

## **Technical specifications for Gas Chromatograph-Mass Spectrometer (GC-MS)**

We require a latest compact lightweight bench top model of Gas Chromatograph with Mass Spectrometer (GC-MS). The system should allow the control and operation of the GC-MS from a latest single software platform.

### **Gas Chromatograph Specifications**

1. Oven temperature should be controllable and programmable from ambient to 450°C and able to ramp the oven temperature rate at  $\geq 100^{\circ}\text{C}/\text{min}$  or better, must support at least 20 temperature programming ramps, oven should be large enough to accommodate capillary column of 100 meters length x 0.10 - 0.50 mm inner diameter or better
2. Split/split less capillary injector with operating temperature range up to 400°C or better and the injector system must be able to deliver  $\geq 100$  psi with Turbomolecular pump (dual stage/air-cooled) and electronic pneumatic controller (EPC) and real time ambient temperature and pressure compensation, split ratio of 7500:1, pressure range from 0 to 150 psi with resolution of 0.01 psi or better and maximum temperature attainable up to 450°C, Inlet should be capable of taking total flow range from 0 to 1250 ml/min with He, digital flow control and automatic leak check facility for carrier gas
3. GC should have a customized large display unit and operating conditions should be fully controllable from an external computer-based control system, should provide built-in diagnostics and comprehensive self-test and should provide power-fail memory protection

### **Mass Spectrometer Specification**

Triple Quadrupole/Time of Flight (TOF) mass spectrometer analyser

1. The Ionization source must be an open Electron Ionization source having energy range 50eV to 200eV, mass analyzer must be capable of routine and sustained acquisition with a mass accuracy of 0.1 amu or better for full mass range and be independent of acquisition speed or mass range, mass accuracy should remain same for 24 hours or better, full mass range of acquisition speeds must be 1 to 50 spectra per second or better, scan speed of the mass analyzer should be equivalent or greater than 30,000 amu/sec or better and scanning shall be done at the increments of 0.1 amu for better mass resolution, mass range (m/z) should be 10-1500 amu or more
2. EI source should have a dual filament design with automatic software selection of the other filament, the system detection limit should have signal to Noise (S/N)  $\geq 10$  for injection of 50 fg of Octafluoronaphthalene (OFN) injected on column for full mass range (Full scan mode)
3. Ion source temperature should have the capability to heat up to 300°C for better sensitivity to active compounds. EI source should be inert to active compounds and programmable, transfer line temperature - in the range of 100-350°C
4. EI SIM/Full Scan mode Instrument detection limit of 20 fg or better
5. 10 replicates taken of 50 fg of OFN should have instrumental detection limit IDL of 20 fg and these limits to be shown during demonstration of the system
6. Relative Standard Deviation (RSD) 5% or better and mass spectrometer must be compatible with helium carrier gas
7. The MS should be differentially pumped between the ionization source and mass analyzer. The vacuum system consists of a turbomolecular pump mounted on the source and mass

analyzer regions with a 250L/second (He) pumping speed and turbomolecular pump is backed by a roughing pump

8. MS should include electronics and software to automatically correct for ion arrival time deviations and preserve spectral integrity.
9. MS must provide a multi-port LAN switch for communication to the PC, GC, and accessories.

### **GC-MS Data System Specifications**

1. GCMS data system should be compliant with Windows 7 and Windows 10 operating systems. GC-MS data system should provide automated overall system optimization algorithms that maximize signal intensity, maximize mass resolution, and calibrate the mass axis.
2. GCMS data system should provide the ability to prepare analyst defined quality assurance protocols for system optimization, vacuum leak tests, and detector response correction.
3. GCMS data system should use the latest version of NIST and Wiley libraries search algorithm for comparing sample mass spectra to databases of mass spectra
4. GCMS data system should allow for the creation and use of analyst-defined libraries of mass spectra to be used for library searches. GCMS data system should allow multiple libraries to be automatically searched simultaneously.
5. GCMS data system should allow for an analyst-defined number of libraries matches to be returned from the library search algorithm. The GCMS data system should provide the ability to calculate retention indices for analytes found in a sample.
6. GCMS data system should allow for fully automated qualitative analysis consisting of: location of all peaks that meet analyst-defined criteria; deconvolution of the mass spectra for all located peaks to remove background-matrix, or coeluting-analyte signals; and tentative analyte identification by library search.
7. GCMS data system should provide a fully automated peak find algorithm capable of detecting coeluting analyte peaks, analyte peaks buried beneath the background of the total ion current chromatogram, or analyte peaks buried beneath significantly larger concentration analytes and/or matrix interferences.
8. GCMS data system should provide a fully automated mass spectral deconvolution algorithm that removes background signal, removes interfering signal from matrix or other analytes, and accurately proportions shared signal found in both the analyte spectrum and the coeluting interference resulting in a clean, full-range mass spectrum for more accurate analyte identification.
9. Demonstration should be given to show the asked performance of complete system
10. One-year warranty from the date of Installation followed by 5 years AMC (optional)
11. One-person training at manufacturers facility should be provided

### **Accessories and Consumables**

1. Capillary column of 30-60 meters length x 0.10 - 0.50 mm inner diameter – 02 Nos
2. GC syringes of 1, 5, 10, 25 and 50 microlitres - 02 each
3. Latest available computer with original windows 10 OS, 24-inch 4K/FHD screen, good quality laser jet printer and 10KVA online UPS
4. Helium cylinder with regulator, all ferrules, stainless steel connecting tubes, gas purification panels, necessary chemicals for chemical ionization, and all required accessories
5. Complete maintenance kit with operation manuals for hardware and software both
6. A list of references in India, where similar systems have been installed must be provided and this will be taken very seriously while making the decision