**Solutions to SAC on Instrumentation**

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

|  |  |
| --- | --- |
| **Element** | **mass present (g)** |
| carbon |  1.221 |
| hydrogen |  0.203 |

1 mark

**2**. n(C) = $\frac{1.221}{12}$ : n(H) = $\frac{0.203}{1}$ \*

 0.102 : 0.203

 1 : 2 which is CH2 \*

 2 marks

**3. a. i**. 56 \*

 **ii**. Presence of a small amount of 2H isotope or 13C isotope \*

 **b**. **i**. 56 – 41 = 15, therefore likely to be CH3**.** \*

**ii**. CH3CH+ \*

 **c**. CH2 = 14. 56/14 = 4 therefore molecular formula = C4H8 \*

2 + 2 + 1 = 5 marks

**4**. **a**. No broad peak at 3200 cm-1 \*

 **b**. C – H bond \*

 **c**. The molecule is a fairly simple structure. It might also be symmetrical\*

 **d.** Probably C = C double bond, given the formula is C4H8\*

 1 + 1 + 1 +1 = 4 marks



**5**.

 Isomer 1: 1-butene Isomer 2: 2-butene

 2 marks

**6. a**. 2 \*

 **i**. – CH = CH – **CH3 \***

 **ii**. R – CH = **CH** - R \*

1 + 2 = 3 marks

**7.** Correct answer is 2-butene.\* It has two different hydrogen environments matching the

 NMR shown. 1-butene would have 4 different environments\*

2 marks

**8. a**. 2\*

 **b**. Non polar due to the lack of electronegative elements, and molecule is symmetrical.\*

 1 + 1 = 2 marks

**9**. This mystery molecule can be reacted with bromine solution.

 **a**. The brown colour of the bromine will disappear\*

 **b**. 

 2,3-dibromobutane\*

1 + 1 = 2 marks



**10.**

 1 mark

**11**.

Only one product forms: 2-butanol 1 mark

