

Liquid Chromatography – Mass Spectrometer-Diode Array Detector (LC-MS-DAD) Location: IDL Quantity: 1		Compliances (Yes/ No) <i>**If No, please indicate reason of non-compliances.</i>
(1) Critical Specifications		
(i) The proposed system must be a Fast Liquid Chromatograph coupled with both Mass Spectrometer and Diode Array detector		Yes/ No
(ii) The entire system must be a unified platform to be supplied by a single Contractor to ensure seamless operation		Yes/ No
(2) Binary/Quaternary pump		
(i) Allow gradient formation		Yes/ No
(ii) Flow range: minimum 0.05 to 2.0 mL/min with 0.01 mL/min increments (or better)		Yes/ No
(iii) Operating pressure range: At least 0 – 800 bar for the entire range of operating flow rates		Yes/ No
(iv) Flow precision: $\leq 0.075\%$ RSD		Yes/ No
(v) Flow rate accuracy: within $\pm 1\%$ of set value		Yes/ No
(vi) Working pH range for all components: at least 2 – 12 as standard		Yes/ No
(3) Solvent degasser		
(i) Number of independent channels: at least 4		Yes/ No
(ii) Working pH range for all components: at least 2 – 12 as standard		Yes/ No
(4) Autosampler		
(i) Able to accommodate minimum 96 samples of 2-mL vials with a thermostatted tray (minimum 4 °C to 40 °C)		Yes/ No
(ii) Minimum injection volume: 0.1 – 10.0 μL as standard, up to 1000.0 μL with optional extension loop		Yes/ No
(iii) Injection cycle time: not more than 50 sec per sample		Yes/ No
(iv) Carryover: Must be $\leq 0.002\%$, with caffeine (UV) and sulfadimethoxine (MS)		Yes/ No
(v) Precision: $<0.3\%$ RSD		Yes/ No
(5) Column Compartment		
(i) Temperature range: minimum 20 °C to 80 °C (or higher)		Yes/ No

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(ii) Temperature accuracy: ± 1 °C or less		Yes/ No
(iii) Includes ability to track column information and usage history		Yes/ No
(6) Diode Array Detector		
(i) Detection type: at least 512-element photodiode array		Yes/ No
(ii) Lamp type: Deuterium lamp		Yes/ No
(iii) Able to monitor at least 6 compound specific wavelengths		Yes/ No
(iv) Signal and spectral sampling rate: at least 80 Hz		Yes/ No
(v) Wavelength range: at least 190 – 500 nm		Yes/ No
(vi) Wavelength accuracy: better than ± 1 nm		Yes/ No
(vii) Baseline noise: less than 4 μ AU with standard 10 mm analytical flow cell		Yes/ No
(viii) Drift: $\leq 1.0 \times 10^{-3}$ AU/h with standard 10 mm analytical flow cell		Yes/ No
(ix) Linearity: does not deviate by more than 5 % for ≥ 2.0 AU		Yes/ No
(7) Single quadrupole mass spectrometer system		
(i) The mass analyser must be a single quadrupole mass spectrometry system with electrospray ionisation source as standard		Yes/ No
(ii) (Non-mandatory requirement) The system is able to switch on and off for power saving, and be able to pump down and be ready for sample analysis within one hour after switching on for efficient use of system.		Yes/ No
(iii) The system must be able to perform simultaneous analysis in at least four analysis modes, e.g. positive/negative ESI modes, variable fragmentor voltage selection, and concurrent SIM/scan		Yes/ No
(iv) Mass range must be settable between 50 -1250 m/z minimally		Yes/ No
(v) Scan speed must be at least 10,000 Da/s		Yes/ No
(vi) Dynamic range must be at least 4×10^6		Yes/ No
(vii) Mass accuracy must be ± 0.2 Da or better over the full mass range		Yes/ No
(viii) Mass stability (drift) must be less than 0.1 Da over a 24-hour period		Yes/ No
(ix) Mass resolution during autotune must not be more than 0.7 Da		Yes/ No

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(x) The ion source must be able to perform polarity switching between positive and negative ion modes in no more than 25 ms		Yes/ No
(xi) The ionisation source flow rate must have a compatibility of up to 2 mL/min.		Yes/ No
(8) Splitter		
(i) Tenderer shall quote for a splitter module which allows accurate splitting of the sample solution to the MS at a set split ratio, controlled either via the system software or manually adjustable. There shall have at least three split ratios that is selectable within a single module.		Yes/ No
(ii) The quoted splitter module must be compatible and fully integrated with the proposed LC-MS/DAD system in this tender.		Yes/ No
(iii) At least one track record of the successful installation of splitter module with the proposed LC-MS-DAD system or same brand of LC-MS in the application for MS quantitation purposes shall be provided. Please submit a reference list of installation for the proposed system or same brand of LC-MS which includes splitter module in Annex D to Part 3 – Price Schedule: (D) Track Records.		Yes/ No
(9) Data management software system		
(i) Must be a single integrated software to control both the LC and MS system		Yes/ No
(ii) Must have multi-tasking capability – capable of control, data acquisition, data evaluation and reporting		Yes/ No
(iii) Must include data analysis software for spectral evaluation with purity (where applicable) and spectral matching functions		Yes/ No
(iv) (Non-mandatory requirement) Allow the extraction of UV data from MS chromatogram in the same window and vice versa		Yes/ No
(v) (Non-mandatory requirement) Able to view real-time spectra and signal even when no sample injection is performed.		Yes/ No
(vi) Must be able to provide log/trails for method and results changes		Yes/ No

