The use of differential equations is worldwide and arises quite often in biological and physical applications. Differential equations have been used to create mathematical models of real world systems in which rates of change are involved. One area where it is useful is **in** a model for nutrient exchange in the placenta. An attempt has been made by Zimmerman to develop a model for mother-foetus relation through pregnancy but his work did not include the nutrient exchange from foetus to mother. An extensive literature exist on this subject but waste elimination from the foetus to mother has not been introduced in developing a mathematical model in the placenta. The objective of this study was to develop a mathematical model for the nutrient exchange of waste products from foetus to mother and also to test for stability of the model developed. The methodology included: analysis of Zimmerman's model; adding the placenta as the interface and formulating a system of equations in the form, $Y = AY + \tilde{f}'(t)$from the three compartmental diagram. The eigenvalues of these equations were calculated and used to test for stability. It was established that the eigenvalues of the coefficient matrix are negative real numbers, >11 and complex numbers with negative real parts, ,>-2 and ,\3 .This shows that the model provides one straight line of solutions tending to the origin mid a plane of solutions which spiral towards the origin. This gives a more accurate mathematical model for nutrient exchange in the placenta. This model would create a lot of insight into nutrient exchange in the placenta, the elimination of waste from the foetus and open room for further research from the mathematical concept developed.