Assignment 3 (10 marks)

1) The First Brillouin Zone of a Simple Cubic lattice is the Wigner Seitz cell of a lattice that is:
    a. Hexagonal
    b. Simple Cubic
    c. Face Centered Cubic
    d. Body centered Cubic

2) The First Brillouin Zone of a Face Centered Cubic lattice is the Wigner Seitz cell of a lattice that is:
    a. Hexagonal
    b. Simple cubic
    c. Face Centered Cubic
    d. Body centered Cubic

3) The First Brillouin Zone of a Body Centered Cubic lattice is the Wigner Seitz cell of a lattice that is:
    a. Hexagonal
    b. Simple cubic
    c. Face Centered Cubic
    d. Body Centered Cubic

4) A Bragg Plane is defined as a plane that
    a. Perpendicularly bisects a valid reciprocal lattice vector
    b. Touches the origin
    c. Touches the end of the Reciprocal lattice vector
    d. Goes through the Reciprocal lattice vector at one third of its length

5) For any given wave vector, the condition for diffraction is satisfied when
    a. Both ends of the wave vector touch the same Bragg plane
    b. The wave vector lies on the Bragg plane
    c. The wave vector is perpendicular to the Bragg plane
    d. One end of the wave vector touches the Bragg plane

6) $E\ Vs\ k$ relationship of nearly free electrons distort in the vicinity of the Bragg planes due to:
    a. Reflection
    b. Diffraction
    c. Refraction
    d. Total internal reflection

7) With respect to k space, the flat band diagram
    a. Indicates the locations of the bands
    b. Does not indicate the locations of the bands
    c. Indicates the locations of the bands in the extended zone scheme
    d. Indicates the locations of the bands in the repeated zone scheme

8) For a given shape and size of a Brillouin zone, the band structure is decided by

a. N_f
b. E_f
c. Both a and b
d. Neither a nor b

9) Bands are represented using $E\ Vs\ k$ diagrams in the
   a. Extended zone scheme
   b. Repeated zone scheme
   c. Reduced zone scheme
   d. All of the above

10) Whether the material is metallic, semiconducting, or insulating, is decided by
   a. The location of the Fermi energy, E_f, and/or the nearest bandgap above the Fermi energy
   b. The location of the Fermi energy, E_f, and the smallest bandgap within the material
   c. The location of the Fermi energy, E_f, and the average bandgap in the material
   d. Current flowing in the material at V = 0V