Practice quiz Scanning electron microscopy

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Questions:

0 points possible (ungraded)

1. Why does scanning electron microscopy exhibit a higher spatial resolution than optical microscopy?

- ○ Larger wavelength of electrons compared to photons
- ◉ Smaller wavelength of electrons compared to photons
- ○ Electron is travelling in vacuum
- ○ Lower energy of electrons compared to photons

✔

Explanation

Scanning electron microscopy is capable of imaging at a significantly higher resolution than the optical microscope, owing to the smaller de Broglie wavelength of electrons. Depending on the electron energy, the associated wavelength can be as small as a few pm, but the resolution of a SEM tool is limited by electron scattering.
For further information, please see video “Scanning electron microscopy” at 00:43.

2. Which of the following components are essential for a typical scanning electron microscope?

- ☑ Electron gun
- ☐ Ion source
- ☑ Electromagnetic lenses
- ☑ Vacuum chamber
- ☐ X-ray generator
- ☑ Electron detectors

✔

Explanation

In a SEM, electrons are emitted from the electron gun and accelerated under a high voltage to obtain momentum and travel through the chamber. Several electromagnetic lenses shape and steer the electron beam. In order to avoid unwanted scattering between electrons and atmosphere molecules, the entire system is working in a vacuum chamber. The electron beam is focused onto the sample surface and interacts with sample atoms. Detectors with filters collect the backscattered electrons.
For further information, please see video “Scanning electron microscopy” at 01:40.

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ℹ Answers are displayed within the problem