CHEMISTRY 1B (CHEM1102) - November 2014

NB These answers have not been checked

2014-N-2

- BN

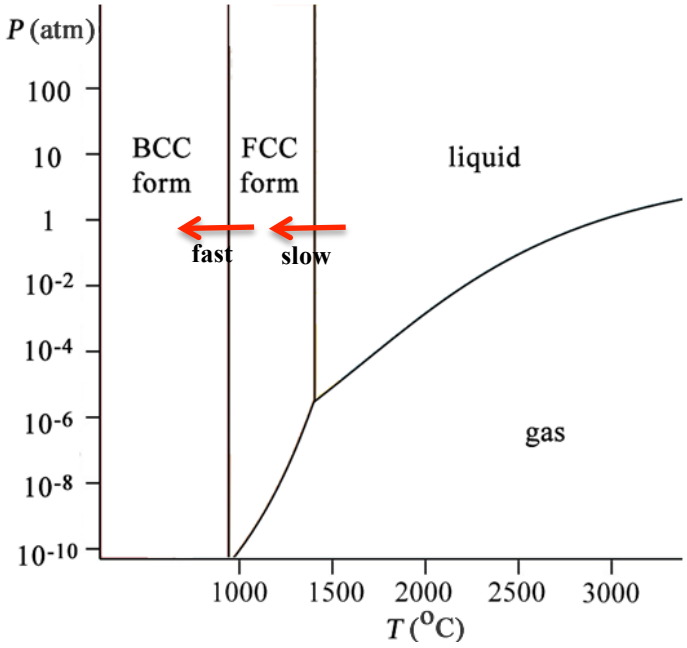
  +III (or +3)

  The B-N bonds are partially ionic.

2014-N-3

- BCC form

  See below



Fast cooling to room temperature does not allow the atoms to re-arrange; they are stuck in the FCC form as considerable re-arrangement is needed to turn this in the BCC form.

The line between BCC and FCC has a negative slope (\). If the system is on the line and the pressure is increased, the system moves into the FCC region.

2014-N-4

- 2.75

  C_6H_5COOH

  10.97

  NH_3

2014-N-5

- $C_6H_5COOH(aq) + NH_3(aq) \rightarrow C_6H_5COO^-(aq) + NH_4^+(aq)$

$$K = \frac{[\mathbf{C_6H_5COO^-(aq)}][\mathbf{NH_4^+(aq)}]}{[\mathbf{C_6H_5COOH(aq)}][\mathbf{NH_3(aq)}]}$$

1.1×10^5

$C_6H_5CO_2^-(aq)$, $NH_4^+(aq)$, $H_2O(l)$

2014-N-6

- $CaC_2O_4 \cdot H_2O(s) \rightarrow Ca^{2+}(aq) + C_2O_4^{2-}(aq) + H_2O(l)$ $K_{sp} = [Ca^{2+}(aq)][C_2O_4^{2-}(aq)]$

4.8×10^{-5} mol L^{-1}

No effect

3.0×10^{-8} M

2014-N-7

- The high charge on the Zn^{2+} ion draws electron density out of the O–H bonds in the water molecule. This weakens the O–H so the H^+ is more likely to leave.

Zn^{2+} has 0 unpaired *d* electrons, Co^{2+} has 3 unpaired *d* electrons:

Zn^{2+}, $3d^{10}$

Co^{2+}, $3d^7$

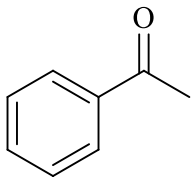
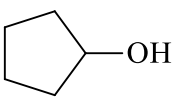
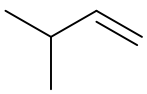
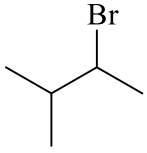
↑↓	↑↓	↑↓	↑↓	↑↓
↑↓	↑↓	↑	↑	↑

Co^{2+} is paramagnetic and the magnetism can be used to study the active site.

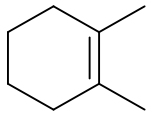
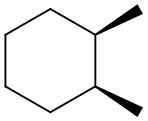
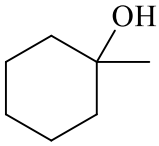
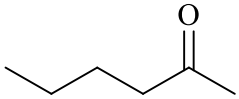
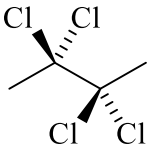
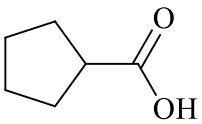
Co^{2+} may be oxidised to Co^{3+}. Co^{2+} tends to be octahedrally coordinated so the coordination geometry may change.

2014-N-8

- See below

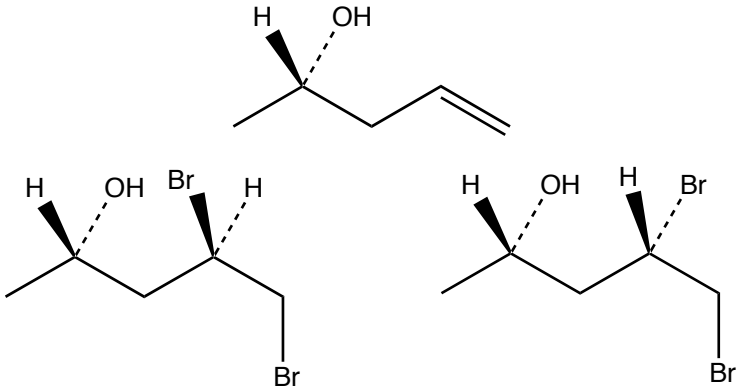
	1. $NaBH_4$ 2. $H^{\oplus}$ / H_2O	
	hot concentrated H_2SO_4	
		

