

國立中正大學 114 學年度碩士班招生考試試題

科目名稱：半導體元件物理

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系所組別：機械工程學系光機電整合工程

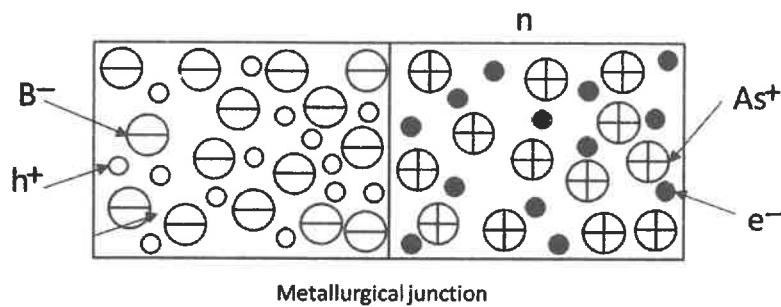
1. (30%) True or false: If the statement is true, explain why it is true. If it is false, give a counter example.

- (a) In the photoelectric effect, the work function of a metal depends on the frequency of the incident light. (5%)
- (b) The energy of the photon is proportional to its frequency. (5%)
- (c) Electron can be diffracted. (5%)
- (d) A particle that is confined to some region of space cannot have zero energy. (5%)
- (e) Two electrons can have the same quantum state in atom. (5%)
- (f) At $T=0$, an intrinsic semiconductor is an insulator. (5%)

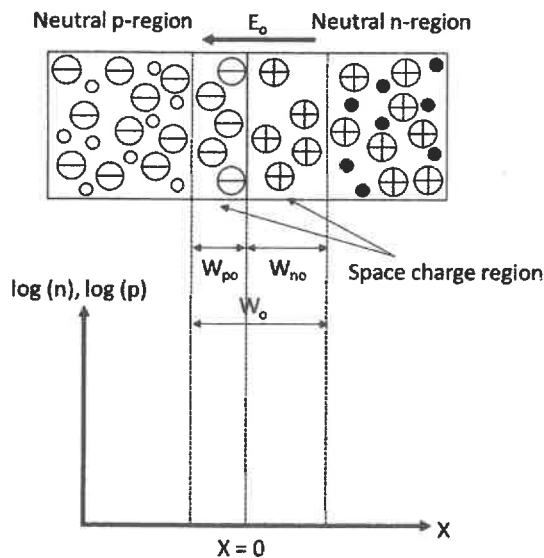
2. (20%)

- (a) When molybdenum is bombarded by electrons at 35 kV, its X-ray spectrum shows intensity peaks at certain wavelengths; however, these peaks are not observed when the target material is replaced by tungsten. Explain why this special feature occurs. Are there any other special features that classical electromagnetic theory can not explain? If yes, please explain it. (10%)
- (b) At the same temperature, will the gas pressure of classical molecules, bosons, or fermions be the greatest? Why? (10%)

3. (50%) Please consider what happens when one side of a sample of Si is doped n-type and the other side p-type, and plot the results when p-n junction is forming.



(a) (10%)



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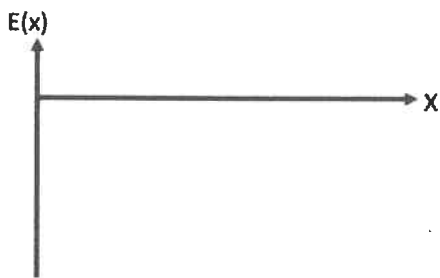
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(b) (10%)



(c) (10%)



(d) (10%)



(e) (10%)

