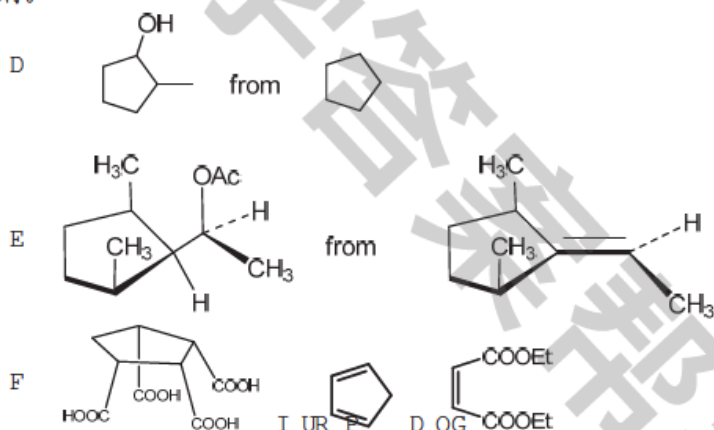


The 200-MHz ^1H NMR spectrum of isomer **G** of $\text{C}_3\text{H}_5\text{Br}$.

- b) 异构体 **H** 的 ^{13}C NMR spectrum: δ 32.6 ppm (CH_2); 118.8 ppm (CH_2); and 134.2 ppm (CH).
- c) 异构体 **I** 的 ^{13}C NMR spectrum: δ 12.0 ppm (CH_2) and 16.8 ppm (CH). The peak at lower field is only half as intense as the one at higher field.

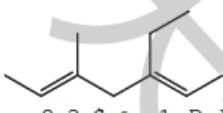
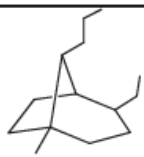
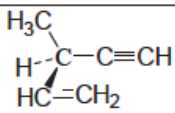
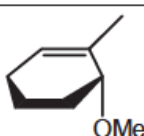
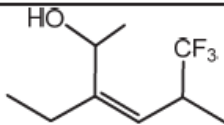

(15) 完成下面化合物的合成。除指定原料外，可用无机试剂和不多四碳的有机试剂。



课程代码	C	H	M	2	3	4	0	0	T
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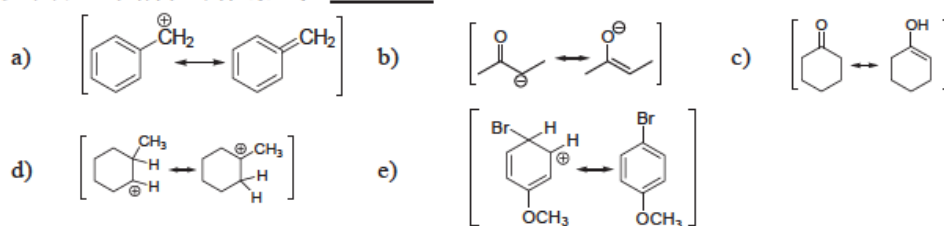
N 1.				fl	h	A		?	1	
k										

