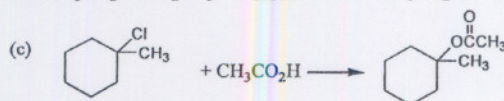
- Please estimate the amount of strain in *cis*-1-*tert*-butyl-4-ethylcyclohexane, given that the 1,3-diaxial steric strain between hydrogen and other group is 4.0 and 11.4 kJ/mol for $-\text{CH}_2\text{CH}_3$ and $-\text{C}(\text{CH}_3)_3$, respectively.
- Please explain why CH_3OH can be both a nucleophile and an electrophile.
- Please explain why in alkanes increased branching lowers alkanes' boiling points.
- Assign *R* or *S* configuration to each chirality center in the following molecule:



- Why do you suppose that it's not possible to prepare a Grignard reagent from a bromo alcohol such as 4-bromo-1-pentanol?



- 3-Bromo-1-butene and 1-bromo-2-butene undergo $\text{S}_{\text{N}}1$ reaction at nearly the same rate even though one is a secondary halide and the other is primary. Explain!
- Tell whether each of the following reactions is likely to be $\text{S}_{\text{N}}1$, $\text{S}_{\text{N}}2$, $\text{E}1$, or $\text{E}2$:



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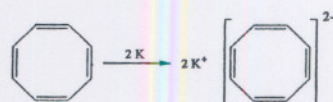
(第二頁共二頁)

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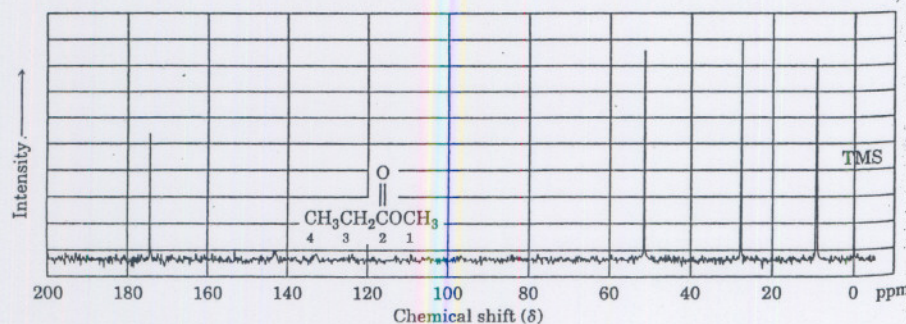
14. Cyclooctatetrene readily reacts with potassium metal to form the stable cyclooctatetraene dianion, $C_8H_8^{2-}$.

Why do you suppose this reaction occurs so easily? What geometry do you expect for the cyclooctatetraene dianion?

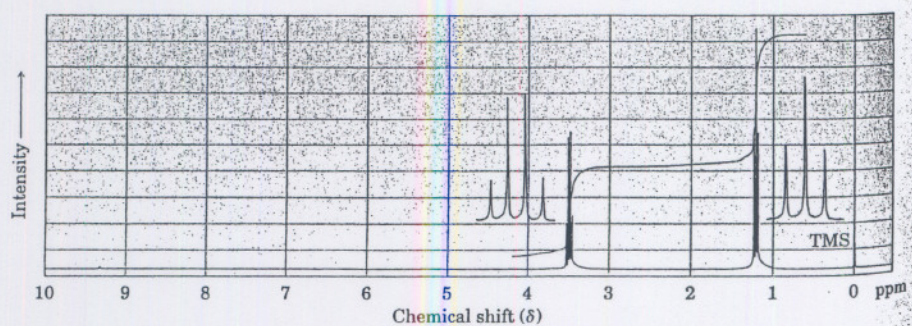


15. Please explain the difference between these two terms, "kinetic control" and "thermodynamic control".

16. Assign the resonances in the ^{13}C NMR spectrum of methyl propanoate, $CH_3CH_2CO_2CH_3$.



17. The integrated 1H NMR spectrum of a compound of formula $C_4H_{10}O$ is shown below. Propose a structure consistent with the data.



Please explain the following terms: (a) Hyperconjugation, (b) Regiospecific, (c) Bromonium ion, (d) Meso compounds, (e) Racemic mixtures, (f) Hyperconjugation, (g) Tautomerism, (h) Prochirality center.

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