PART 3: REQUIRMENT SPECIFICATIONS
EQUIPMENT 1: LIQUID CHROMATOGRAPHY – MASS SPECTROMETER - DIODE ARRAY
DETECTOR (LC-MS-DAD)
LOCATION: ILLICIT DRUGS LABORATORY

HSA000ETT19300038

Liquid Chromatography – Mass Spectrometer-Diode Array Detector (LC-MS-DAD) Location: IDL Quantity: 1	Compliances (Yes/ No) <i>**If No, please indicate reason of non-compliances.</i>
(vii) The system test result reports must be customisable according to laboratory's needs. The report must minimally be able to capture and print out the following information in the report to facilitate the integration and interface for result extraction: - Data file name - Method used - Operator - Date Acquired - System - Sample Name - Misc Info - Vial Number	Yes/ No
(viii) The sequence and sequence printout shall minimally include the following information: - Sequence line - Type of sample - Vial number - Data file name - Name of Method - Sample Information (with at least 2 lines of information) - Amount of sample - Volume of sample - Dilution factor - Internal Standard Amount	Yes/ No
(ix) The library and library matching printout shall minimally include the following information: - Sequence line - Type of sample - Vial number - Data file name - Name of Method - Display of MS and UV spectra of target - Results of the UV library match	Yes/ No

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(x) Should preferably be able to include both LC and MS chromatograms with their respective spectra and purity values, where applicable, in a single report template	Yes/ No
(xi) Assistance is to be provided by the Contractor to ensure the seamless integration and interface with the laboratory's information management system for the system report printing and extraction.	Yes/ No
(xii) Must be able to link up to OpenLAB Enterprise Content Manager which the lab is currently using for data archival	Yes/ No
(10) Computer and Printer	
(i) 1 set of PC with minimum specifications as follow: - Operating System: Microsoft Windows 10 Professional SP1 or newer - Processor: Intel® Core™ 8 th Gen i7 Processor or better for Desktop - Monitor: Minimum 22" IPS LED Monitor - Hard Disk: 1TB 7200 rpm SATA 6Gb/s HDD or better - Memory: Minimum 16 GB DDR4 RAM - Optical Mouse - Keyboard	Yes/ No
(ii) Laserjet network printer with at least 1200x1200dpi resolution and prints at least 32 pages per minute. The printer must be capable of automatic duplex printing.	Yes/ No
(iii) The PC/notebook provided with the system must be network ready and be able to connect to the HSA's network for interfacing with HSA's LIMS (Laboratory Information Management Software) system, e.g. LISA, LabWare, etc. If required, an additional network card shall be included to ensure the connectivity to HSA's LIMS system.	Yes/ No
(iv) Integration with HSA's LIMS system (e.g. LISA, LabWare) - The system software must be able to interface with HSA LIMS for the following: (1) Raw Data Files archival & retrieval. (2) System test result report output to PDF for archival. (3) System test result report for result uploading. (4) To accept work list upload from HSA LIMS, if applicable.	Yes/ No

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(v) Configuration and setting of System PCs/Note for integration with HSA's LIMS system: - The Contractor shall work with HSA assigned personnel for the setting up and configuration of System PCs / notebook to ensure the connection to the HSA network as well as integration to HSA's LIMS system. - The Contractor shall work with HSA personnel for the following: (a) To define and assign a Hostname and/or PC name given by HSA to facilitate the system management on HSA network. (b) To define the Raw Data file structure & directory assigned by HSA to facilitate the automation of electronic archival and retrieval of files. (c) To work with HSA's LIMS system Contractor to ensure the system report print out to be in PDF file format. (d) To perform UAT to ensure the integration to HSA's LIMS system is running fine.	Yes/ No
(11) Installation, commissioning and warranty	
(i) All systems proposed must be GLP compliant.	Yes/ No
(ii) Prices quoted must include installation and commissioning, warranty, operator training and system starter kit.	Yes/ No
(iii) An endorsed copy of 5x5 risk assessment form for the installation of the system must be submitted to the laboratory 2 weeks before the delivery. A template of this form can be found on MOM website.	Yes/ No
(iv) The system shall come with at least three (3) years warranty that covers the system hardware, software and computer. The warranty shall minimally include the following: a) unlimited breakdown calls and on-site support services during Office Hours from 8:00 am to 5:30 pm Monday to Friday excluding Saturday, Sunday and Public Holidays; b) at least one preventive maintenance (PM) per year with PM kit if applicable; c) supply of all replacement parts and repair consumables (wear & tear parts); and d) provision of software upgrade or revisions such as version up if any, with no additional cost.	Yes/ No
(v) Contractor shall accommodate observation by laboratory staff during the maintenance process.	Yes/ No
(12) Training	