1. (12 pts) ; IUPAC \ [2~4# Q E'' Q E '' E (= ~ 0 ' X _ ° ~ V • (M A'' ~A. Q E ° R/S ☉Z/E X _ ~

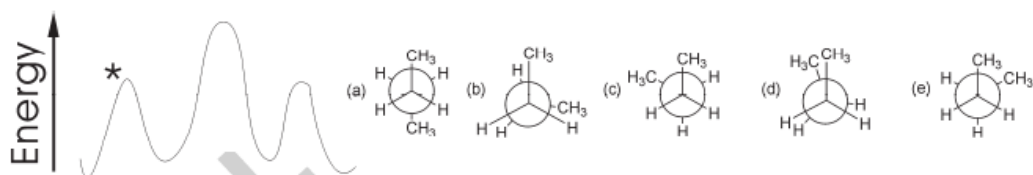
N 1.	☉ (=	N 1.	☉ (=
1)	 <p>, 8 3 \$ & 1 D P H</p> <p>[2~4# E~</p>	2)	 <p>~ ~ , J Q R U H 6 W H U R F K H P L V W U</p> <p>, 8 3 \$ & 1 D P H</p> <p>[2~4# E~</p>
3)	 <p>, 8 3 \$ & 1 D P H</p> <p>[2~4# E~</p>	4)	 <p>, 8 3 \$ & 1 D P H</p> <p>[2~4# E~</p>
5)	 <p>, 8 3 \$ & 1 D P H</p> <p>[2~4# E~</p>	6)	 <p>, 8 3 \$ & 1 D P H</p> <p>[2~4# E~</p>

2. (20 pts) 选择题: 针对下面每一个问题, 选择最佳答案。

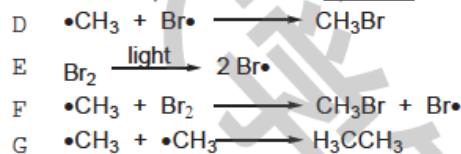
1) 以下哪一对结构互为共振式? _____



2) _____

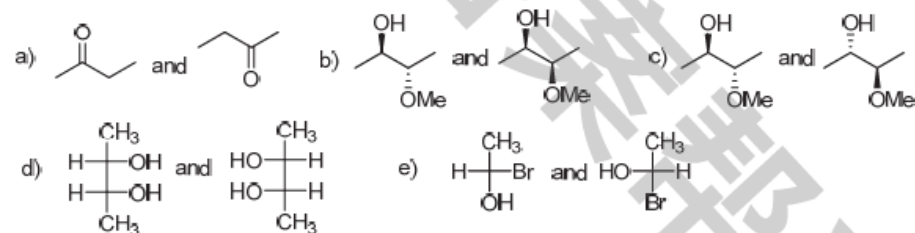


3) _____

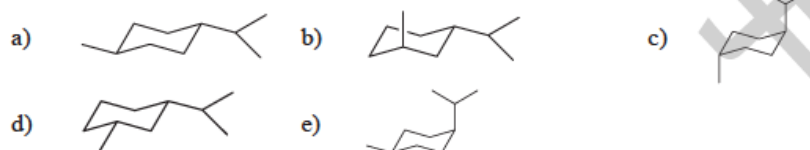


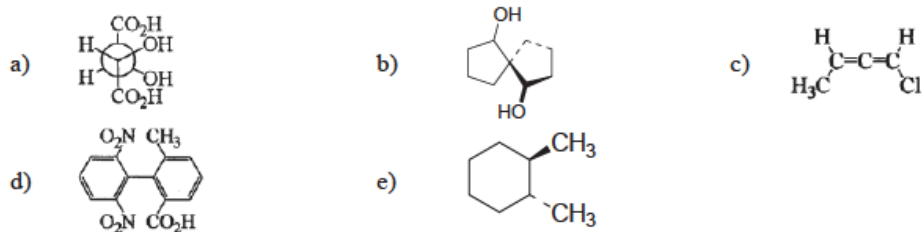
H _____

4) _____



5) _____





- 7) $\text{C}_6\text{H}_5\text{COOH}$ (aq) \rightleftharpoons $\text{C}_6\text{H}_5\text{COO}^-$ (aq) + H^+ (aq) $K_a = 1.06 \times 10^{-4}$. A 0.50 g sample of $\text{C}_6\text{H}_5\text{COOH}$ is dissolved in 100 mL of water. The pH of the solution is _____.
- a) (+) 1.06 b) (+) 10.6 c) (+) 100.6 d) (+) 0.106 e) (+) 0.53

