B) Conjugation — Conjugation in Bacteria was discovered by Leder Berg and Tatum (1946) in E. coli. In this process DNA from a donar or male cell is transferred into a recipient or a female cell through a conjunction tube. Maleness is determined by the presence of a plasmid known as F-factor or fertility factor or Sex factor. Bacterial cells in which F-factor is present are called F^+ or male cells or donar cells and cells in which the F-factor is absent are known as F^- or female cell or recipient cell. The F-factor remains in two stages viz.- as plasmid and as episome. The plasmid replicate independently. However sometimes it is integrated into the nucleoid of bacteria then it is called episome.

i) Transfer of F-factor from F^+ to F^- cell —

The F^+ donar possess an independent F-factor (Plasmid). Transfer of F-factor by F^+ donar to a F^- cell takes place in the following way: —

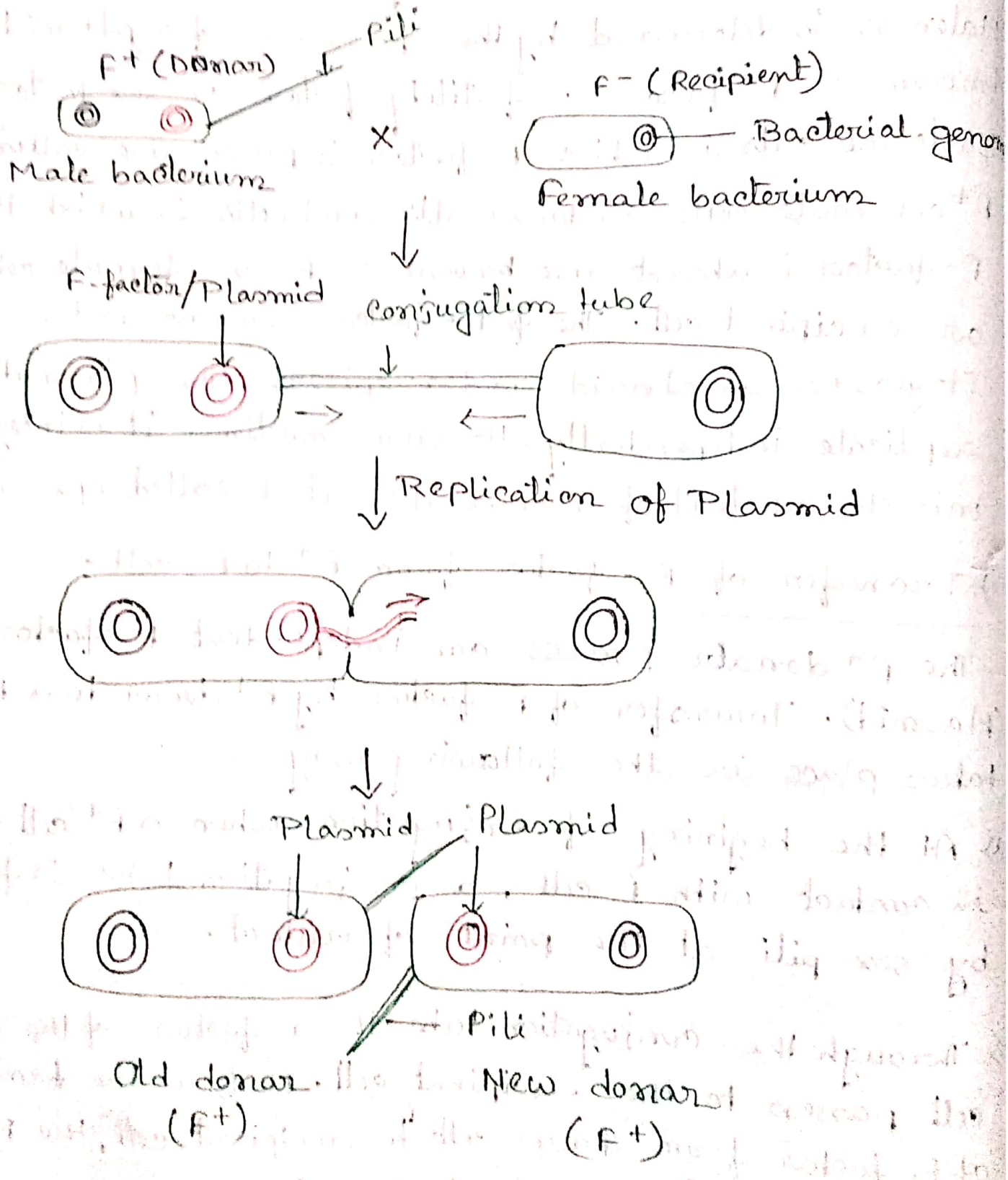
a) At the begining of conjugation when a F^+ cell comes in contact with F^- cell, a conjugation tube is formed by sex pili at the point of contact.

b) Through the conjugation tube the F-factor of the donar cell passes to the recipient cell. Before the transfer of F-factor from donar cell to recipient cell, the F-factor replicates to form two F-factor. Of these, one passes into the recipient cell while the other remains within the donar cell. As a result there is a recombination of genetic material of a recipient cell.

c) From the donar cell a partial genome i.e. one replica of the F-factor passes into the recipient cell. As a result the recipient cell forms a partial deploid cell known

as merozygote or hemizygote.

d) When transfer of partial genome is completed, the recipient female cell (F-) is converted into a F^+ cell.



ii) Transfer of F-factor by Hfr donar :— When the F-factor is integrated into the DNA of F+ cell it is called Hfr (High frequency of recombination) cell. When ~~the F-factor is integrated into the~~ DNA of During conjugation of a Hfr cell with a F⁻ cell, the F⁻ cell remain as F⁻ because of seperation of two conjugating cell, before the final transfer of ultimate F-segment. It takes place in the following way:-

a) At the begining when a Hfr cell comes in contact with a F⁻ cell, a conjunction tube is formed by sex pili at the point of contact.

b) The DNA of Hfr cell together with the episome replicates as a result two DNA associated with episome are produced.

c) One DNA of the Hfr cell then migrates to the donar cell through the conjunction tube.

d) Before the final transfer of episome the conjugating cell becomes seperate. So no transfer of episome takes place from Donar to the recipient cell.

e) As there is no final transfer of episome, the recipient cell remains as F⁻, although genetic recombination takes place.

During conjugation between Hfr and F⁻, the F-factor becomes integrated into the bacterial main DNA. The F-factor replicates along with the main DNA.

When such F-factor are transferred, the recipient bacterial cell (Female cell) becomes heterozygous specially for the part of DNA which the

F^- has received from the male bacterium. This phenomenon is known as sexduction.