ANSWERS: Constitutional isomers and stereoisomers

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **2019** | **Evidence** | **Achievement** | **Merit** | **Excellence** |
| 1 (i)  2. | The enantiomers can be distinguished based upon their ability to  rotate plane-polarised light. One enantiomer will rotate the plane polarised light to the left while the other enantiomer will rotate the  plane-polarised light to the right. | Recognises tetrahedral arrangement of correct atoms / groups about asymmetric C atom.  Identifies enantiomers rotate  (plane) polarised light.  One structure | Two correct structures of 2-chlorobutane.  AND  Explains enantiomers can rotate (plane) polarised light in opposite directions.  Three structures | All structures |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **2018** | **Evidence** | **Achievement** | **Merit** | **Excellence** |
| (i)  (ii)  (iii) | Gylceraldehyde can exist as enantiomers because it has an asymmetric carbon atom, i.e. a carbon atom with four different groups attached.  The enantiomers can be distinguished based upon their ability to rotate plane polarised light. One enantiomer will rotate the plane polarised light to the left while the other enantiomer will rotate the plane polarised light to the right. | • Recognises tetrahedral arrangement of groups about chiral C atom.  • Identifies and describes the asymmetric C atom.  • Identifies enantiomers rotate (plane) polarised light in opposite directions | • Two correct enantiomers of glyceraldehyde  • Explains requirement for optical isomers and how to distinguish between them. |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **2017** | **Evidence** | **Achievement** | **Merit** | **Excellence** |
| 1.  2. | There must be a carbon atom that has **four different species (groups)** attached to it.  This creates two molecules that are **mirror images** of each other that are **nonsuperimposable**.  The different isomers will **rotate (plane)-polarised light in opposite directions**. This will distinguish the isomers. | Any of the following to a maximum of three:  • One correct 3-D Drawing  OR two 3-D drawings with the four correct groups  • States that four-different species are required  • Mirror images  • Non-superimposable  • Enantiomers will rotate plane-polarised light. | • Correct 3-D drawings and partial explanation.  OR  Full explanation with correct but careless drawings. | • Correct 3-D drawings  with full explanation. |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **2016** | **Evidence** | | **Achievement** | | **Merit** | | **Excellence** | |
| (i)  (ii) | Glycine.  It does NOT have a chiral C, i.e. it needs four different groups around the central C atom, glycine only has three. | | * Attempts to draw two 3-D structures but with careless error   OR  ONE correct 3-D structure.   * Glycine plus one relevant statement | | * TWO correct 3-D images. * Glycine plus explanation of chiral / asymmetric carbon. | |  | |
| **2015** | | **Evidence** | | **Achievement** | | **Achievement with Merit** | | **Achievement with Excellence** |
| (a)(i)  (ii) | | A chiral compound contains a carbon atom with 4 different groups attached.  Same – boiling point / melting point / density / solubility.  Different – enantiomers rotate plane-polarised light in different directions. | | * ONE correct. | | * BOTH correct. | |  |
| (b) | | http://www.4college.co.uk/a/ep/stereo5.gif | | * One correct 3-D image.   OR  BOTH isomers drawn but an error in the way the groups are connected to asymmetric carbon. | | * Both enantiomers correct. | |  |
|  | |  | |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **2014** | **Evidence** | **Achievement** | **Merit** | **Excellence** |
|  | 91391assq1b1 | • Two isomers. | * All three isomers.   OR  Two isomers and correct choice with partial explanation. | * All three isomers.   AND  Correct choice with explanation. |

© <https://www.chemical-minds.com>

NCEA questions and answers reproduced with permission from NZQA