- 8) $\text{C}_6\text{H}_5\text{COOH}$ (aq) \rightleftharpoons $\text{C}_6\text{H}_5\text{COO}^-$ (aq) + H^+ (aq) $K_a = 1.06 \times 10^{-4}$. A 0.50 g sample of $\text{C}_6\text{H}_5\text{COOH}$ is dissolved in 100 mL of water. The pH of the solution is _____.
- a) 92 % (+) and 8 % (-) b) 92 % (-) and 8 % (+)
c) 84 % (+) and 16 % (-) d) 96 % (+) and 4 % (-)
e) 88 % (+) and 12 % (-)

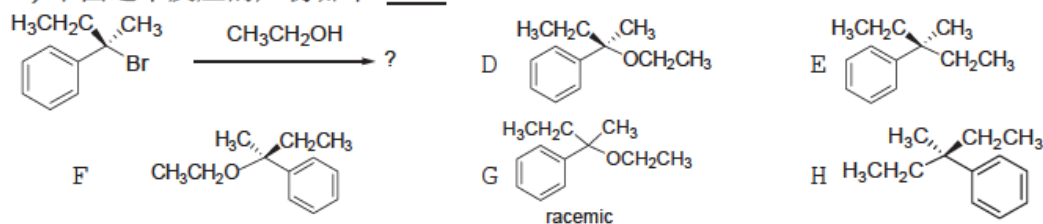
- 9) $\text{CH}_3\text{Cl} + \text{OH}^- \rightarrow \text{CH}_3\text{OH} + \text{Cl}^-$, $k = 3.5 \times 10^{-3} \text{ mol}^{-1} \text{ L s}^{-1}$. $[\text{CH}_3\text{Cl}] = 0.50 \text{ mol L}^{-1}$, $[\text{OH}^-] = 0.015 \text{ mol L}^{-1}$. The rate of reaction is _____.
- a) $2.6 \times 10^{-5} \text{ mol L}^{-1} \text{ s}^{-1}$ b) $2.6 \times 10^{-6} \text{ mol L}^{-1} \text{ s}^{-1}$
c) $2.6 \times 10^{-3} \text{ mol L}^{-1} \text{ s}^{-1}$ d) $1.76 \times 10^{-3} \text{ mol L}^{-1} \text{ s}^{-1}$
e) $1.76 \times 10^{-5} \text{ mol L}^{-1} \text{ s}^{-1}$

- 10) $\text{C}_6\text{H}_5\text{COOH}$ (aq) \rightleftharpoons $\text{C}_6\text{H}_5\text{COO}^-$ (aq) + H^+ (aq) $K_a = 1.06 \times 10^{-4}$. A 0.50 g sample of $\text{C}_6\text{H}_5\text{COOH}$ is dissolved in 100 mL of water. The pH of the solution is _____.
- (a) F^- (b) Cl^- (c) Br^- (d) I^-

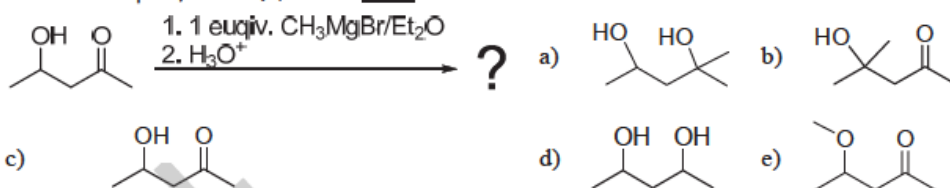
- 11) $(S)-(+)-2\text{-iodobutane}$ reacts with NaI in acetone. The product is _____.
- (a)
- (b)
- (c)
- (d)
- (e)

- 12) $(\text{CH}_3)_3\text{CCl} \xrightarrow{\text{CH}_3\text{O}^-} \text{H}_3\text{C}-\text{C}(\text{CH}_3)=\text{CH}_2$