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(i) Operational training on theory for at least 55 staff at HSA's premises.		Yes/ No
(ii) Hands-on training for operating the system at HSA's premises for 3-6 staff.		Yes/ No
(13) Technical support		
Contractor shall provide full assistance in terms of hardware, software and application support.		Yes/ No
(14) Delivery		
The delivery of the system is to be coordinated with the Laboratory.		Yes/ No
(15) Requirements for Sample Testing		
(i) Shortlisted Tenderer is required to perform testing for Sample A, B & C. Only one (1) set of sample will be provided to shortlisted Tenderer for the testing and the analysis must be performed in accordance to the <i>Instructions for Sample Testing</i> that will be provided. (ii) The samples must be analysed on the equipment model proposed in this tender. (iii) The samples will be sent down by laboratory staff within 3 weeks after the tender is closed and the analysis shall be performed on the same day. Please indicate the availability of the proposed system between <u>24 Sep 2019 to 15 Oct 2019</u> (3 weeks after tender closing date): Availability date: _____		Yes/ No
(iv) The testing results/ reports and supporting documents for all samples shall be submitted within 2 weeks after sample testing date. The testing result submitted shall show the compliance with the requirements of system test result reports as described in Clause 9 (vi) to (viii) . (v) If Tenderer requires to extend the deadline for result submission, please write in to the Authority and a maximum of 7 working days can be provided.		Yes/ No
(vi) The linearity of Sample A must be $R^2 \geq 0.99$ (minimally)		Yes/ No
(16) Option to purchase		
(i) Tenderer shall quote for the option to purchase 2-year post warranty comprehensive maintenance at the same condition described above for warranty (refer Clause 11(iv) & (v)).		Yes/ No

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(ii) The Services to be performed by the Contractor shall consist of Preventive Maintenance and Corrective Maintenance described as follow: I. <u>Preventive Maintenance</u> a) The Preventive Maintenance shall consist of: i. Routine maintenance of the system, including but not limited to the testing of functions and inspecting of the condition of the system in order to keep the system safe for use and in good working order; and ii. Adjustment and/or repair of any defect in or malfunction of the system discovered by the Contractor's representatives during the course of routine maintenance checks. b) The Preventive Maintenance performed shall be in compliance with the maintenance procedures and safety tests specified by the manufacturer. c) The Preventive Maintenance shall be carried out during Office Hours.	Yes/ No
II. <u>Corrective Maintenance</u> Upon receipt of oral or written notice from the Authority, the Contractor shall use its best endeavours to ensure that the Contractor's suitably qualified and duly authorised representatives attends to the Authority, within the response time of not more than 4 hours upon receipt of oral/written notification if the request is made on a Working Day i.e. Monday to Friday (excluding Saturday, Sunday and Public Holiday). If the request is made on a non-Working Day, the Contractor shall respond within the response time of within the first four (4) hours of the beginning of the next Working Day.	Yes/ No
(iii) Replacement and Purchase of Components a) The Contractor shall inform the Authority of any part or component of the system that needs to be replaced. Prior written approval must be issued by the Authority before the replacement may be effected unless the replacement required is deemed urgent by the Authority in which case a verbal approval (which shall subsequently be confirmed in writing) obtained from an authorised officer of the Authority shall suffice. b) The Contractor shall use all reasonable endeavours to supply only original or genuine replacement components, which are required to maintain the system in good working order.	Yes/ No

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(iv) Guarantee a) The Contractor hereby warrants that all the System and every part or unit thereof serviced by the Contractor shall conform to the requirements of this Contract and be free from any defect or deficiency in their performance or workmanship for a period of three (3 months) from the date of acceptance of the Services by the Authority (hereinafter referred to as “the System Guarantee Period”). The Contractor hereby also warrants that all materials and every part or unit thereof, used for the Services shall be free from any defect in manufacture or any defect arising out of design, workmanship or materials used or any failure or malfunction due to quality of material, workmanship, design, assembly, installation or integration for a period of three (3) months from the date of acceptance of the materials by the Authority (hereinafter referred to as “the Materials Guarantee Period”). The System Guarantee Period and the Materials Guarantee Period shall collectively be known as the “Guarantee Period”. b) Where during the Guarantee Period, any part or unit of the System serviced by the Contractor or materials used for the Services or supplied therefor are found to be defective of any of the reasons specific in Clause 15-iv(a) above, the Contractor shall at the written request of the Authority replace or repair at the same at the expense within a Guarantee Turn-Around-Time of 7 days or any other duration as agreed by the Authority. The System or materials or part or unit thereof so replaced or repaired shall be subject to the Guarantee under this Clause for the Authority or three (3) months whichever is later and such balance of the Guarantee Period shall begin to run only from the date of receipt of the part or unit so replaced or repaired by the Authority.	Yes/ No

Please indicate any non-compliance to requirement specifications here should there be any.

