Chemistry 1B Adv/SSP (CHEM1902/1904) November 2006

2006-N-2

- pH = 6.72

  56%

  3.8 mL

2006-N-3

- Rate = $k[NO_2]^2$

  2.08×10^{-4} L mol^{-1} s^{-1}

  5.21×10^{-5} mol L^{-1} s^{-1}

  $2NO_2(g) \rightarrow NO(g) + NO_3(g)$ slow

  $NO_3(g) + CO(g) \rightarrow NO_2(g)\ CO_2(g)$ fast

  The slow first step is consistent with rate law of Rate = $k[NO_2]^2$. The fast second step is consistent with the rate being independent of [CO].

2006-N-4

- Talc consists of silicate sheets with Mg^{2+} and OH^- counter ions. Weak intermolecular forces mean the sheets can glide past one another giving it a greasy feel. Quartz consists of 3-d structure with all tetrahedra covalently bonded. It therefore has very high melting point. (See textbook for further detail - look up "silicate materials" in index.)
- Iron is transition metal with 6 coordination sites that can form octahedral complexes. In haemoglobin, 5 of these sites are bound to the haem unit and the protein, leaving the vacant site available to bind molecular oxygen. The O_2 is carried to body tissues where it is released.

  cis-Platin, $[Pt(NH_3)_2Cl_2]$ can bind to DNA by losing the Cl's in the square planar complex. The corresponding *trans* compound is inactive. Lability of the Cl's and the shape of square planar complex are both crucial to the effectiveness of this platinum compound.

2006-N-5

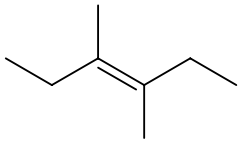
- tetraamminedichlorocobalt(III) chloride-2-water

  stereoisomerism, coordination sphere isomerism

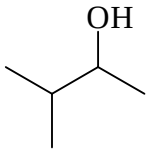
  6

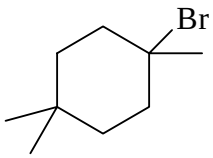
  IV

2006-N-6

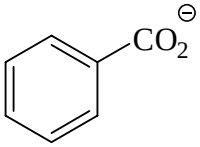
- 

(*E*)-3,4-dimethyl-3-hexene



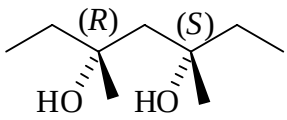


1-bromo-1,4,4-trimethylcyclohexane



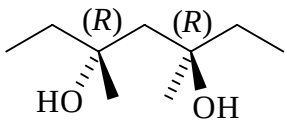
2006-N-7

- achiral



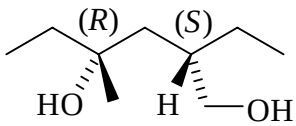
(3*R*, 5*S*)-3,5-dimethylheptane-3,5-diol

chiral



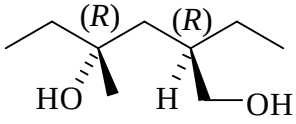
(3*R*, 5*R*)-3,5-dimethylheptane-3,5-diol

chiral



(2*S*, 4*R*)-2-ethyl-4-methylhexane-1,4-diol

chiral



(2*R*, 4*R*)-2-ethyl-4-methylhexane-1,4-diol

2006-N-8

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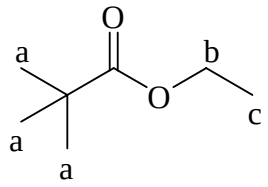