- 13) 下面这个反应的产物哪个? _____
 a) E1 b) E2 c) S_N1 d) S_N2

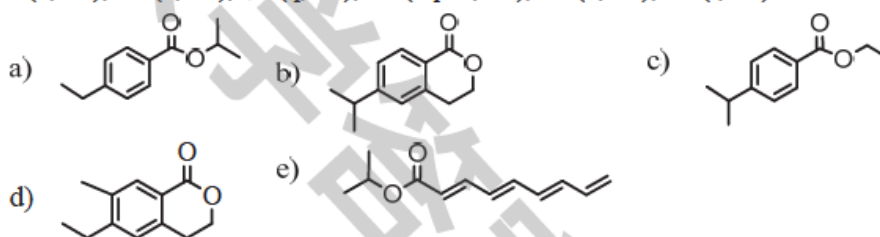


- 14) $\text{Mg} \text{Et} \text{X} \text{ } \{ (= \text{ ? } \text{_____}$



- 15) " $\text{E} (= \text{K} \text{ V} \text{ 1H, NMR?}$

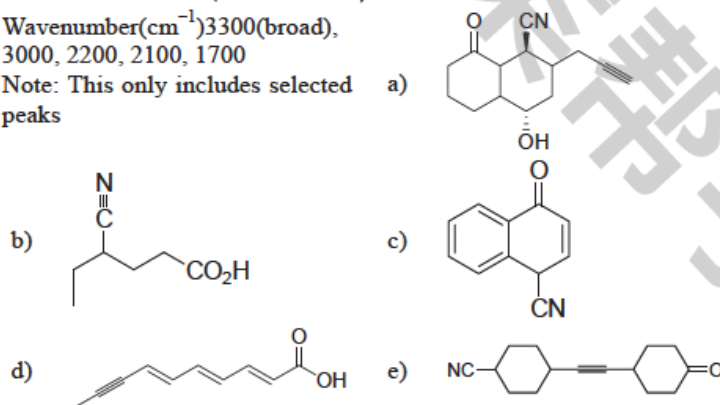
δ 7.9 (d, 2H), 7.2 (d, 2H), 4.1 (q, 2H), 2.7 (septet, 1H), 1.6 (d, 6H), 1.2 (t, 3H)



- 16) $\text{MgFw} \text{ } \text{E} (= \text{K} \text{ V} \text{ , X4v ?E} \text{ B}$

Wavenumber(cm^{-1}) 3300(broad), 3000, 2200, 2100, 1700

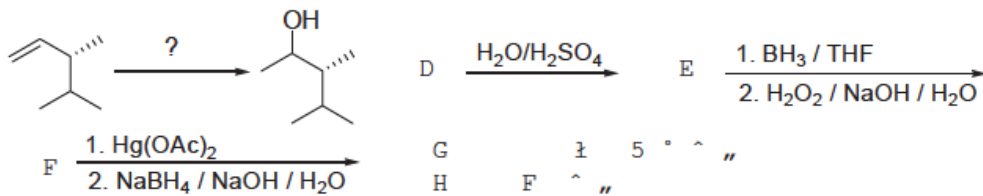
Note: This only includes selected peaks



- 17) ? . (= $\text{E O E} \text{ , } 21640 \text{ cm}^{-1} \text{ E} \text{ B} \text{ u}$ 9 ~ WX 4 SX
 ~ 6 " ? _____



18) 哪一个反应条件最适合完成下面的转化?



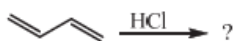
19) M6 E (=, 5 ° SM) ; h, X 2 6NN d
 $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$ $\text{CH}=\text{CHCHClCH}_3$ $\text{CH}_3\text{CH}_2\text{CHClCH}_3$

(a) $A > B > C$ (b) $B > C > A$ (c) $B > A > C$ (d) $C > B > A$


20) "E (= Diels-Alder) ; h?



