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GLC IN DRUG ANALYSIS

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The purpose of the gas chromatograph is to separate mixtures into individual components that can be detected and measured one at a time. A plot of the detector output is called a chromatogram, which charts the detector's response as a function of time, showing the separate components. The separation occurs based on differences in affinities for the two phases. As shown in the figure, the sample is introduced into the GC column by way of a heated injector, which volatilizes all three components and introduces them into the gas flowing over the stationary phase. He sample is introduced into the GC column by way of a heated injector, which volatilizes all three components and introduces them into the gas flowing over the stationary phase. In this example, the compound represented by the arrowhead has the least affinity for the stationary phase. As a result, it moves ahead of the other two components and will reach the detector first. The compound symbolized by the diamond has the greatest affinity for the stationary phase and spends the most time associated with it. As a result, this compound will be the last to reach the detector. Separation has been achieved based on the different affinities of the three types of molecules found in the sample. In reality, complex mixtures cannot always be completely separated, with some compounds emerging from the column simultaneously. In most forensic applications of GC, a sample is prepared by dissolving it in a solvent, and the solution is injected into the instrument using a syringe. For example, to analyze a white powder suspected of being cocaine, a small portion is weighed out and dissolved in a solvent such as methylene chloride, methanol, or chloroform. A tiny portion of the sample is then drawn up into a syringe and injected into the heated injector port of the instrument. A tiny portion of the sample is then drawn up into a syringe and injected into the heated injector port of the instrument. The mobile phase gas (called the carrier gas) also enters the injector port, picking up the volatilized sample and introducing it into the column where the separation process occurs. If the sample contains cocaine, it will emerge from the column at a given time (known as the retention time) that can be compared to the retention time of a known standard sample of cocaine. The retention time in conjunction with information obtained from the detector is used to positively identify the compound as cocaine if indeed it is present. Another method of sample introduction for GC is called pyrolysis, in which a solid sample such as a fiber or paint chip is heated in a special sample holder to extreme temperatures, causing the sample to decompose into gaseous components that can then be introduced into the GC. Pyrolysis is used when the sample is not readily soluble in common GC solvents. A number of different detectors are available for use in gas chromatography. In forensic applications, the most commonly used are mass spectrometry (often abbreviated as MSD for mass selective detector), flame ionization (FID), and nitrogen-phosphorus (NPD). The MSD is the most common of the three, principally because it can provide definitive identification of compounds (in almost all cases) along with quantitative information.