

Mass Spectrometry uses

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Pharmaceutical industry

- Mass spectrometer is very sensitive so small samples can be measured accurately
- Can also differentiate between similar compounds- can detect isomers
- In pharmaceutical industry, mass spec is used in combination with high performance liquid chromatography
- Similar to paper chromatography
- In HPLC, a mixture of chemicals is injected into one end of steel tube which is packed with Silica
- The compounds are pumped through the tube at high pressure
- Once separated into solvents, they are passed through the mass spec
- Can be used to identify break down products of a drug in the body or to assess the purity of the sample

Radioactive elements

- Elements undergo radioactive decay- occurs when an unstable nuclei breaks apart to become stable and emits an alpha, beta or gamma radiation in the process
- Alpha- 2 protons, 2 neutrons (helium nuclei)
- Beta- high energy electrons
- Gamma- electromagnetic radiation
- During the process, the radioactive isotope of one element becomes a different isotope of a different element
- Occurs spontaneously and randomly
- Half life- the time taken for half of the atoms now present to decay

Drug testing

- Urine sample taken
- Testosterone: epitestosterone in a normal person is 4:1
- With anabolic steroids this can raise to 6:1
- Mass spec detects ratio
- Some people have naturally high levels so can appear to have illegal drugs when they haven't
- Some people have low levels, so when they do use drugs, they appear to be normal
- New development is the use of more sensitive mass spec which detects carbon 13 : carbon 12.
- In synthetic testosterone, this ratio is different to in natural hormones

Space

- NASA sent a mass spec to Jupiter which detected helium, CO₂, molecular nitrogen, CO, atomic oxygen, atomic nitrogen