Electron Diffraction and Imaging

Assignment No – 9 (solution)

1. **In Phase Contrast microscopy, the contrast is enhanced by,**
   a. Converting amplitude change to phase change
   b. By collecting more scattered electrons
   c. Converting phase change to amplitude change
   d. Collecting more transmitted electrons

2. **Lattice fringe contrast pattern in HRTEM is observed due to,**
   a. Interference of incoherent beams with different phases
   b. Interference of coherent beams with different phases
   c. Interference of coherent beams with same phases
   d. Interference of incoherent beams with same phases

3. **Lattice fringe periodicity depends upon,**
   a. The volume of the unit cell
   b. Structure factor
   c. Atomic number
   d. The lattice plane spacing

4. **To obtain a lattice fringe image in TEM,**
   a. the Selected Area Diffraction aperture should be around two beams
   b. The Objective aperture should be around two beams
   c. The Selected Area Diffraction aperture should be around any one of the scattered beam
   d. The Objective aperture should be around any one of the scattered beam

5. **Moire fringes arises due to**
   a. Interference of spots in the diffraction pattern arising from the same grain
   b. Thickness variance in the sample
   c. Interference of spots in the diffraction pattern which are close to each other but arising from different crystals
   d. Dynamical scattering in the sample

6. **The sample is considered as phase object when**
   a. the phase of the exit wave linearly increases with increase in thickness of the specimen
   b. the phase of the exit wave linearly decreases with thickness of the specimen
   c. the phase of the exit wave is independent of thickness of the specimen
   d. the phase of the exit wave is independent of absorption in the specimen

7. **The effect of spherical aberration for a fixed Δk value can be compensated by varying**
   a. Accelerating voltage
   b. Overfocus
   c. Sample thickness
   d. Defocus

8. **The Fourier transform of the HRTEM image from single crystal will give**
   a. Spot pattern corresponding to all periodicities present in crystal
   b. Spot pattern corresponding to periodicities present in the lattice image
   c. Ring pattern corresponding to all periodicities present in crystal
   d. Ring pattern corresponding to periodicities present in the lattice image

9. **At Scherzer defocus,**
   a. Effect of spherical aberration is compensated by defocus
   b. Effect of spherical aberration is compensated by over-focus
   c. Shows the best phase contrast
   d. Shows poor phase contrast

10. **Chose the correct statement**
   a. The maximum number of reflections have the same sign for phase error at Scherzer defocus
   b. The contrast transfer function has the same sign for all g vectors at Scherzer defocus
   c. Large number of g vectors has maximum value near to one for contrast transfer function at Scherzer defocus
   d. Very few g vectors has maximum value near to one for contrast transfer function at Scherzer defocus

11. **Who invented phase contrast microscope?**
   a. Ernst Ruska
   b. Fritz Zernike
   c. Zacharias Jansen
   d. Max Knoll

12. **Moiré fringe spacing correspond to**
   a. Lattice parameter of overlapping phases accurately.
   b. Difference in lattice parameter between overlapping phases
   c. Lattice strain
   d. Displacement of atoms from exact position

13. **Measuring separation between adjacent black or white dots in HRTEM images,**
   a. one can determine d spacing
   b. one can determine defect concentration in the sample

c. one can find out point group symmetry of the sample
d. one can find out space group symmetry of the sample

14. **Choose the correct statement**

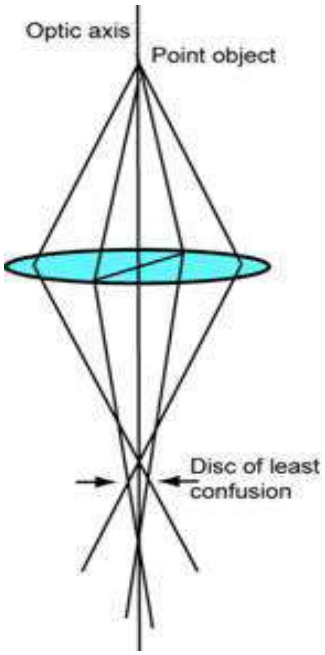
a. Spherical aberration and defocus make the phase error introduced by objective lens zero for a specific scattering angle
b. Spherical aberration and defocus makes phase error introduced by objective lens zero for all scattered angles
c. Spherical aberration and defocus of objective lens change the amplitude of exit wave function
d. Spherical aberration and defocus of objective lens add a constant phase error to all diffracted beams

15. **Choose the correct statement**

a. Image processing is used to generate exit wave function
b. Image processing is used to remove noise from the image
c. Image processing is used to determine lattice parameter of the crystal
d. Image processing is used to determine the space group of the lattice

16. **Identify the type of aberration shown in the image.**

a. Chromatic
b. Coma
c. Astigmatism
d. Spherical



NOTE: If you need any explanation for any of the question, you are welcome to write us on the forum. -- -- NPTEL Team.