Reference To	Remarks

GAS CHROMATOGRAPH-MASS SPECTROMETER (GC-MS) SYSTEM (2 UNITS)Specifications & Description

- The Gas Chromatograph-Mass Spectrometer (GC-MS) system shall directly operate on ~230V and ~50Hz and shall minimally comprise of the following:
 - Gas Chromatograph 1 set
 - GC Mainframe, Column Oven and Electronic Pneumatic Control
 - Inlet – Split/Splitless (S/SL) Inlet 1 set
 - Detector - Mass Spectrometer 1 set
 - Autosampler
 - Autoinjector Tower 1 set
 - Autosampler Tray 1 set
 - Data Management System & PC
 - Accessories
- The entire system must be a unified platform manufactured by a single vendor to ensure seamless operation.
 - Tenderer must be able to demonstrate that for the past 4 years (from 2016), it has at least 1 successful set-up of the proposed system and capability to provide after-sales service efficiently and effectively.
For reference, please provide the list of successful installation from 2016 to present (at least 1 track record must be submitted) in **Annex D to Part 3 - Price Schedule: (D) Track Records on the proposed model or same brand of GC-MS that can deliver the equivalent performance.**

A GC Mainframe

1. The system shall consist of 1 inlet and 1 mass spectrometer detector and upgradeable with the ability to run simultaneously: 2 inlets and 2 detectors in the future.
2. Full Electronic Pneumatic Control (EPC) available for all inlets and detectors. Control range and resolution can be optimized for the specific inlet or detector module.
3. Comes with atmospheric pressure and temperature compensation such that results do not change even when the laboratory environment does.
4. Easy access to service, maintenance and log from the GC front panel.
5. Preprogrammed leak tests
6. Automatic hands-free leak test.
7. Built in column bleed compensation.
8. Must be able to run log to record at least 50 potential errors that occurred during the last analytical run.
9. Upgradeable to the latest firmware.
10. Upgradeable to allow solvent bypass, backflush, heart cutting and splitters to multiple detectors capabilities

B Chromatographic Performance

1. Retention time repeatability : $\leq 0.008\%$ or ≤ 0.0008 min
2. Area repeatability : $\leq 1\%$ RSD

C Column Oven

1. Minimum operating temperature range : 4 °C above ambient to at least 450 °C
2. Temperature set point resolution : 0.1 °C or below
3. Programming ramp/plateaus : at least 20 ramps or holds
4. Maximum temperature ramp rate : at least 120 °C/min
5. Max run time : at least 2 hours
6. Oven cool down : 450 °C to 50 °C in no more than 4 min
7. Oven power safety : Turn off automatically when door is opened
8. Must be able to accommodate at least two 100 m × 0.53 mm i.d. capillary columns.

D Electronic Pneumatics Control (EPC)

1. Compensation for barometric pressure and ambient temperature changes.
2. Automatic carrier gas shutoff if the inlet pressure drops significantly or if leak is detected.
3. Pressure setpoints must be able to be adjusted by increments of $\leq \pm 0.001$ psi for the range 0.000 to 99.999 psi; $\leq \pm 0.01$ psi for the range 100.00 psi to 150.00 psi, to provide more precise retention time locking or similar function in other names.
4. Units for pressure : bar, psi and kPa
5. Pressure/flow ramp : Allow ≥ 3 ramp settings in the method
6. Pressure sensor accuracy : $\leq \pm 2$ %
7. Pressure sensor repeatability : $\leq \pm 0.05$ psi
8. Drift : $\leq \pm 0.1$ psi/ 6 months
9. Flow sensor accuracy : $\leq \pm 5$ %
10. Flow sensor repeatability : $\leq \pm 0.35$ %
11. Carrier & makeup gas settings : Selectable for He, H₂, N₂ & argon/methane
12. Column flow control modes : constant pressure, constant flow, ramped pressure, ramped flow

E Split/Splitless Inlet (S/SL)

1. Suitable for all capillary columns : Must be able to cover the range of 50-530 μ m id
2. Split ratios : To at least 500:1
3. Support up to 4 modes : Split, Splitless, Pulsed-Split and Pulsed-Splitless.
4. Maximum temperature : At least 400 °C in $\leq 1^\circ$ C increments
5. Pressure ranges : 0 to at least 100 psi
6. Total flow setting range : 0 to at least 400 mL/min Helium or Hydrogen
7. Gas saver mode to reduce gas consumption without compromising performance.
8. Adjustable septum purge flow control to eliminate "ghost" peaks.
9. Built in turn top inlet sealing system or equivalent without the need to use special wrench or tools for quick and easy liner replacement in under 30 seconds. Quick liner replacement minimizes the system's exposure to air and system downtime.
10. Split and septum purge flow can be changed without changing the column flow.

