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# Mass Spectrometry

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## 1 DEFINATION

The mass spectrometer is an instrument which can measure the masses and relative concentrations of atoms and molecules. It makes use of the basic magnetic force on a moving charged particle.

$$r = (mv/qB) = (mE/qBB)$$

### 1.1 CIRCULAR PATH FROM MAGNETIC FIELD

If a charge moves into a magnetic field with direction perpendicular to the field, it will follow a circular path. The magnetic force, being perpendicular to the velocity, provides the centripetal force.

### 1.2 VELOCITY SELECTOR

A velocity selector is used with mass spectrometers to select only charged particles with a specific velocity for analysis. It makes use of a geometry where opposing electric and magnetic forces match for a specific particle speed. It therefore lets through undeflected only those particles with the selected velocity.

### 1.3 VELOCITY SELECTOR

Mass spectrometers are sensitive detectors of isotopes based on their masses. They are used in carbon dating and other radioactive dating processes. The combination of a mass spectrometer and a gas chromatograph makes a powerful tool for the detection of trace quantities of contaminants or toxins. A number of satellites and spacecraft have mass spectrometers for the identification of the small numbers of particles intercepted in space. For example, the SOHO satellite uses a mass spectrometer to analyze the solar wind.

### 1.4 APPLICATIONS OF MASS SPECTROMETERS

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### 1.5 MAGNETOHYDRODYNAMICS

A magnetohydrodynamic generator has been described as a magnet on the tail of a jet engine. A super-hot plasma is created, ionizing the atoms of the fuel mixture. The magnetic field deflects positive and negative charges in different directions. Collecting plates for the charges provide a DC voltage.