Answers to Problem Sheet 5

1. Mark each stereogenic centre in the following compounds with an asterisk (*).

![4-chlorocyclopent-1-ene](image)

No stereogenic centre - ring is symmetrical about substituted carbon

![Cl](image)

4-chlorocyclopent-1-ene

![Cl](image)

One stereogenic centre - ring is unsymmetrical about substituted carbon

![OH](image)

Three stereogenic centres – each has a hydrogen and three different groups around it. These hydrogens are not drawn in the stick representation.

2-isopropyl-5-methylcyclohexanol

2. (a) 2,4-pentanediol

Two chiral centres would seem to give $2 \times 2$ combinations. However, only three isomers are possible.

The $(2R, 4R)$ and $(2S, 4S)$ forms pictured below are enantiomers of each other.
The third combination of chiral centres gives a form which is superimposable on the fourth combination, its mirror image. This is called the *meso* isomer which possesses a plane of symmetry through the centre of the molecule.

(b) 2,3,4-pentanetriol

Two chiral centres would seem to give $2 \times 2 \times 2$ combinations. However, only 4 isomers are possible.

The $(2R, 4R)$ and $(2S, 4S)$ forms pictured below are enantiomers of each other:

There are also two *meso* forms:
Any other form that is drawn down is actually identical to one of these.
4.

\[ \text{anticlockwise - (S)} \]

\[ \text{clockwise - (R)} \]

\[ \text{higher priority group the same side - (Z)} \]

5.

(a) \[ \text{racemic} \]

(b) \[ \text{achiral} \]

(c) \[ \text{Reaction proceeds via } \text{NH}_2^- \text{ ion removing } H^+ \text{ from } -\text{OH} \text{ group so chiral centre is not affected.} \]