F Mass Spectrometer

1. Mass Spectrometer must utilize a quadrupole mass filter consisting of a monolithic hyperbolic quadrupole or equivalent configuration such that the rods will not become misaligned over time.
2. The quadrupole's coating shall be made of inert material such as gold that will not oxidize, thus keeping maintenance and cleaning to a minimum.
3. The metallic parts of the ion source shall be constructed entirely from inert material. Stainless steel is not acceptable as it is not suitable for analysis of trace reactive materials. Coating the metallic parts with an inert material is also not acceptable as the coating will wear away over use.
4. The system shall have an Electron Multiplier detector
5. Must have high performance synchronous SIM/Scan with automated SIM set up that can convert a full scan method to a SIM or SIM/Scan method. The software must automatically configure the number of SIM groups, SIM cycles across the peak, and the ions added to each group.
6. The system must be able to automatically set up a SIM/scan method from an injected standard.
7. The system must provide one click autotune for PFTBA, with the ability to print out auto-tune results automatically.
8. Source : EI Source
9. Ionization energy : 10 - 150 eV or better
10. Ionization current : 5-250 μ A or better
11. Transfer line temperature : 100-350 $^{\circ}$ C or better
12. Ion Source temperature : 150-350 $^{\circ}$ C or better
13. Quadrupole temperature : 110-200 $^{\circ}$ C or better
14. Filament : Dual filament for EI or fast filament replacing function to reduce system down time
15. Mass range : To at least 1000 a.m.u. with unit mass resolution over the entire mass range
16. Mass resolution : Unit mass adjustable by tuning
17. Mass axis stability : Not more than 0.10 amu/48 hrs
18. Detector : Electron Multiplier
19. Dynamic range : at least 10^6
20. Electronic scan rate : at least 12,500 amu/sec and scanning at the increments of 0.1 amu or less for better mass resolution
21. EI scan sensitivity : at least 600: 1 S/N for 1 μ L injection of 1 pg of OFN (octafluoronaphthalene), scanning from 50-300 amu when monitor at m/z 272.
22. EI SIM sensitivity : Less than 24fg of OFN as derived at 99% confidence level from area precision of eight splitless injection of 100 fg OFN, monitoring at m/z 272 or equivalent
23. SIM capability : at least 100 groups of masses, with at least 60 mass per group
24. Pumping system : Turbomolecular pump which can achieve a vacuum state in the MS unit to be at least 10^{-8} atm
25. Rough pump : **Quiet/low noise** and **oil-free** foreline pump/rough pump
26. Maintenance access : Source, filaments, lenses, mass filter and detector
27. Maximum total flow : Allow at least up to 2 mL/min

G Autosampler

1. Tenderer shall quote for a single-function liquid autosampler (without additional headspace or solid-phase microextraction functions) in order to ensure reproducible injection results and reliable communication with the GC-MS system.
2. Provide autoinjector tower with an autosampler tray which is capable of handling at least 150 sample vials, the control is random access using the data management software.
3. Sample tray configuration must have at least 3 removable racks.
4. Autoinjector must be auto-aligning and able to be installed or removed without the use of tools.
5. Supports neckless (shell) vials, standard 2 mL vials, and micro vial inserts.
6. The sensors on the autosampler shall offer the ability to detect whether or not a vial has been grasped if gripping mechanism is used.
7. Sensors to detect the injection port location for easy movement between front and rear inlet ports (if there are 2 inlet ports – front and rear).
8. Capable of user-definable sandwich injection mode, with up to 3 layers of additional liquid in one injection or an air gap for each layer.
9. Fast and on-column default injection types.
10. Adjustable dispense rate, draw rate, and injection rate.
11. Fast injections are performed in less than 100ms.
12. The autoinjector shall have illumination on the syringe to allow operator to verify the syringe's proper functioning and that the correct type has been installed.
13. User-changeable syringe carriage. Able to accommodate 1, 2, 5, 10, 25, 50, and 100µL
14. Minimum sample injection: ≤10 nL (with 1 µL syringe); ≤0.1 µL (with 5 µL syringe)
15. Maximum sample injection volume: ≥50 µL (with 100 µL syringe in standard tower)
16. Injection range: 1% to 50% of syringe volume in increments of 1%.
17. Available solvent-saving mode extends solvent capacity by up to eightfold.
18. Solvent saver mode capable of using 10 to 80% of syringe volume.
19. Adjustable plunger speed.
20. Capability to run priority samples.
21. To support "next sample overlap" feature in which decreases analysis time and increases throughput by performing pre-run rinses and picking up the next sample before the current run is completed.
22. The depth of the sampling can be adjusted from the default position to be able to access to very small sample volume.
23. GC shall have the capacity to have two autoinjectors mounted simultaneously on the GC so that injections can be made simultaneously by both autoinjectors.
24. Autosampler's rinse configuration shall ensure minimal carryover during analysis:
 - i. Total wash solvent volume (usable volume; or volume above the minimum fill line of the solvent wash vials) shall be at least 20 mL distributed in at least 4 solvent wash vials to ensure adequate washing of the syringes for a full sequence of 150 samples with the laboratory's current wash settings.
 - ii. Tip of syringe needle shall not extend beyond the neck of the waste bottle to avoid contamination.
 - iii. Allow two different types of rinse solvents to be used.

25. Option to purchase: Barcode reader

Autosampler shall have an integrated barcode reader or an additional module attached to the autosampler to allow reading of vial barcode labels. Tenderer shall have at least one reference/track record which the additional barcode reader module was successfully integrated. Barcode label printing device is **NOT** required.

