



**Answer the following questions.**

**Question 1**

**(15 marks)**

The characteristic solar cell parameters,  $J_{SC}$ ,  $V_{OC}$ , FF and  $P_{max}$ , are used to determine the *power conversion efficiency* (PCE). Discuss the meaning of these parameters with clarify how they referring to the solar cell performance.

**Question 2**

**(10 marks)**

What is the difference between external quantum efficiency and internal quantum efficiency of solar cell?

**Question 3**

**(15 marks)**

Write short notes on the development of solar cells in view of which so called solar cell generations? Mention the advantages and disadvantages for each generation?

**Question 4**

**(30 marks)**

Discuss with draw the energy diagram for the process of charge generation and transport within organic photovoltaic cells and clarify the efficiency of all steps through the process and their effect in the performance of solar cell?

**Question 5**

**(15 marks)**

Show that, how the energy levels for the nanoparticles and polymer, in photoactive layer of bulk heterojunction solar cell, should be chosen so that they promote the charge separation and transfer?

**Question 6**

**(15 marks)**

In photoactive layer of organic/inorganic photovoltaic cells, explain the importance of aggregation control within the nanoparticle phase to produce morphologies that minimize recombination losses?

*With my Best Wishes*