SSR DEGREE COLLEGE (AUTONOMOUS) NIZAMABAD
M.SC. PHYSICS
INERNAL – II SEM – II
Subject Solid state physics
QUESTION BANK

I. Multiple Choice

1.According to the free electron theory, all solids should:
A) Be semiconductors
B) Be insulators
C) Conduct electricity
D) Show superconductivity
Answer: C) Conduct electricity

2.Free electron theory cannot explain why some materials are:
A) Good conductors
B) Poor conductors or insulators
C) Electrically neutral
D) Dense

Answer: B) Poor conductors or insulators

3.Free electron theory cannot distinguish between:
A) Metals and semiconductors
B) Electrons and protons
C) Current and voltage
D) Resistance and resistivity
Answer: A) Metals and semiconductors

4.Bloch theorem is applicable to:
A) Amorphous solids
B) Crystalline solids
C) Liquids
D) Gases
Answer: B) Crystalline solids

5. Bloch theorem was proposed by:
A) Drude
B) Sommerfeld
C) Felix Bloch
D) Einstein

Answer: C) Felix Bloch

6.The Kronig–Penney model is based on:
A) Maxwell's equations
B) Schrödinger equation
C) Newton's laws
D) Einstein's theory
Answer: B) Schrödinger equation

7. Allowed energy levels in the Kronig–Penney model form:
A) Discrete lines only
B) Continuous bands
C) Circles
D) Shells
Answer: B) Continuous bands

8. The gap between the valence band and conduction band is called:

A) Fermi energy
B) Forbidden energy gap
C) Work function
D) Binding energy

Answer: B) Forbidden energy gap

9.At the bottom of the conduction band, the density of states is:
A) Infinite
B) Zero
C) Maximum
D) Constant

10.Effective mass depends on:
A) Electron charge only
B) Crystal structure and E-k relation
C) Temperature only
D) Number of atoms

11.The charge of a hole is:
A) Negative
B) Neutral
C) Positive
D) Variable
Answer: C

12.Growth from vapour phase generally produces crystals through
A) Deposition of atoms on a substrate
B) Melting of solids
C) Dissolving salts
D) Electrolysis only
Answer: A) Deposition of atoms on a substrate

13.Which technique uses a rotating seed crystal dipped in molten material?
A) Bridgman technique
B) Czochralski technique
C) Hydrothermal method
D) Sol-gel method
Answer: B) Czochralski technique

14. The first stage in crystal growth from solution is
A) Annealing
B) Nucleation
C) Doping
D) Etching
Answer: B) Nucleation

15.Crystal growth from a saturated solution occurs due to
A) Evaporation of solvent
B) Melting
C) Ionization
D) Diffusion only
Answer: A) Evaporation of solvent

16.Crystal imperfections are generally classified into:
A) One type only
B) Two types only
C) Point, line, surface, and volume defects
D) Metallic and non-metallic defects
Answer: C) Point, line, surface, and volume defects

17.Frenkel defect is generally found in crystals having:
A) Large cations and small anions
B) Small cations and large anions
C) Equal-sized ions
D) Neutral atoms only

Answer: B) Small cations and large anions
18. Which defect decreases the number of ions in a crystal?

A) Frenkel defect
B) Schottky defect
C) Interstitial defect
D) Substitutional defect
Answer: B) Schottky defect

19.In Schottky defect, the density of the crystal:
A) Increases
B) Remains unchanged
C) Decreases
D) Becomes zero
Answer: C) Decreases

20.Which of the following is a point defect?
A) Grain boundary
B) Edge dislocation
C) Vacancy
D) Twin boundary
Answer: C) Vacancy

II. Fill in the Blanks

1. Electrical conduction in semiconductors is due to __ and holes.
   Answer: electron
2. The resistivity of metals is __ than that of insulators.
   Answer: lower
3. Silicon and germanium are examples of __.
   Answer: Semiconductors
4. Glass and mica are examples of __.
   Answer: Insulators
5. The most common intrinsic semiconductors are ____ and ____.
   Answer: Silicon, Germanium
6. At absolute zero temperature, an intrinsic semiconductor behaves like an ____.
   Answer: insulator
7. The energy level at which the probability of occupancy is 50% is called the ____ level.
   Answer: Fermi
8. The highest occupied energy band at 0 K is called the ____ band.
   Answer: valence
9. The Hall effect was discovered by ____ in 1879.
   Answer: Edwin Hall
10. The SI unit of Hall coefficient is ____.
    Answer: m^3/C
11. A crystal defect that produces color in an otherwise transparent ionic crystal is called a
    Answer: Color center
12. An electron trapped at an anion vacancy forms an ____ center.

Answer: F-center

13. According to Fick's First Law, the diffusion flux is proportional to the ____ gradient.
Answer: concentration
14. Fick's Second Law is used for ____ state diffusion.
Answer: non-steady
15. The Kirkendall effect provides evidence for the ____ mechanism of diffusion.
Answer: vacancy
16. In the Kirkendall experiment, ____ markers are placed at the interface of two metals.
Answer: inert
17. Dislocations are classified into ____ and ____ dislocations.
Answer: edge, screw
18. Edge dislocations move by a process known as ____.
Answer: slip
19. In a screw dislocation, the Burgers vector is ____ to the dislocation line.
Answer: parallel
20. Helical arrangement of atoms is characteristic of a ____ dislocation.
Answer: Screw

III. Descriptive Questions

1. What do you mean by negative effective mass
2. What is kirkendal effect ?
3. Distinquish between metals ,semiconductors and insulators
4. Write a short note on ionic conductivity and edge, screw dislocations
5. State and explain Bloch theorem
6. Explain schottky defect with diagram