Tenderer shall quote the **option item** in the format set out in the Price Schedule.

Please provide at least one track record of successful integrated barcode reader on the autosampler, if applicable.

Model of the system	Year of installation (eg. 2017)	Company

H Accessories

1. The price quoted for the system shall minimally include the following:
 - a. One MS maintenance kit. It shall include ion source assembly, filament assembly, column nuts, ferrules, ion source cleaning kit and others.
 - b. One auto-sampler supply kit. It shall include 5 µL autosampler syringe (6 units), solvent and waste bottles that meets Part G – Clause 24(i).
 - c. One split/splitless injection port kit. It shall include septa (50), O-rings, gold-plated seals, and straight deactivated glass split liner with deactivated quartz wool (6).
 - d. One ion gauge controller to monitor the pressure in the high vacuum chamber.
 - e. All gas traps required for the GC-MS system.

I Specifications for Data Station Software and Operating Software

1. The system software shall be based on Microsoft Windows 10 Professional SP1 operating environment or newer.
2. The software shall be able to control the Gas Chromatograph through local area network (LAN) technology.
3. Must be built-in or integration to ECM control for simultaneous detector data acquisition.
4. Flexible GUI (graphical user interface) to display the system status, show real-time plot and change all system set points.
5. Lab monitor and Diagnostic software to allow continuous monitoring of GC in real time to alert user maintenance needs and system problems
6. Capable of at least four simultaneous signal detector data acquisition.
7. The software must be able to fully control the system using pre-stored methods of all the operating parameters.
8. Must have the capability to lock/adjust retention time using user-specified columns and settings to achieve the same retention times for the compounds on every run of the same methods.
9. The system shall have the capability for simple method transfer between different GC models.
10. **Must be able to use current Agilent in-house mass spectral library in “.L” format either directly or through conversion**

- a. Should conversion of library be required, it must be user friendly and can be done by user
- b. The conversion must not cause any loss in mass spectra information (no missing ions and comparable ion ratios)
11. Must be able to use and share libraries through network drive with or without additional software. If additional software is required for the above function, tenderer shall quote for the software and to specify in the Price Schedule
12. Must be able to do library search for minimum 3 libraries at the same time.
13. Must be able to load and read data from existing GC-MS systems (Agilent 7890A-5975C, 7890B-5977A, 7890B-5977B and Intuvo 9000-5977B) in the laboratory. Acquired data from proposed system shall also be accessible in all GC-MS systems with or without additional software. If additional software is required for the above function, tenderer shall quote for the software and to specify in the Price Schedule
14. Contractor shall work with the laboratory for the writing of macros, which can be tagged to the laboratory's in-house GC-MS methods to allow automatic printing of results after analysis; or equivalent function without the need of macro
15. The software shall have the capabilities which include the following features:
 - a. Built-in trace ion detection capability which will help the detection of low-level compounds in complex matrices.
 - b. Gain normalization autotune or equivalent.
 - c. SemiQuant or equivalent for estimating concentrations of non-calibrated compounds base on calibrated compounds.
 - d. Allows clock-time programming with the ability to start a GC at the user-specified time without user intervention.
16. Able to acquire data, integrate, review and report on an actively running sample.
17. All systems proposed shall be compliant to Good Laboratory Practice (GLP) with system suitability, system and sequence logbook.
18. Multitasking capability, mass storage of chromatographs and reports, and customised report generator.
19. Macro programming capability or ability to do report and sequence customisation (to user required report format) without the need of macro.
20. User-friendly, intuitive software to facilitate efficient data analysis. Selection of spectra and chromatogram, magnification of spectra and chromatogram, integration, spectra subtraction, library search shall be completed in a minimum number of clicks compared to the existing GC-MS software.
21. The software must allow the generation and printing of a magnified mass spectrum. When performing this function, the mass spectrum of the selected compound from the library **must be magnified simultaneously to the same scale** and be included and printed in the match report. Printing of the magnified mass spectrum must be easy and with minimum number of clicks, without the need of preconfiguring the printing template for magnified mass spectrum.
22. Able to perform manual integration of single and group peaks capability for better peak identification.
23. Able to perform and print out peak overlay and peak stacking for multiple chromatograms.
24. 1 set of PC with minimum specifications as follows:
 - a. Operating System: Microsoft Windows 10 Professional SP1 or newer
 - b. Processor: Intel® Core™ 8th Gen i7 Processor or better
 - c. Monitor: Minimum 22" IPS LED Monitor
 - d. Hard Disk: 1TB 7200 rpm SATA 6Gb/s HDD or better
 - e. Memory: Minimum 16GB DDR4 RAM
 - f. Optical Mouse

- g. Keyboard
 - h. An additional network card
25. Tenderer shall ensure that the PC/notebook that provided with the system is network ready and be able to connect to the HSA's network for interfacing with HSA's LIMS (Laboratory Information Management Software) system, e.g. LISA, LabWare, etc.
26. Laserjet printer with at least 1200x1200dpi resolution and prints at least 32 pages per minute. The printer must be capable of automatic duplex printing.
27. **Schedule of Rate (SOR):**

Tenderer shall quote the **SOR** for option to purchase **1 unit** of the software and 1 training session in the format set out in the SOR table in **Annex C**. The price quoted shall be valid for 1 year from date of award for the proposed system.

