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Assignment:-

1) Explain conductivity of metals and alloys.

→ An alloy is a material that consists of a mixture of two or more elements that are metals, non-metals. Therefore, alloy is a metal with addition of elements such as iron, chromium and aluminium.
The addition of alloy elements to pure metals causes additional scattering of the conducting electrons and thus the thermal conductivity is decreased during alloying.
In an alloy, the constituent metal ions have different charge and size. They occupy random locations with respect to each other, hence leading to ideal lattice distortion.

Mathiessen's rule states that the resistivity of a metallic material is given by the addition of a base resistivity that accounts for the effect of temp (ρ_i) and a temp independent term that reflects the effect of atomic level defects, including impurities forming solid solutions (ρ_d)

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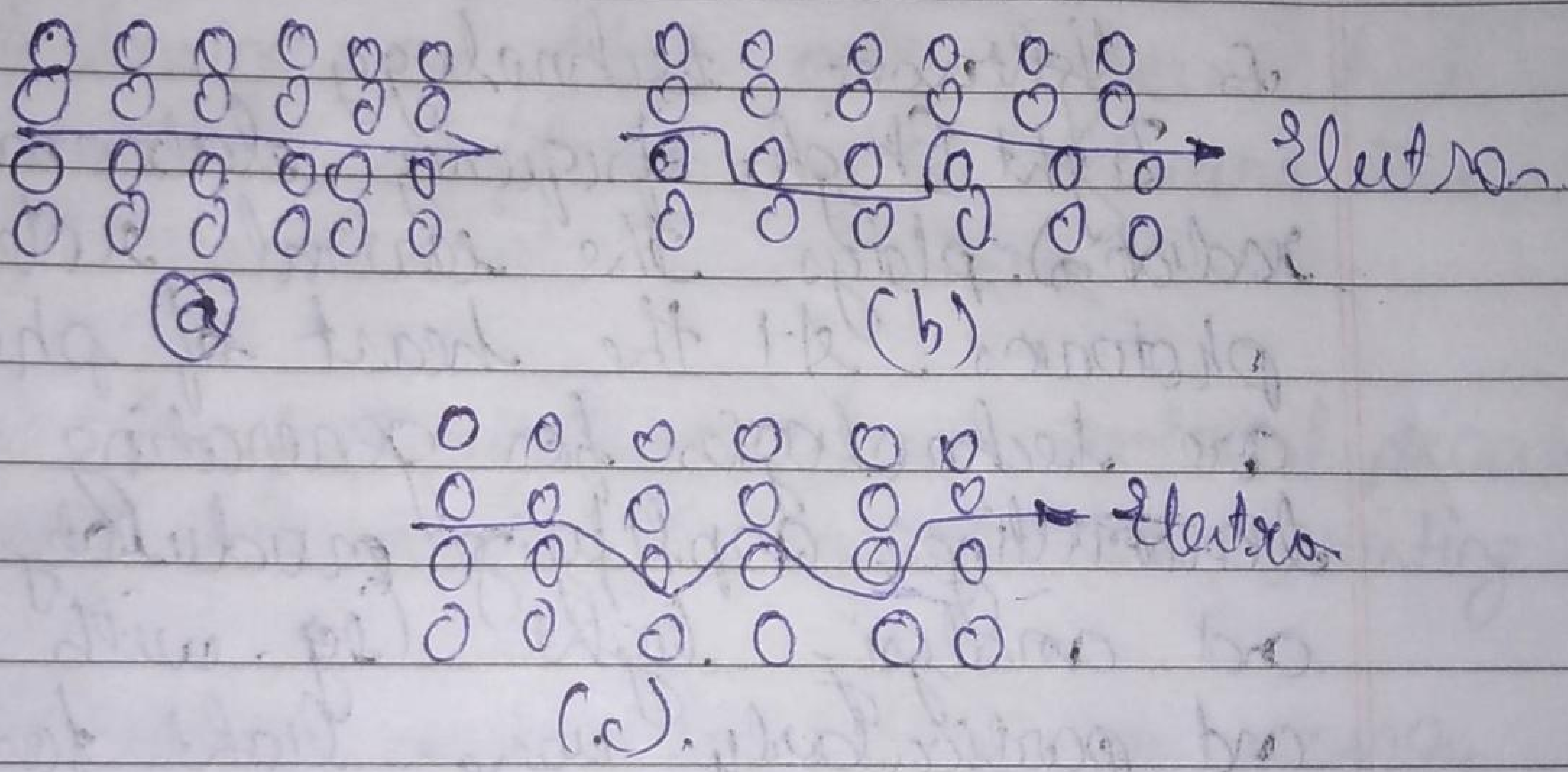
The resistivity of a metallic results from the scattering of conduction electrons. Lattice vibrations scatter electrons because the vibrations distort the crystal. Imperfections such as impurity atoms, interstitials, dislocations and ~~ga~~ grain boundaries scatter conduction electrons static potential differs from that of the perfect ~~cry~~ crystal.



Movement of electron through:-
(a) a perfect crystal.
(b) a crystal heated at high temperature.
(c) a crystal containing atomic level defects
scattering of electrons reduces the mobility and conductivity.

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2) Explain photonic material and its application.

Ans) Photonics is the science and technology of light, with an emphasis on application harnessing light in a wide range of fields. The term "photonics" was coined by the French physicist pierre Aigrain in 1967 and is widely used since the mid -1970s. An alternative term is lightwave technology.

Light (high-frequency electromagnetic radiation) plays the central role in photonics. At the heart of photonics are technologies for generating light, transmitting, amplifying modulating, detecting and analysing light (eg. with spectroscopy) and particularly using light for various practical purposes.

Typical applications are:-

i) Health care and life science (biophotonics) eg. medical diagnostics and therapy in opthalmology, in infection sciences and cancer research.

ii) Information technology, eg. optical fibre communications for fast internet access, free-space optical communications, quantum cryptography and optical data storage. In the

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iii) Sensing, e.g. fibre-optic sensors, high-speed cameras, infrared motion detectors or industrial process control.

iv) Manufacturing, e.g. laser material processing, semiconductor chip manufacturing, printing.

v) Lighting and illumination, e.g. energy efficient LED illumination.

vi) Defence and space technology, e.g. satellite surveillance systems, navigation, imaging, night vision, missile guidance.