**Carbon chemistry test**

**Question 1**

A student was given the task of identifying a liquid organic compound that contains only carbon, hydrogen and oxygen. They carried out the following tests:

|  |  |  |
| --- | --- | --- |
|  | Procedure | Result |
| Test 1 | Some brown Br2 (aq) was added | A reaction occurred and resulted in a colourless product being formed |
| Test 2 | Some Na2CO3 (s) was added | A reaction occurred and a colourless gas was produced |

Based on the above test results, the compound could be:

1. CH3CH2CH2COOH
2. CH2CH=CHCOOH
3. CH3CH2OOCCH3
4. HOCOCH=CHCH3

**Question 2**

The ester propyl butanoate could be formed from the reaction between

1. 1-propanol and butanoic acid
2. propanoic acid and 1-butanol
3. 1-propanol and propanoic acid
4. propane and butanoic acid

**Question 3**



The systematic name for the molecule shown is

1. 2-ethyl,2-methylpropane
2. 2,2-dimethylbutane
3. hexane
4. 3,3-dimethylbutane

**Question 4**

A short organic pathway is drawn below.

 uv/Cl2 KOH/H2O

 **butan-1-ol**

**Y**

**X**

In this process, molecule Y could be

1. butene
2. butane
3. butanol
4. 1-chlorobutane

**Question 5**

The number of structural isomers possible for C4H10 is

1. 1
2. 2
3. 3
4. 4

**Question 6**



The order of boiling points, from lowest to highest, for these molecules will be

**A**. propane, butane, propan-2-ol

**B**. propane, propan-2-ol, butane

**C**. butane, propan-2-ol, propane

**D**. propan-2-ol, propane, butane

**Question 7**

****

The functional groups present on this molecule are

1. hydroxyl, amide and carboxyl
2. hydroxyl, amine and carboxyl
3. hydroxyl, amide and ester
4. hydroxyl, amide and carboxyl

**Question 8**

The empirical formula of an organic molecule is CH2O. The molecule could be

1. methanol
2. ethanol
3. ethanoic acid
4. propanoic acid

**Question 9**

The molecule shown could be formed from the reaction between

1. methanoic acid and propan-1-amine
2. methanamine and propanoic acid
3. propanoic acid and methanamide
4. butanoic acid and ammonia

**Question 10**

The molecule HCOOH is

1. methanol
2. hydrogen ester
3. ethanoic acid
4. methanoic acid

**SECTION B - Short-answer questions**

|  |
| --- |
| **Instructions for Section B**Questions must be answered in the spaces provided in this book.To obtain full marks for your responses you should* Give simplified answers with an appropriate number of significant figures to all numerical questions; unsimplified answers will not be given full marks.
* Show all workings in your answers to numerical questions. No credit will be given for an incorrect answer unless it is accompanied by details of the working.

Make sure chemical equations are balanced and that the formulas for individual substances include an indication of state; for example, H2(g); NaCl(s) |

**Question 1** (8 marks)

1. Draw and label the geometric isomers of the molecule CH3CH2CHCHCH2CH3. 3 marks
2. Draw a structural diagram of a carbon compound that will have an optical isomer. 1 mark

1. **i**. Draw two structural isomers that have the molecular formula C 3H6O2.

 **ii.**  Name the isomers. 2 + 2 = 4 marks

**Question 2** (8 marks)

The following questions relate to the pathway used to produce the molecule drawn.



**a. i**. Name this molecule \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 **ii**. Circle and name the functional group Name: \_\_\_\_\_\_\_\_\_\_\_

1 + 1 = 2 marks

**b**. Outline a pathway for the synthesis of this molecule from an alkane. 3 marks

**c**. This molecule is reacted with ethanoic acid.

  **i**. Draw both products that will form.

 **ii**. Circle and name the functional group formed. 3 marks

**Question 3** (8 marks)

**a**.

 propanol 1- propanoic acid

 The systematic names for these molecules are both incorrect. Explain why.

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2 marks

**b**. **i**.

 4-methyl pentane is not the correct systematic name for this compound. Explain why.

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 **ii**. Is this molecule an isomer of pentane? Explain your answer.

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1 + 1 = 2 marks



**c**.

 **i**. Name the two molecules.

 **ii**. Draw the products formed from the reaction of these two molecules with acidified K2Cr2O7.

2 + 2 = 4 marks

**Question 4** (6 marks)

**a. i.** Sketch ethane and pentane.

 **ii**. Explain carefully how the properties of these two molecules are similar

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 **iii**. Explain carefully how the properties of these two molecules differ.

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1 + 1 + 2 = 4 marks

**b**. Give the systematic name for the following two molecules.

 

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 2 marks

**Question 5**  (10 marks)

**a**. Propan-1-ol can be formed from a substitution reaction

 + KOH/H2O +

+

Propan-1-ol

 Molecule A Substance B

 Use the boxes provided to draw the missing reactant and the missing product

 2 marks

**b**. Propan-1-ol can be formed from an addition reaction.

Propan-1-ol

 + H2O/H3PO4

 **i**. Use the box provided to draw the missing reactant.

 **ii**. Propan-1-ol is unlikely to be the only product from this reaction. Draw another possible

 product.

 **iii**. An ester is to be formed from propan-1-ol.

 Draw a possible pathway for this process, showing any necessary catalysts or reagents.

1 + 1 + 4 = 6 marks

**c**. Write the name and molecular formula of an alkene with 8 carbon atoms.

 Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Formula: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

 2 marks