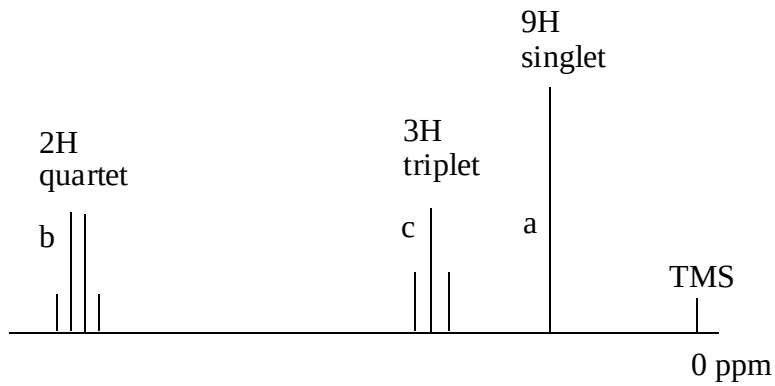

constitutional isomers

1) IR spectrometry: **Y** has strong carbonyl absorption at about 1700 cm^{-1}. **Z** does not.

2) **Z** has 3 signals (all singlets) with relative intensities of 3:2:2. in ^{1}H NMR spectrum; **Y** has 3 signals (singlet, triplet and quartet) with relative intensities of 9:2:3 in ^{1}H NMR spectrum.

3) **Z** has 4 signals in ^{13}C NMR spectrum, **Y** has 5 signals in ^{13}C NMR spectrum.

4) fragmentation pattern in mass spectrum

2006-N-9

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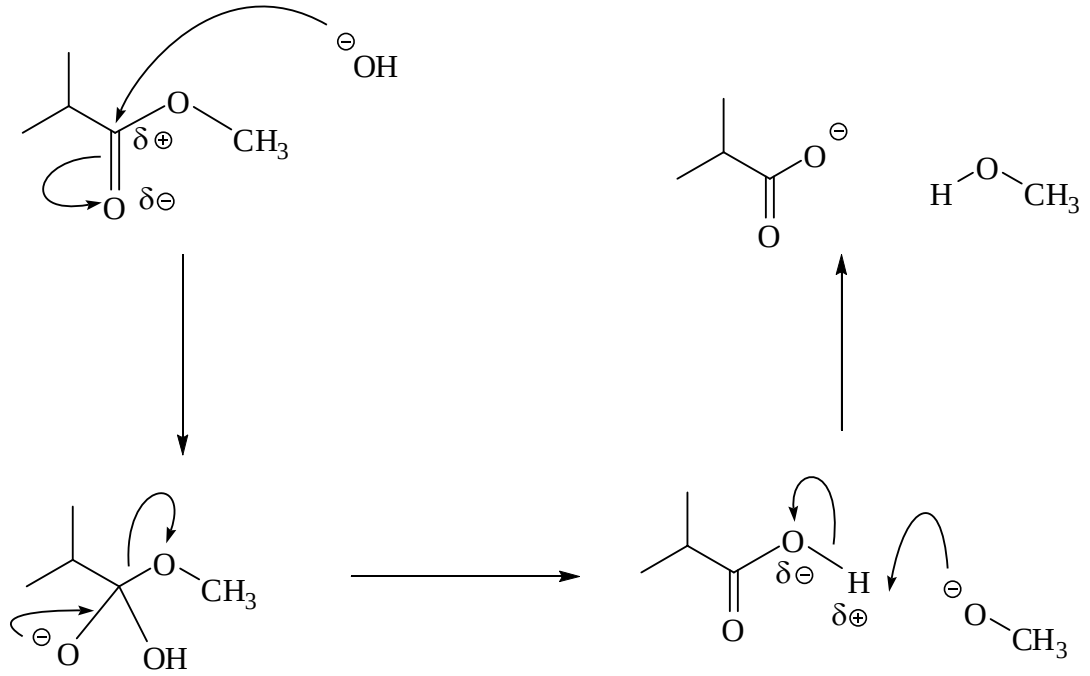