A chemometrics software to be able to perform the following functions:

- a. Carrying out multivariate data analysis with ease of data importation
- b. User friendly graphical interface (i.e the incorporation of step-by-step instructions, labelled toolbars, or MouseOver icons with hover box) with data visualization capability
- c. Able to export processed data and graphical representations
- d. Able to perform general transformations for data pre-processing such as scaling, averaging and centering
- e. Handle a great variety of both generic and proprietary forms of instrumental data from systems (e.g. mass spectra from GC-MS, infra-red data from FTIR)
- f. Tools for data explorations and pattern recognition such as Principal Component Analysis (PCA)
- g. Able to perform linear and non-linear regression, prediction and classification (SIMCA, PLS-DA, clustering) on data set
- h. A comprehensive list of statistical tools for data analysis
- i. Possessing in-built validation models for validation

Tenderer shall provide demonstration and/or a software trial for the lab to test the suitability of the software upon request. Tenderer shall also quote for the training of the staff in the lab on the usage of the software and shall provide the option for the training for not more than 6 staffs.

J Integration with HSA's LIMS system (e.g. LISA, LabWare)

- 1. The system software must be able to interface with HSA LIMS for the following:
 - a. Raw Data Files archival & retrieval.
 - b. System test result report output to PDF for archival.
 - c. System test result report for result uploading.
 - d. To accept work list upload from HSA LIMS, if applicable.
- 2. Tenderer shall ensure the System PC/notebook provided will be able to run
 - a. OpenLab - Cerity Enterprise Content Manager (ECM) Version 3.3.2.130
 - b. Open Lab – Cyberprinter
- 3. System shall be able to import and run a sequence file generated by LIMS. The sequence file generated is usually in csv or txt file format.

K Configuration and setting of System PCs/Note for integration with HSA's LIMS system:

1. The Contractor shall work with HSA assigned personnel for the setting up and configuration of System PCs / notebook to ensure the connection to the HSA network as well as integration to HSA's LIMS system.
2. The Contractor shall work with HSA personnel for the following:
 - a. To define and assign a Hostname and/or PC name given by HSA to facilitate the system management on HSA network.
 - b. To define the Raw Data file structure & directory assigned by HSA to facilitate the automation of electronic archival and retrieval of files.
 - c. To work with HSA's LIMS system Contractor required, to ensure the system report print out to be in PDF file format.
 - d. To perform UAT to ensure the integration to HSA's LIMS system is running fine.

L System Reports Requirement:

1. The Contractor shall work with Laboratory to ensure the seamless integration and interface with HSA's LIMS system for the system report printing and extraction.
2. The system must be able to generate the following for test result:
 - a. Raw Data File. Please specify the file format: _____
 - b. Hardcopy print out.

Tenderer shall specify if there are other types of output files can be generated by the system.
Please specify: _____

3. The following information must be included and printed in the test result output report to facilitate the integration and interface for result extraction and they are:
 - a. File Directory
 - b. Operator
 - c. Date Acquired
 - d. Instrument
 - e. Sample Name
 - f. Misc Info
 - g. Vial Number
 - h. Library searched (applicable to library search report printout)
 - i. Quality match factor (applicable to library search report printout)
 - j. Identity of the matched drug/compound (applicable to library search report printout)

M Installation, Commissioning, Training and Warranty

1. All systems proposed must be GLP compliant. The tender must include installation and commissioning.
 - a. An **endorsed copy of 5 × 5 risk assessment form** for the installation of the system must be submitted to the laboratory 2 weeks before delivery. A template of this form can be found on MOM website.
2. The system shall come with a minimum **three (3) years warranty** that minimally includes the following:

- a. Biannual preventive maintenance (PM);
 - b. Supply of PM kit if applicable;
 - c. Unlimited breakdown calls and on-site services during Office Hours i.e. 8am to 5.30pm from Monday to Friday except Sat, Sun & Public Holidays;
 - d. Supply of replacement of parts including wear & tear parts;
 - e. Update /upgrade of software version
3. Tenderer shall also quote for the **option** to purchase **2-year post warranty comprehensive maintenance** at the same condition described above for warranty.
 4. Upon request, contractor shall accommodate observation by laboratory staff during the maintenance process.
 5. Tenderer shall quote for the **option** for training as follows:
 - a. Operation training on theory for approximate 50 staff at HSA's premises
 - b. Hands-on training for operating the system for maximum 6 staff.
 6. Performance of Services
 - I) The Services to be performed by the Contractor shall consist of Preventive Maintenance and Corrective Maintenance as described below.

