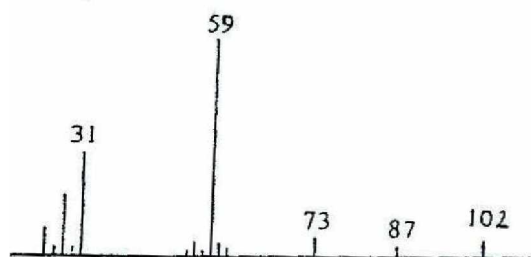
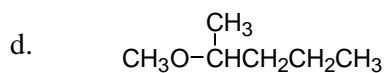
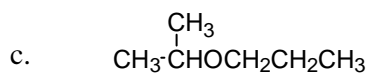
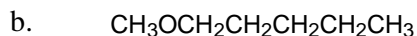
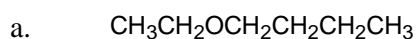


I. Circle the most correct answer for each of the following MCQ. (35 Marks)

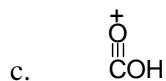
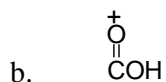
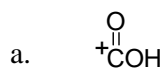
1. Wavenumbers (cm^{-1}) and wavelengths can be interconverted as follow:

- a. $\bar{\nu} = 1/\lambda \text{ um } 10^4.$
- b. $\bar{\nu} = 1/\lambda \text{ cm } 10^4.$
- c. $\bar{\nu} = 1/\lambda \text{ m } 10^4.$
- d. $\bar{\nu} = 1/\lambda \text{ nm } 10^4.$

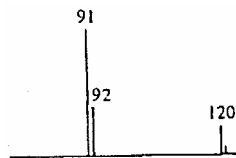
2. The mass spectrum of a compound is shown on the right. Which structure is best consistent with this spectrum.



3. In the mass spectrum of acetic acid (CH_3COOH), the peak at m/z 45 is associated with:



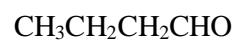
4. In the mass spectrum of an alcohol the M^+ and base peaks appeared at m/z 74 and 31, respectively, which of the following structures fits this data:
- $(CH_3)_3COH$
 - $CH_3CH(OH)CH_2CH_3$
 - $CH_3CH_2CH_2CH_2OH$
 - None of the above.
5. In the mass spectrum of 2-pentanone ($CH_3COCH_2CH_2CH_3$), the base peak is due to the loss of:
- $$\begin{array}{c} \bullet+ \\ CH_3 - C = CH_2 \\ | \\ OH \end{array}$$
 - $CH_2 = CH_2$
 - $CH_2 = \overset{+}{C}H_2$
 - $$\begin{array}{c} CH_3 - C = CH_2 \\ | \\ OH \\ + \end{array}$$
6. In the mass spectrum of $C_6H_4Cl_2$, the relative intensities of M , $M + 2$ and $M + 4$ will be:
- 9 : 6 : 2
 - 9 : 4 : 1
 - 18 : 12 : 2
 - 9 : 3 : 1
7. The partial mass spectrum is shown on the right. Which structure is best consistent with this spectrum:
- $C_6H_5CH_2CH_2CH_3$.
 - $C_6H_5CH(CH_3)_2$
 - $C_6H_5COCH_3$
 - $p\text{-}CH_3.C_6H_4CH_2CH_3$



- II. Complete each of the following sentences: (35 Marks)
1. Double bonds favour allylic cleavage and give the resonance stabilized carbonium ion at m/z value of
 2. β -Cleavage of the alkyl-substituted aromatic compounds results in the formation of ion at m/z values of
 3. The range of values for the C=O stretching vibration may be explained by using a- b-
..... c-
 4. The first step in trying to analyze the IR spectrum of an unknown is to check presence or absence of
 5. The IR spectrum is considered the simplest, most rapid and most reliable mean for identification of
- III. Briefly define the IR spectrum, indicate the uses of IR spectroscopy, and give 3 of the most common terms used in IR spectroscopy. (10 Marks).

IV. Account for each of the following m/z (%) values observed in the mass spectrum of the corresponding compound (include the mechanism of fragmentation in your answer) (20 Marks).

1. m/z : 72 (70), 71 (10)
44 (100), 29 (50)



2. m/z : 128 (3), 113 (10),
58 (60), 43 (100).

