**Suggested responses Instrumentation task 2**

\* = 1 mark

1. Complete the table provided to show the mass of each element present

|  |  |
| --- | --- |
| **element** | **mass present** |
| carbon | 2.110 |
| hydrogen | 0.352 |
| oxygen | 0.938 |

\*

1 mark

**2**.  = \* 0.176 : 0.352 : 0.0586 = 3 : 6 : 1 = C3H6O\*

2 marks

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**3. a. i**. 58 59 \*

**ii**. The abundance of the peak at 58 is far greater than the peak at 59\*

**iii**. The small peak at 59 is probably due to the unlikely occurrence of a 13C isotope

of a 2H isotope \*

1 + 1 + 1 = 3 marks

**b**. **i**. This is 15 less than the parent ion, matching a CH3 group (note: a positive

charge shown is incorrect)\*

**ii**. CH3+ \*

**iii**. No CH3CH2 chain on the molecule \*

1 + 1 + 1 = 3 marks

**c**. C3H6O has a mass of 58, so the empirical and molecular formulas are the same \*

1 mark

**4**. **a**. This is not an alkanol or carboxylic acid \*

**b**. Perhaps the oxygen is present as a C = O functional group \*

**c**. The structure does not have a range of functional groups. It might be a fairly

symmetrical structure. \*

1 + 1 + 1 = 3 marks

**5. a**. One only\*

1. There is only one hydrogen environment, so no neighbouring hydrogen \*

1 + 1 = 2 marks

**6.** Time to put all of the evidence together.

The molecular formula is C3H6O

The molecule cannot be an alkanol because because of the infrared spectrum and the

NMR \*

The molecule cannot be an amine because it contains no nitrogen \*

The molecule cannot be a carboxylic acid because the molecule has only one oxygen\*

and there is no O – H peak on the infrared spectrum\*

The number of different hydrogen environments is one\*

1 + 1 + 1 + 2 + 1 = 6 marks

**7**.

1 mark

\*this is acetone or propanone (propan-2-one also okay)

**8. a**. Two \*

**b**. The oxygen atom\* would make it polar as it introduces significant dipoles \*

1 + 2 = 3 marks

**9**. propene 🡪 propan-2-ol (H3PO4/H2O) Need to separate propan-1-ol and propan-2-ol

Propan-2-ol and K2Cr2O7/H+ to propanone

4 marks