

Simplifying Test Prep

Chapter-14 Semi Conductor Electronics: Material, Devices and Simple Circuit Class – XII Subject – Physics

14.1. In an n-type silicon, which of the following statement is true:

- a) Electrons are majority carriers and trivalent atoms are the dopants.
- b) Electrons are minority carriers and pentavalent atoms are the dopants.
- c) Holes are minority carriers and pentavalent atoms are the dopants.
- d) Holes are majority carriers and trivalent atoms are the dopants.

**Sol.** (c)

14.2. Which of the statements given in Exercise 14.1 is true for p-type semiconductors.

**Sol.** (d)

- 14.3. Carbon, silicon and germanium have four valence electrons each.These are characterised by valence and conduction bands separated by energy band gap respectively equal to (Eg)C, (Eg)Si and (Eg)Ge. Which of the following statements is true?
  - a) (Eg)Si < (Eg)Ge < (Eg)C
  - b) (Eg)C < (Eg)Ge> (Eg)Si

# c) (Eg)C > (Eg)Si > (Eg)Ge

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d) (Eg)C = (Eg)Si = (Eg)Ge

**Sol.** (c)

- 14.4. In an unbiased p-n junction, holes diffuse from the p-region tonregion because
  - a) free electrons in the n-region attract them.
  - b) they move across the junction by the potential difference.
  - c) hole concentration in p-region is more as compared to nregion.

d) All the above.

## **Sol.** (c)

**Sol.** (c)

- 14.5. When a forward bias is applied to a p-n junction, it
  - a) Raises the potential barrier.
  - **b)** Reduces the majority carrier current to zero.
  - c) Lowers the potential barrier.
  - d) None of the above.

**14.6.** For transistor action, which of the following statements are correct:

- a) Base, emitter and collector regions should have similar size and doping concentrations.

# b) The base region must be very thin and lightly doped. Get SOLVED Question Papers, Updated Syllabus, Sample Papers, Study Material, NCERT solutions, Online test with solutions and much more......



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- c) The emitter junction is forward biased and collector junction is reverse biased.
- d) Both the emitter junction as well as the collector junction is forward biased.

**Sol.** (b), (c)

- 14.7. For a transistor amplifier, the voltage gain
  - a) Remains constant for all frequencies.
  - b) Is high at high and low frequencies and constant in the middle

frequency range.

- c) Is low at high and low frequencies and constant at mid frequencies.
- d) None of the above.

**Sol.** (c)

Sol.

14.8. In half-wave rectification, what is the output frequency if the inputfrequency is 50 Hz. What is the output frequency of a full-wave rectifier for the same input frequency?

For Half-wave rectification: 50 Hz For Full-wave rectification: 100 Hz





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## amplification factor of the transistor is 100, find the input signal voltage and base current, if the base resistance is 1 k $\Omega$ .

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Given: Rc = 2 k ohmsVc = 2 V $\beta = 100$ Rb = 1 k ohm



Calculating collector current Ic = Vc / Rc= 2 / 2000= 1 mANow, we know Current amplification factor  $\beta = Ic / Ib$ Hence,  $Ib = 1 / 100 \times 1000$ Ib = 10 micro-amperesOr, Therefore,  $Vi = 10 \times 10^{-6} / 1 \times 10^{3}$ = 0.01 V

14.10. Two amplifiers are connected one after the other in series (cascaded). The first amplifier has a voltage gain of 10 and the second has a voltage gain of 20. If the input signal is 0.01 volt, calculate the output ac signal.

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Given: Av' = 10 Av'' = 20 Vi = 0.01 V

For cascade connection Net voltage gain, Av = Av'.Av''= 200Now, Av = Vo / ViOr  $Vo = 200 \times 0.01$ Vo = 2 V



14.11.A p-n photodiode is fabricated from a semiconductor with band gap of 2.8 eV. Can it detect a wavelength of 6000 nm?



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