2014-N-8 (cont.)

		
	dilute aqueous H_2SO_4	
	$Cr_2O_7^{2\ominus}$ / $H^{\oplus}$	
	2 equivalents of Cl_2	
	$SOCl_2$	

2014-N-9

- See below



2014-N-10

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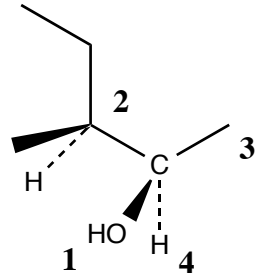
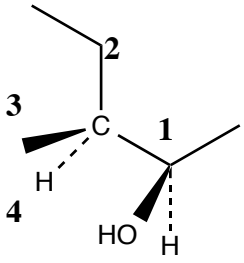


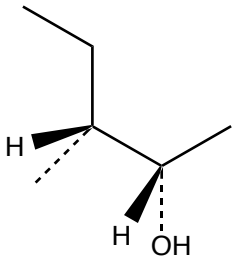
(*R*)



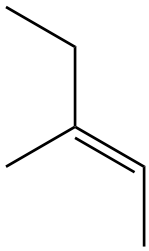
(*S*)

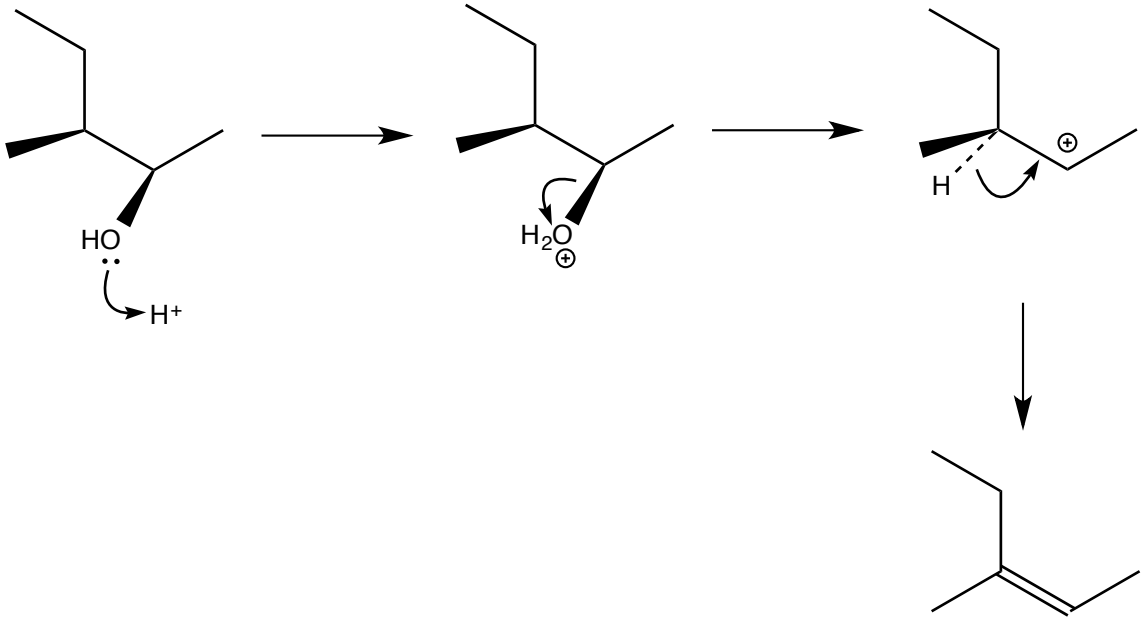
(*Z*)-3-methylpent-2-ene

Enantiomer of **A**:



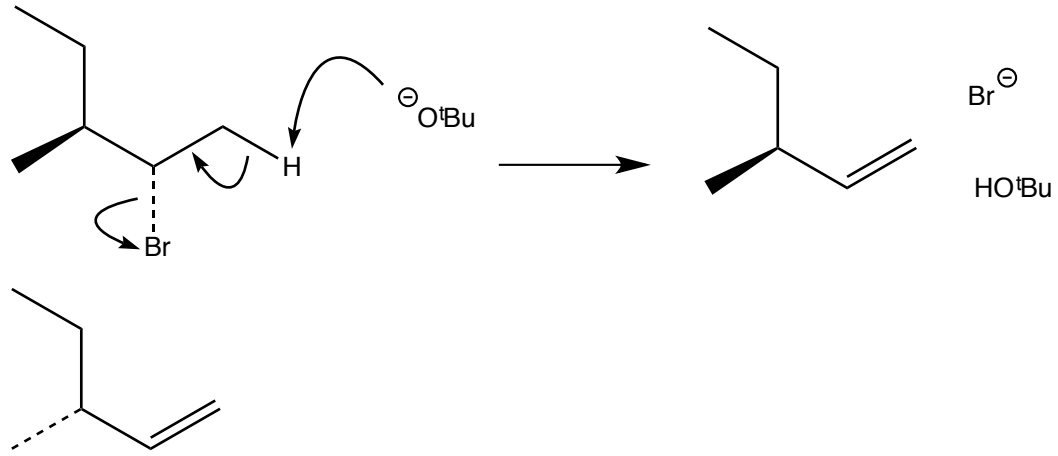
Diastereoisomers of **B**:





2014-N-11

- C is the less substituted alkene and, according to Zeirsev's rule, this is favoured because it is more stable.



2014-N-12

- See below