21) $M6E \rightarrow h^*$



a) $\text{CH}_3-\overset{+}{\text{CH}}-\text{CH}_2-\text{CH}_3$ b) $\overset{+}{\text{CH}}_2-\text{CH}_2-\text{CH}=\text{CH}_2$
c) $\text{CH}_3-\overset{+}{\text{CH}}-\text{CH}=\text{CH}_2$ d) $\text{CH}_2=\overset{+}{\text{C}}-\text{CH}=\text{CH}_2$
e) None of these

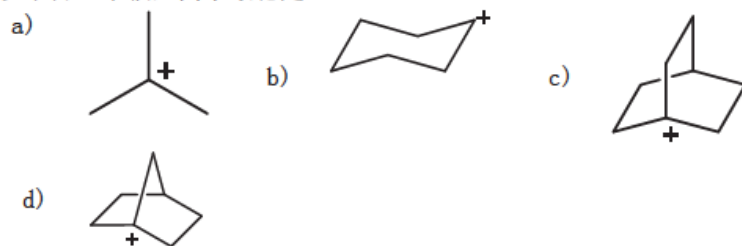
22)  \mathbb{E} (=! \mathbb{E} & $\underline{\mathbb{S}}$)
(a) 1-butene (2) *trans*-2-butene (3) *cis*-2-butene

23) " \mathbb{E} (=, XGL B?

a) $\text{CH}_3\text{CH}_2\text{COOH}$ b) CH_3COOH c) CH_2FCOOH d) CH_2ClCOOH

a) HO^- b) CH_3O^- c) $i\text{-PrO}^-$ d) $t\text{-BuO}^-$

25) 以下哪一个碳正离子最稳定



26) DMF 是以下哪一个溶剂的缩写

- a) HC(=O)NMe_2 b) $\text{CH}_3\text{(=O)CH}_3$ c) CHCl_3 d) $\text{CH}_3\text{S(=O)CH}_3$

27) 下面这个三级碳自由基的单电子处于哪一种分子轨道中? _____



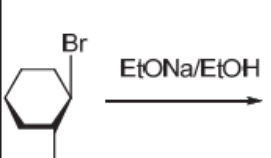
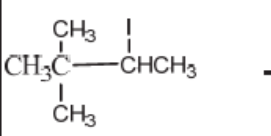
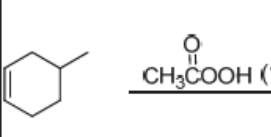
Tertiary carbon radical

D V SE VS VSG VSH

28) " -6. " " \$K", f 0* ?U ____/ i "

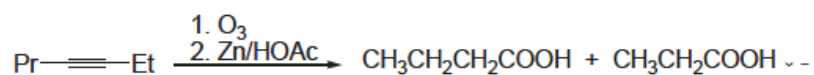
- a) hydrogen bond b) London force c) dipole-dipole interaction

S W V m M6 i h, X { (= " @4 > ,E ,X i h 5 °

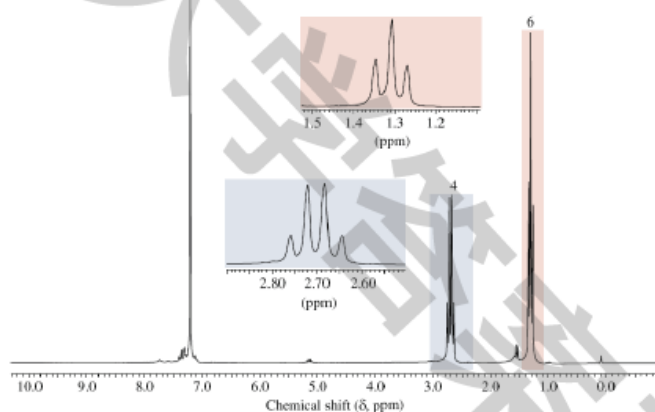
1 ~ -		<div style="border: 1px solid black; width: 300px; height: 60px; margin: 0 auto;"></div>
2 ~ -		<div style="border: 1px solid black; width: 300px; height: 60px; margin: 0 auto;"></div>
3 ~ -		<div style="border: 1px solid black; width: 300px; height: 60px; margin: 0 auto;"></div>

