

**Introduction to x-ray photoelectron spectroscopy
and x-ray absorption spectroscopy**

Questions for your discussion

What does it mean?

What is a work function?

What is a K edge?

And why do you call it an *edge*?

What is a cross section?

What is a channeltron?

What is a Rydberg state?

What is a π^* state and what is a σ^* state?

In a molecule or solid, what is the main difference between a core orbital and a valence orbital?

Approximately which energy do soft x-rays have?

X-ray photoelectron spectroscopy

What is the principle of photoelectron spectroscopy? What do you measure? And how do you measure?

What is the primary information that you get out from a photoelectron spectrum?

What is the primary connection to the quantum mechanics that you have learnt about so far?

Is there more information in a photoelectron spectrum?

What is meant by the term *chemical shift*?

Sketch a photoelectron spectrum over the entire available energy range defined by the photon energy (what do I mean by this?)!

Mention some types of photon sources which you could use in your experiment. Can you mention advantages and disadvantages for each of them?

What is an Auger electron?

Why do XPS measurements on solids only probe the surface of the solid and not the bulk?

Why is the mean free path of electrons in matter very short in the soft x-ray region?

X-ray absorption spectroscopy

X-ray absorption spectroscopy (XAS) = Near-edge x-ray absorption fine structure (NEXAFS)
= X-ray absorption near edge structure (XANES)

What is the principle of x-ray absorption spectroscopy?

What is the primary information that you get out from an x-ray absorption measurement?

What is meant by the term *ionisation threshold* and how can it be seen in an XAS measurement?

How can you measure a x-ray absorption spectrum? What is meant by *total yield mode*, *partial yield mode*, and *Auger yield mode*?

What is meant by lifetime broadening? Put this term into relationship to one of the basic relationships of quantum mechanics. What does it imply if one says that the lifetime broadening of a resonance is small? Why is the lifetime broadening of a π^* resonance smaller than that of a σ^* resonance?

X-ray photoelectron spectroscopy and x-ray absorption spectroscopy

What is the relationship between these two spectroscopies?