Preventive Maintenance

- a) The Preventive Maintenance shall consist of:

Routine maintenance of the System, including but not limited to the testing of functions and inspecting of the condition of the System in order to keep the System safe for use and in Good Working Order; and Adjustment and/or repair of any defect in or malfunction of the System discovered by the Contractor's representatives during the course of routine maintenance checks.
- b) The Preventive Maintenance performed shall be in compliance with the maintenance procedures and safety tests specified by the manufacturer.
- c) The Preventive Maintenance shall be carried out and completed during Office Hours from 8:00 am to 5:30 pm Monday to Friday excluding Saturday, Sunday and Public Holidays.

Corrective Maintenance

- d) Upon receipt of oral or written notice from the Authority, the Contractor shall use its best endeavours to ensure that the Contractor's suitably qualified and duly authorised representatives attends to the Authority, within the response time of not more than 4 hours upon receipt of oral/written notification if the request is made on a Working Day i.e. Monday to Friday (excluding Saturday, Sunday and Public Holiday). If the request is made on a non-Working Day, the Contractor shall respond within the response time of within the first four (4) hours of the beginning of the next Working Day.
- II) Replacement and Purchase of Components
 - a) The Contractor shall inform the Authority of any part or component of the System that needs to be replaced. Prior written approval must be issued by the Authority before the replacement may be effected unless the replacement required is deemed urgent by the Authority in which case a verbal approval (which shall subsequently be confirmed in writing) obtained from an authorised officer of the Authority shall suffice.
 - b) The Contractor shall use all reasonable endeavours to supply only original or genuine replacement components, which are required to maintain the System in Good Working Order. All replacement components shall not be chargeable during the period of warranty period and post warranty comprehensive maintenance contract

III) Guarantee

The Contractor hereby warrants that all the System and every part or unit thereof serviced by the Contractor shall conform to the requirements of this Contract and be free from any defect or deficiency in their performance or workmanship for a period of three (3 months) from the date of acceptance of the Services by the Authority (hereinafter referred to as "the System Guarantee Period"). The Contractor hereby also warrants that all materials and every part or unit thereof, used for the Services shall be free from any defect in manufacture or any defect arising out of design, workmanship or materials used or any failure or malfunction due to quality of material, workmanship, design, assembly, installation or integration for a period of three (3) months from the date of acceptance of the materials by the Authority (hereinafter referred to as "the Materials Guarantee Period"). The System Guarantee Period and the Materials Guarantee Period shall collectively be known as the "Guarantee Period".

N Technical Support

1. Technical support for hardware, software and application issues must be provided throughout the warranty period.
2. The technical support team must be able to assist Laboratory to complete the report customisation, method setup, transfer and validation of methods within 3 months from the date of request.

O The delivery of the system shall be coordinated with the Laboratory.**P Sample Testing Requirement**

1. Shortlisted Tenderer is required to perform sample testing for Sample A & Sample B on the equipment model proposed in this tender. The sample must be analysed locally and not to be sent overseas.
2. Only 1 set of samples (Sample A & B) will be provided to shortlisted tenderer for testing. The request for additional sample is not allowed.
3. The samples will be sent down by laboratory staff within 4 weeks after the tender is closed and the analysis shall be performed on the same day. Please indicate the availability of the proposed system between 24 Sep 2019 (tender closing date) to 22 Oct 2019 (4 weeks after tender closing date):

4. Instructions for sample testing, column and mass spectra library will be provided prior to the sample testing.

Sample Testing Result

5. Tenderers shall submit the sample testing results according to the instructions for sample testing via email to Tan_Siew_Hoon@hsa.gov.sg. The soft copy results and reports shall be submitted within 2 weeks from the date of sample testing.
6. Hardcopy of sample testing result and reports shall be submitted within 1 week from deadline of the soft copy submission.
7. For extension of sample results submission deadline, please write in to Tan_Siew_Hoon@hsa.gov.sg and a maximum of 5 working days can be provided.

8. Shortlisted Tenderer who fail to follow the stipulated instructions to perform the test or fail to submit the test results by the stipulated deadline shall be disqualified from the evaluation.
9. The **analysis result** shall minimally meet all the criteria that required in the tender as follow:
- (I) Sample A & B: Able to meet the current limit of detection (LOD) in the laboratory as well as positive identification for the targeted compounds. When analysing the solutions provided, the following must be fulfilled for each compound of interest:
- signal-to-noise ratio to be greater or equal to 3:1 and the abundance of the peak of interest in the total ion chromatogram (TIC) must be more than the difference between the upper and lower baseline limits.
 - nominal mass of molecular ion must be present if it is present in the mass spectra library provided
 - all mass ions present in the mass spectra library with a relative abundance of greater than 10% must be present in the mass spectrum of the drug of interest.
- (II) In addition, the following has to be achieved for Sample A:
- peak resolution between the targeted compounds to be greater than 1.5
 - retention time repeatability for the compounds of interest with a RSD within 2%
- (III) Tenderer is required to show the number of steps for obtaining the library match during manual processing. Please provide the detailed steps and screenshot from the point where the Total Ion Chromatogram(TIC) is displayed upon data loading to successful library matching.

COMPLIANCE TO REQUIREMENT SPECIFICATIONS

I hereby confirm that I can meet all the

YES/ NO*

Requirement Specifications as stated above.

*Please indicate any non-compliance here should there be any.

Reference To	Remarks