4)	$ \begin{array}{c} \text{Cyclohexane} \xrightarrow[\text{mono-chlorination}]{\text{Cl}_2, h\nu} \left[\quad \quad \quad \right] \xrightarrow{\text{Mg, Et}_2\text{O}} \left[\quad \quad \quad \right] \xrightarrow[2. \text{H}_3^+\text{O}]{1. [\text{HCHO}]_n} \\ \\ \left[\quad \quad \quad \right] \xrightarrow{\text{SOCl}_2} \text{Cyclohexyl-CH}_2\text{Cl} \xrightarrow{\text{EtONa/EtOH}} \left[\quad \quad \quad \right] \\ \\ \xrightarrow{\text{HBr, } t\text{BuOO}t\text{Bu}} \left[\quad \quad \quad \right] \xrightarrow[3. \text{H}_3^+\text{O}]{\begin{array}{l} 1. \text{Mg, Et}_2\text{O} \\ 2. \text{Epoxide} \end{array}} \left[\quad \quad \quad \right] \end{array} $
5 ~ ~	$ \left[\quad \quad \quad \right] \xrightarrow{\text{Br}_2} \text{meso-4R,5S} $
6 ~ ~	$ \text{Cyclooctatetraene} \xrightarrow[2. \text{H}_2\text{O}_2/\text{H}_2\text{O}]{1. \text{B}_2\text{H}_6/\text{THF}} \left[\quad \quad \quad \right] $
7 ~ ~	$ \begin{array}{c} \text{Me} \quad \text{H} \\ \diagdown \quad / \\ \text{C} = \text{C} \\ / \quad \diagdown \\ \text{Et} \quad \text{Me} \end{array} \xrightarrow{\text{Br}_2} \left[\begin{array}{c} \text{Me} \\ \\ \text{---} \\ \\ \text{Me} \end{array} + \begin{array}{c} \text{Me} \\ \\ \text{---} \\ \\ \text{Me} \end{array} \right] $ <p style="text-align: center;">Fischer Projection Fischer Projection</p> <p>Note: Backbones of Fischer projections of products were drawn as time savers.</p>
8 ~ ~	$ \text{CH}_3\text{CH}=\text{CH}_2 \xrightarrow[2. \text{NaOH}]{1. \text{Cl}_2/\text{H}_2\text{O}} \left[\quad \quad \quad \right] \xrightarrow{\text{CH}_3\text{OH, H}^+} \left[\quad \quad \quad \right] $
9 ~ ~	$ \text{H}_3\text{C}-\text{C}\equiv\text{CH} \xrightarrow{2\text{HBr, Br}^-} \left[\quad \quad \quad \right] $

6. (10 pts) 化合物 A \cdot $C_{14}H_{25}Br$ dA \ " \mathbb{I}_{H} (NaC \equiv CH) 0
 1,12-dibromododecane (Br(CH $_2$) $_{12}$ Br) - o d 0NaNH $_2$ - o **B** ^
 (C $_{14}$ H $_{24}$) d \$ **B** ^ y ~ HO $_2$ C(CH $_2$) $_{12}$ CO $_2$ H d } Lindlar ' \$ ' \$
 i / . PB \$ **C** (C $_{14}$ H $_{26}$) d\$ **C** | ' \$ i \$ \$ **D** (C $_{14}$ H $_{28}$) d
 i / . PB \$ **E** ^ (C $_{14}$ H $_{26}$) dC **E** y ~ [
 O=CH(CH $_2$) $_{12}$ CH=O d T l » h < r . n **A-E** ^ r d
 7. (: - y ~ \mathbb{I} n z ~ N 6 d H " !



8. (4 pts) \$ **F** h34 Q ^1H NMR V " " d n c r d



^1H NMR spectrum of compound F.

- (6 pts) T l » V α' o n \$ C $_3$ H $_5$ Br 8 Q r:
 a) r **G** ^1H NMR V " " .!