Electron Diffraction and Imaging

Assignment – 11 (solution)

1. Which radiation will have the smallest radius for Ewald sphere?
   a. X-Ray
   b. Light
   c. Electron
   d. Gamma rays

2. The extinction condition for face centred orthorhombic lattice is
   a. All h,k,l values are permissible
   b. Summation of h+k+l should be even
   c. h,k,l values should be mixed
   d. h,k,l values should be unmixed

3. What is the Laue condition for diffraction?
   a. $\Delta k.a = $ integer
   b. $\Delta k.b = $ integer
   c. $\Delta k.c = $ integer
   d. All of the above

4. Select the correct statement,
   a. Reciprocal lattice vector is in the direction of plane normal and its magnitude is inversely proportional to inter-planar spacing
   b. Reciprocal lattice vector is perpendicular to the plane normal and its magnitude is inversely proportional to inter-planar spacing
   c. Reciprocal lattice vector is in the direction of plane normal and its magnitude is directly proportional to inter-planar spacing
   d. Reciprocal lattice vector is perpendicular to the plane normal and its magnitude is directly proportional to inter-planar spacing

5. The Dark Field image in STEM is obtained by
   a. The exclusion of the undiffracted central electron beam
   b. Choosing a specific diffracted beam using objective aperture.
   c. Precession of the electron beam
   d. Interference of the central beam and the scattered beam

6. The -3 symmetry is present in which direction for BCC crystal?
   a. [100]
   b. [111]
   c. [110]
   d. [121]
7. The chromatic aberration in case of field emission gun is less than that of Tungsten filament because of
   a. Less energy spread
   b. Less operating temperature
   c. Less work function
   d. small crossover size

8. The contrast in amorphous material is due to
   a. Mass thickness contrast
   b. Diffraction contrast
   c. Atomic number contrast
   d. Phase contrast

9. The divergent beam of incident electrons inside the sample is useful for
   a. Crystal structure determination
   b. Selected area diffraction
   c. Kikuchi diffraction
   d. Dark field imaging

10. Choose the incorrect statements for STEM
   a. Images are not affected by the imaging lens aberration.
   b. Magnification is determined by the focal length of the objective lens
   c. The beam must scanning parallel to optic axis.
   d. Resolution of STEM depends upon the probe size.

11. For obtaining diffraction pattern from specific area of sample in TEM, SAD aperture is inserted
    a. Above the imaging plane of objective lens
    b. In the imaging plane of objective lens
    c. In the back focal plane of objective lens
    d. Between the sample and the objective lens

12. The Viewing screen in TEM is coated with
    a. Ag
    b. AgBr
    c. ZnS
    d. All the above

13. If we increase the magnification of the lenses between the objective lens and the viewing screen, then for a specific diffraction vector g, 
    a. The magnitude will increase and the direction of g will change
    b. The magnitude will decrease and the direction of g will change
14. The incoherent electron beam for Kikuchi diffraction is generated in the sample by
   a. Ionisation of core electrons by incident beam
   b. Plasmon losses of incident beam
   c. Rutherford scattering of incident beam
   d. Phonon scattering of incident beam

15. The CCD camera for recording the diffraction patterns in TEM should be at the
   a. image plane of projector lens
   b. back focal plane of projector lens
   c. the plane of the viewing screen
   d. anywhere in the column