University of Salahaddin – Hawler Education College Physics Department Name: (



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First Examination / First Semester / 1st Trail (2023 - 2024) **Answer the following questions.** (20 Marks) Group (A and B) 1: The most widely used semiconductive material in electronic devices is ------. 2: The current density in a conductor is defined as -----. 4: The atomic number is ------5: The unit of electron mobility is -----. 6: The energy level corresponding to the electron deficiency of the type á' is located just above the valence band and is called ------7: An atom consists of -----8: The intrinsic semiconductors such as pure Ge or Si are ------ semiconductor. 9: Semiconductors have a ----- forbidden band. 10: How to create the current in semiconductor? ------11: If an atom does have more electrons, it is called a ------. 12: The recombination rate depends on ------. 13: The Fermi level lies -----14: Electrons that orbit close to the nucleus have ----- energy than those that orbit farther away. 15: As temperature increases, some of the valence band electrons acquire sufficient thermal energy to jump to the conduction band leaving behind an equal number of ------ in the valence band. 16: How many valance electrons does a conductor such as gold have? ------. 17: In n-type semiconductors, holes are -----. 18: The fifth shell of an atom can have ----- electrons. 19: The electrical conductivity of a *p*-type semiconductor is given by: ------20: A 20m length of cable has a cross-sectional area of 1mm^2 and a resistance of 5 Ω . Data given: DC resistance, R=5 Ω , cable length L=20m, and the cross-sectional area of the conductor is 1mm² giving an area of: A=1×10⁻⁶m². The conductivity of the cable is -----

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Answering:

- 1: The most widely used semiconductive material in electronic devices is silicon.
- 2: The current density in a conductor is defined as the current per unit area $(\vec{j} = \frac{1}{A}\hat{a})$.
- 3: The band gap of semiconductors varies from 0.2 to 2.5 eV.
- 4: The atomic number is the number of PROTONS in the atoms of an element.
- 5: The unit of electron mobility is $m^2 V^{-1} s^{-1}$.

6: The energy level corresponding to the electron deficiency of the type á' is located just above the valence band and is called **the acceptor level**.

7: An atom consists of **protons**, electrons, and neutrons.

8: The intrinsic semiconductors such as pure Ge or Si are **un-doped** semiconductor.

9: Semiconductors have a thinner forbidden band.

10: How to create the current in semiconductor? These electrons and holes <u>move</u> in opposite direction under the effect of an external electric field and <u>constitute</u> the current.

11: If an atom does have more electrons, it is called a **negative ion**.

12: The recombination rate depends on the concentration of electrons and holes in a material.

13: The Fermi level lies in the middle of the conduction band and valence band.

14: Electrons that orbit close to the nucleus have less energy than those that orbit farther away.

15: As temperature increases, some of the valence band electrons acquire sufficient thermal energy to jump to the conduction band leaving behind an equal number of **holes** in the valence band.

16: How many valance electrons does a conductor such as gold have? **One**.

17: In n-type semiconductors, holes are minority carriers.

18: The fifth shell of an atom can have $2n^2 = 2(5)^2 = 50$ electrons.

19: The electrical conductivity of a *p*-type semiconductor is given by: $\sigma_p = ep\mu_p = eN_a^-\mu_p$.

20: A 20m length of cable has a cross-sectional area of 1mm² and a resistance of 5 Ω . Data given: DC resistance, R=5 Ω , cable length L=20m, and the cross-sectional area of the conductor is 1mm² giving an area of: A=1×10⁻⁶m². The conductivity of the cable is $\sigma = \frac{\Delta l}{RA} = \frac{20}{5 \times 1 \times 10^{-6}} = 4MS/m$.