From Educational MS to GC-MS
Pairing the IQ-2000™ and GC

Fast Fact

"Add-on" to Education by Turning the IQ-2000™ into an Educational GC-MS

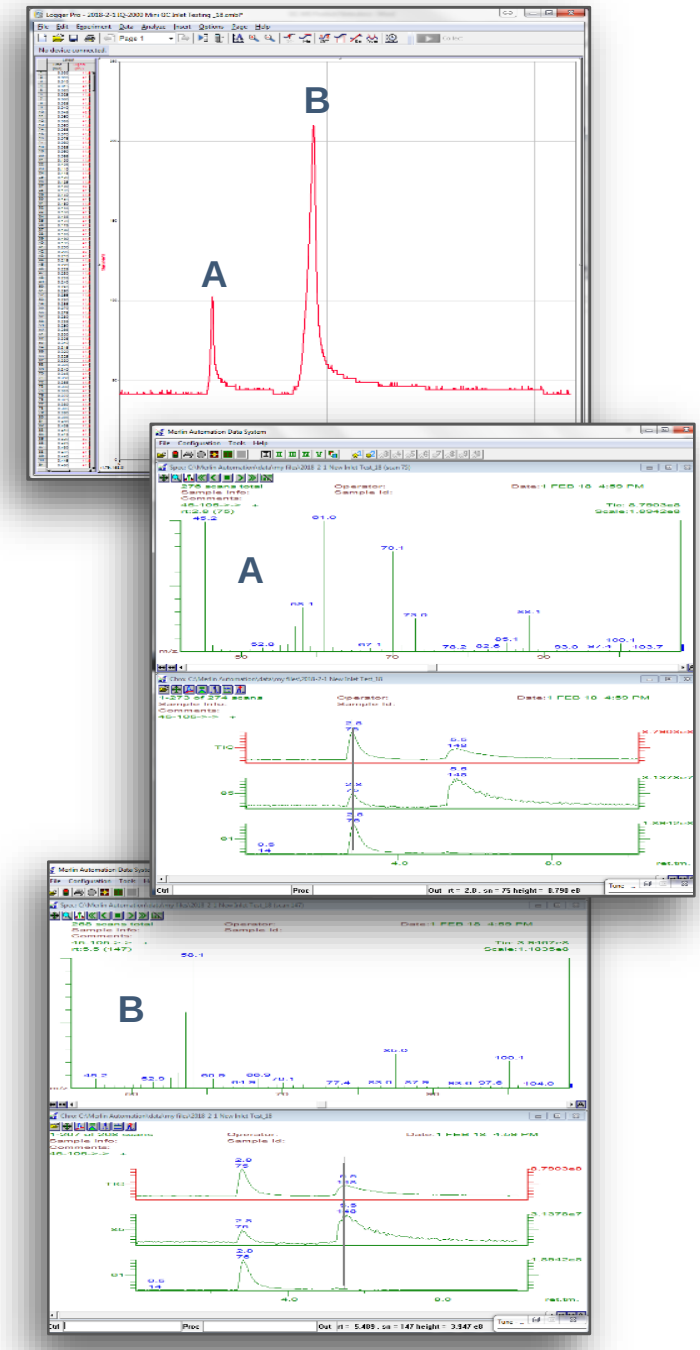

Figure 1. Mixture Sample Data

Gas Chromatography Mass Spectrometry (GC-MS) is a widely used analytical technique which harnesses the power of two analytical methods. Gas Chromatography separates vaporized compounds without decomposition. Mass spectrometry ionizes compounds and separates them based on a mass-to-charge ratio producing a mass spectrum which can be used for chemical identification and concentration calculations. The combination of gas chromatography and mass spectrometry provides researchers with the ability to separate species before analyzing the mass spectrum.

Vernier Mini GC™ Plus and the IQ-2000™

The IQ-2000™ samples from the Mini GC™ Plus exhaust port, allowing students or instructors to quickly connect two analytical techniques, thereby providing in-depth compound identification.

The ability to easily connect or disconnect the instruments gives students the opportunity to fully distinguish the difference between each instrument's capabilities, limitations, and sample requirements.

Using the retention time from the GC and the spectral data from the mass spectrometer, students can correctly identify individual chemicals or mixtures.

Sample Data for a mixture of Ethyl Acetate and Methyl Isobutyl Ketone

Top: Vernier Logger Pro® software displaying sample intensity of two organic solvents vs retention time.

Middle: Merlin Automation software depicting the mass spectrum of Ethyl Acetate (detail **A**).

Bottom: Merlin Automation software depicting the mass spectrum of Methyl Isobutyl Ketone (detail **B**).

Gas Chromatograph	Vernier Mini GC™ Plus	Mass Spectrometer	IQ-2000™
Carrier Gas	Air	**Compounds for Analysis**	Any gas or vapor
Column	Restek MXT-1 Stainless (11 m) Capillary Column	**Detection Range**	100 ppb – 100%
Column Temperature Ramp	Maximum of 10°C / minute Warm-up time: <10 minutes	**Sample Introduction**	Flow-by of GC exhaust to heated fused silica transfer line
Pressure Regulation	Software Controlled	**Detector**	Electron Multiplier
Sample Introduction	Syringe Injection	**Software**	Merlin Automation
Temperature Regulation	Software Controlled 30 - 160°C	**Dimensions**	Without Cart: 77 cm x 51 cm x 63 cm
Onboard Detector	MEMS Chemi – Capacitive with two levels of sensitivity		With Cart: 114 cm x 52 cm x 65 cm
Software	Computer – Logger Pro®		
Stand Alone	LabQuest® 2		
Dimensions	10.8 cm x 13.3 cm x 19.1 cm		

Vernier Mini GC™ Plus Compounds for Analysis		
Mini GC Compound Type	**Typical Compounds**	**Range of Acceptable Boiling Points**
Alcohols	C_1-C_6	50-175°C
Aldehydes	C_1-C_8	50-175°C
Amides	C_3-C_4	150-250°C
Polar-Substituted Aromatic Hydrocarbons	C_6-C_{12}	100-150°C
Carboxylic Acids	C_1-C_4	100-150°C
Esters	C_2-C_{10}	30-200°C
Ethers	C_2-C_8	30-110°C
Heterocycles	C_5-C_8	100-150°C
Halogenated Hydrocarbons	C_1-C_8	30-120°C
Ketones	C_3-C_8	50-175°C
Nitriles	C_2-C_5	50-120°C
Nitroalkane/aromatic	C_1-C_6	100-210°C
Phosphonates	C_3-C_9	180-210°C
Sulfides	C_4-C_8	90-150°C

Figure 2. Extrel® IQ-2000™ Educational Mass Spectrometer with Vernier Mini GC™ Plus

Extrel Core Mass Spectrometers

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