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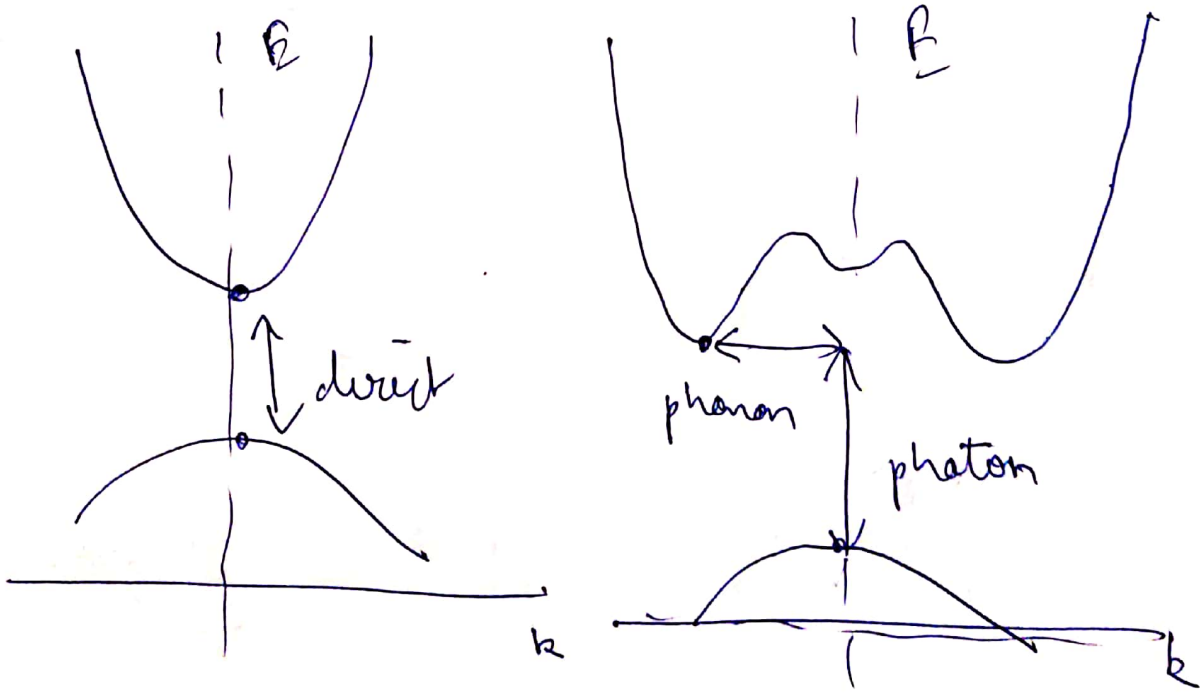
Q7) a) We can find direct and indirect band gaps in a semiconducting material by measuring the photons and the phonons released when an electron goes from a higher state to a lower state.

The photon released will tell us the direct band gap = difference in energies = the energy of photon.

While phonon will tell us the indirect band gap, phonon having wavevector = diff in k value of both.



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Q7) b) $S = 300\ \mu V/K$

$\Delta\theta = 100\ K$

$V = S\Delta\theta$

$= 300 \times 10^{-6} \times 100$

$= 300 \times 10^{-4}\ V$

c) i) Temp difference across a solid produces emf which can drive current through load ~~(power generation)~~ to produce electricity.

ii) Driving current through the same solid which will result in heating of one side and cooling of another - which can be used for refrigeration

iii) Body heat could be used to power watches

iv) Use of waste heat like from friction or heating of engine.