**Name:**

**Enrolment No:**

**UPES**

**End Semester Examination, Dec 2024**

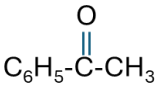
**Course:** Instrumental Methods in Chemical Analysis **Semester: V**

**Program:** BSC (H) Chemistry **Time: 03 hrs.**

**Course Code:** CHEM3038P **Max. Marks: 100**

**Instructions: Read all the questions carefully. There is a choice in section B and C for question 9 and 11.**

## SECTION A
## (5Qx4M=20Marks)

| S. No. | | Marks | CO |
|---|---|---|---|
| Q 1 | Pick the more intense light spot of same power with justified reason.<br>i)  ii)  | **4** | **CO1** |
| Q 2 | Calculate the time of scan for FTIR for scanning between the frequency range 1200-2800 $cm^{-1}$. | **4** | **CO1** |
| Q 3 | Find the correct element with spin quantum no ½ and 1 with justified reason.<br>i) $^{2}_{1}H$ ii) $^{19}_{9}F$ | **4** | **CO1** |
| Q 4 | A compound has a strong infrared 1690 $cm^{-1}$, which of the following structure is likely to be one of the compounds with justified reason.<br>i)  ii) $C_6H_5$-O-CH=$CH_2$ | **4** | **CO3** |
| Q 5 | Figure out **indicated proton** signal type in the given molecule with justified reason:<br>i) $CH_3CH_2$*Cl ii) $CH_3CH_2$*$CH_2Cl$ | **4** | **CO3** |

## SECTION B
## (4Qx10M= 40 Marks)

| | | | |
|---|---|---|---|
| Q 6 | Describe working steps of gas chromatography with help of schematic diagram and mention the effect of column length on resolution. | **10** | **CO2** |

| | | | |
|---|---|---|---|
| Q 7 | Demonstrate the X-ray generating process and the relation of its energy to the binding energy of an element. | **10** | **CO1** |
| Q 8 | Give an overview about competitive immunoassay and illustrate the relation between pathogen concentration and signal intensity. | **10** | **CO2** |
| Q 9 | Mention the superiority of matrix assisted laser desorption ionization method over electron impact ionization.<br>**Or**<br>Classify voltametric technique based on the characteristic of potential scan with graphical representation. | **10** | **CO2** |
| **SECTION-C<br>(2Qx20M=40 Marks)** | | | |
| Q 10 | i) Illustrate the various parts of the mass spectroscopy device and the operation of its different parts.<br>ii) Explain the mass/charge ratio effect on the ion separation in mass spectroscopy. | **10 + 10** | **CO2** |
| Q 11 | i) Show the effect of external magnetic field on the potential energy of the nucleus.<br>ii) Elucidate the coupling constant and the effect of surrounding environment on it.<br>**Or**<br>i) Co-relate the vibrational frequency of a bond with the structure of the molecules.<br>ii) Indicate the essential UV-vis emission spectroscopy parameter that aids in molecule identification. | **10 + 10** | **CO3** |