2006-N-10

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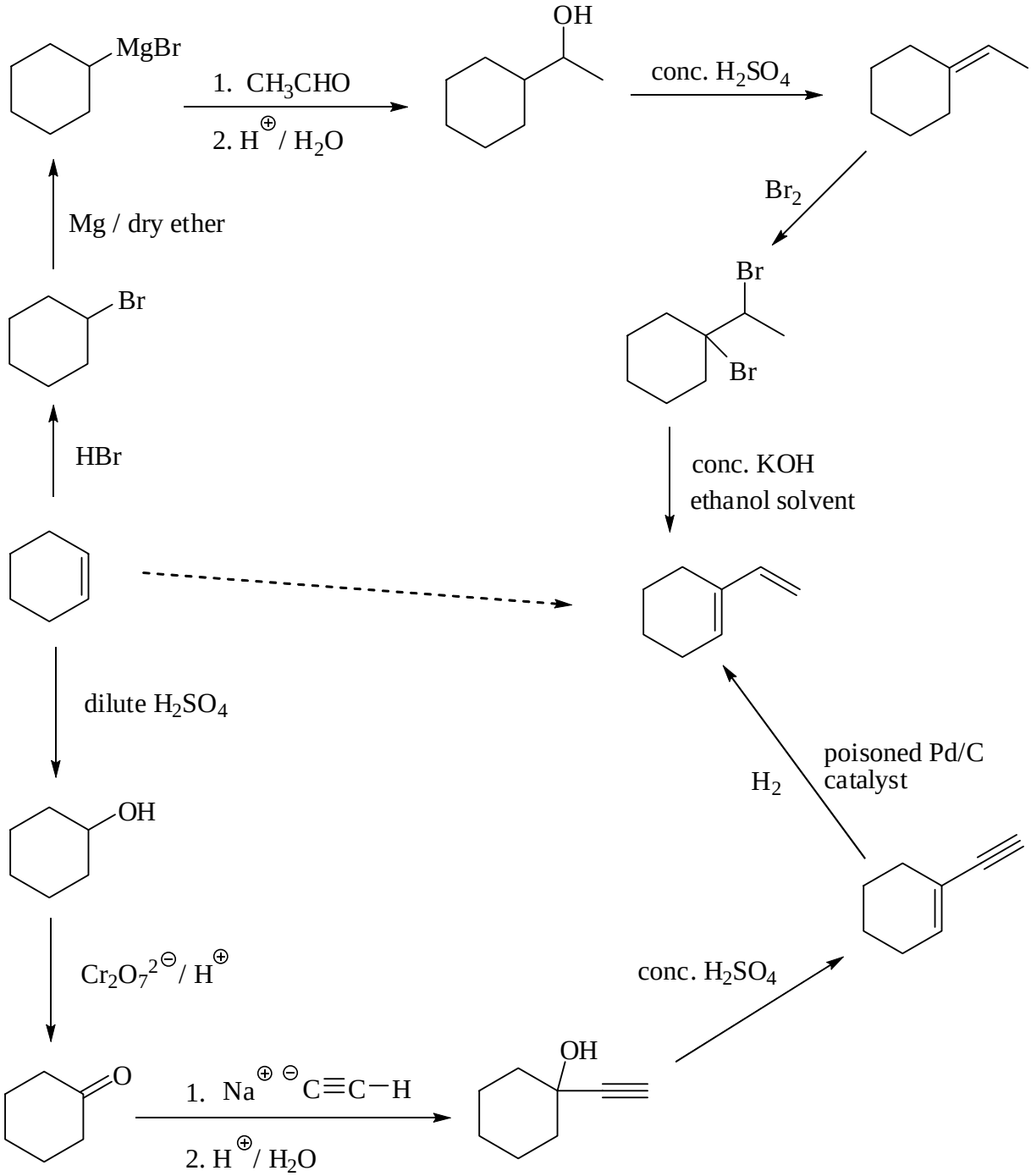
MgBr
1. CH3CHO
2. H⊕ / H2O
OH
conc. H2SO4
Br2
Mg / dry ether
Br
Br
Br
HBr
conc. KOH
ethanol solvent
dilute H2SO4
OH
poisoned Pd/C
catalyst
H2
Cr2O7 2⊖ / H⊕
conc. H2SO4
O
1. Na⊕ ⊖C≡C−H
2. H⊕ / H2O
OH