Atomic Force Microscopy

a) Scan Parameters

Scan the calibration grid with the following parameters:
Scan size: 50 μm x 50 μm
P = 100, I = 10, scan speed = 3Hz
Acquire both forward and backward scans.
What happens by changing the values of P and I?
(reasonable P,I values can be between 1 and 250)
Which are optimal settings in this particular case?
Comment and analyze the results by comparing images and line profiles.

b) Scan Speed

Scan the calibration grid with the following parameters:
Scan size: 50 μm x 50 μm
P = 100, I = 10
What happens by increasing / decreasing the scan speed in between
a few Hz and way below 1Hz?
Comment and analyze the results by comparing images and line profiles for the three different scan speeds.

c) Analysis

Acquire a picture with optimized parameters for P, I and scan speed. Determine periodicity, lateral and vertical dimensions of the features present on the sample. Do a proper consideration of measurement and statistical errors.

d) Digital Optical Media

After optimizing the scan parameters for each sample, take AFM images for two of the following media: CD, DVD, BluRay Disc. Measure the track spacing and channel bit length. Use both: pits and lands and comment on their difference in AFM images. Compare with literature values. Estimate the data capacity that can be stored on the different media. Do a proper consideration of measurement and statistical errors.

e) Quantum Dots

After optimizing the scan parameters, take a high-resolution image of the quantum dot sample. Plot a statistic on the size of the quantum dots and comment the obtained results. Also compare with respect to the used AFM tip with radius $r_{tip} < 8$ nm. Do a proper consideration of measurement and statistical errors.