Test Item File

Contents

Chapter 1 Fundamental Solid–State Principles

1) The nucleus of an atom contains

A) protons and electrons.
B) neutrons and electrons.
C) neutrons and protons.
D) neutrons, protons, and electrons.

2) Gold has one valence electron, tin has four valence electrons, and argon has eight valence electrons. Which of these elements has the highest conductivity?

A) Gold
B) Tin
C) Argon

3) As a result of covalent bonding, intrinsic silicon effectively acts as a/an

A) insulator.
B) semiconductor.
C) conductor.

4) The difference between the energy levels of two orbital shells is called the

A) conduction gap.
B) energy band.
C) valence band.
D) energy gap.

5) Which of the following statements is true?

A) Electrons cannot continually orbit the nucleus of an atom in the space that exists between orbital shells.
B) There is no specific energy level that is associated with a given orbital shell.
C) If an electron jumps from an orbital shell to one that has a higher energy level, it remains in the higher–energy shell permanently.

6) Which of the following is not a commonly used semiconductor in electronic applications?

A) Carbon
B) Lead
C) Silicon
D) Germanium

7) Which of the following is a result of covalent bonding in intrinsic silicon?

A) Atoms are held together.
B) The atoms are electrically stable.
C) The material acts as an insulator.
D) All of the above are results of the bonding.

8) Which semiconductor element is most often used in the production of solid state devices?

A) Carbon
B) Lead
C) Silicon
D) Germanium

9) Conduction through a material with a positive temperature coefficient tends to _____ as temperature increases.

A) increase

B) decrease

C) remain relatively unchanged

10) Pentavalent elements have _____ valence electron(s).

A) one B) three C) five D) eight

11) Trivalent elements have _____ valence electron(s).

A) one B) three C) five D) eight

12) Doping is used to

A) decrease the conductivity of an intrinsic semiconductor.

B) increase the conductivity of an intrinsic semiconductor.

C) limit the conductivity of an intrinsic semiconductor.

13) When pentavalent elements are used in doping, the resulting material is called _____ material and has an excess of _____.

A) n–type; valence–band holes B) n–type; conduction–band electrons

C) p–type; valence–band holes D) p–type; conduction–band electrons

14) When trivalent elements are used in doping, the resulting material is called _____ material and has an excess of _____.

A) n–type; valence–band holes B) n–type; conduction–band electrons

C) p–type; valence–band holes D) p–type; conduction–band electrons

15) The time between the forming of an electron–hole pair and recombination is called

A) charge time. B) recombination time.

C) lifetime. D) conduction time.

16) In an n–type material, the majority carriers are

A) conduction–band electrons.

B) conduction–band holes.

C) valence–band electrons.

D) valence–band holes.

E) neutral atoms.

17) In a p–type material, the minority carriers are

A) conduction–band electrons.

B) conduction–band holes.

C) valence–band electrons.

D) valence–band holes.

E) charged atoms.

18) N–type materials are electrically _____ in their natural state.

A) negative B) positive C) neutral

19) A depletion layer acts as a/an

A) insulator. B) semiconductor. C) conductor.

20) P–type materials are electrically _____ in their natural state.

A) negative B) positive C) neutral

21) Pentavalent atoms are often referred to as

A) donor atoms. B) minority carriers.

C) acceptor atoms. D) majority carriers.

22) Trivalent atoms are often referred to as

A) donor atoms. B) minority carriers.

C) acceptor atoms. D) majority carriers.

23) The small amount of current that is present at the forming of a pn junction is called

A) knee current. B) diffusion current.

C) barrier current. D) depletion current.

24) A p–type material is joined with an n–type material. When forward biased, the voltage across the junction is approximately 700 mV (0.7 V). The two materials are most likely made of

A) silicon. B) germanium. C) carbon. D) lead.

25) When a pn junction is reverse biased, its resistance is

A) high.

B) low.

C) determined by the components that are external to the device.

26) A pn junction is forward biased when

A) the applied potential causes the n–type material to be more positive than the p–type material.

B) the applied potential causes the n–type material to be more negative than the p–type material.

C) both materials are at the same potential.

D) Both A and C above.

27) Why is silicon more commonly used than germanium in the production of solid–state components?

A) It is cheaper. B) It is easier to produce.

C) It is more tolerant of heat. D) All of the above.

28) When a pn junction is forward biased, the depletion layer is at its _____ width and the device acts as a near–perfect _____.

A) minimum; conductor B) minimum; insulator

C) maximum; conductor D) maximum; insulator

29) When a pn junction is reverse biased, the depletion layer is at its _____ width and the device acts as a near–perfect _____.

A) minimum; conductor B) minimum; insulator

C) maximum; conductor D) maximum; insulator

30) When a pn junction is forward biased, the combined resistance of the p–type and n–type materials is called

A) net resistance. B) total resistance.

C) bulk resistance. D) forward resistance.

31) Which of the following is an advantage of transistors over vacuum tubes?

A) Transistors are smaller. B) Transistors use more power.

C) Transistors are fragile. D) All of the above

32) The simplest model of the atom is called the

A) covalent bond model. B) conduction bond model.

C) Bohr model. D) energy gap model.

33) Which of the following is not a trivalent doping element?

A) Aluminum B) Arsenic C) Boron D) Gallium

34) The voltage across a forward–biased germanium pn junction is approximately

A) 0.1 V. B) 0.3 V. C) 0.7 V. D) 0.8 V.

Figure 1–1

35) Referring to Figure 1–1. What type of junction bias is shown?

A) Forward bias B) Reverse bias C) Zero bias

Chapter 1 Fundamental Solid–State Principles
Answer Key

1) C
2) A
3) A
4) D
5) A
6) B
7) D
8) C
9) A
10) C
11) B
12) B
13) B
14) C
15) C
16) A
17) A
18) C
19) A
20) C
21) A
22) C
23) B
24) A
25) A
26) B
27) D
28) A
29) D
30) C
31) A
32) C
33) B
34) B
35) B