Assignment 5 (Solution)

1. The Bright field image is obtained in TEM by,
   a. Using only the direct beam
   b. not using all the scattered electron beam
   c. using only scattered electrons
   d. using direct and one scattered beam

2. Which of these is not a mode of imaging for crystalline material in a TEM?
   a. Bright field
   b. Dark field
   c. HREM
   d. Fresnel contrast

3. Selected area aperture is used
   a. To enhance the contrast in bright field
   b. To enhance the contrast in dark field
   c. to obtain a diffraction pattern from a chosen area of specimen
   d. to align the condenser aperture

4. The functions which can be controlled by objective lens is
   a. Image focus
   b. Beam intensity
   c. Beam deflection
   d. Z-height of the sample

5. What is the criterion for choosing the condenser aperture size?
   a. To control the beam intensity on the sample
   b. To reduce the spherical aberration of objective lens
   c. The magnification at which the image will be viewed
   d. To reduce the spherical aberration of the condenser lens

6. What is the camera length?
   a. The distance from the back focal plane to the projected image
   b. The distance from the sample to the projected image
   c. The distance from the selected area aperture to the projected image
   d. The distance from the sample to the plane in which the diffraction pattern should be imaged in the absence of all lens

7. Resolution of the image in a standard TEM is limited primarily by:
   a. Spherical aberration
   b. astigmatism
   c. defocus
   d. Chromatic aberration

8. Kikuchi pattern arises due to
   a. Coherent elastic scattering of inelastically scattered electrons
   b. Incoherent elastic scattering of inelastic scattered electrons
   c. Coherent inelastic scattering of elastic scattered electrons
   d. Incoherent elastic scattering of elastic scattered electrons

9. If the beam diameter on sample is 2 nm and the grain size in the material is 10 nm, then what kind of diffraction pattern would you expect
   a. Ring pattern
   b. Spot pattern
   c. Diffused ring pattern
   d. Kikuchi pattern

10. Identify, which is not a lens aberration
   a. Astigmatism
   b. Chromatic aberration
   c. Spherical Aberration
   d. Distortion

11. Choose the correct statement with respect to spherical aberration.
   a. The focal length of off axis ray is smaller than that of paraxial rays.
   b. The spherical aberration enhances the astigmatism of the lens.
   c. The rays near to optic axis are focussed more strongly.
   d. It induces a constant phase shift to all scattered beam

12. Contrast in a two phase crystalline specimen arises due to
   a. Only mass thickness contrast
   b. Mass thickness and diffraction contrast
   c. Only diffraction contrast
   d. finite thickness of specimen

13. Choose the correct statement.
   a. The higher the resolution we want to achieve in the specimen the depth of focus reduces
   b. The higher the resolution we want to achieve in the specimen the depth of focus increases
   c. The resolution we want to achieve in specimen does not control depth of focus
   d. The resolution we want to achieve depend on the beam diameter

14. Field emission gun is necessary in TEM
   a. To enhance the contrast of images
   b. To increase uniform area of illumination
   c. To reduce the chromatic aberration
   d. To improve the spatial resolution of the microscope

15. Choose the correct statement
    a. The objective lens in TEM just inverts the image with respect to object
    b. The objective lens just introduces only a rotates the image with respect to object
    c. The objective lens in TEM inverts as well as rotates the image with respect to object
    d. The objective lens does not introduce neither rotation nor inversion to the image with respect to object

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