Uva Wellassa University, Sri Lanka
End Semester Examination – July 2010
CHE 453-2 Semiconductors and Nanomaterials

Time: Two (02) hours

Total **05** Questions
Question **05** is compulsory
Answer **04** questions only.

1) Nanotechnology is the applied science and technology which deals with materials at nanoscale. At nanoscale, materials' properties get change from that of the bulk scale.

   a. Briefly explain what is "molecular nanotechnology". (20 marks)

   b. i. Give 4 examples for change of material's properties at nanoscale, explaining why these changes occur. (60 marks)

   ii. Give examples for novel applications that are created with the new properties you mentioned above. (20 marks)

2) a. i. What are the three different types of SWCNTs? Draw their structures. (15 marks)

   ii. Give three (03) specific properties of carbon nanotubes and their applications. (30 marks)

   b. i. Briefly explain three (03) methods that can be used to produce carbon nanotubes. (30 marks)

   ii. What are the advantages and disadvantages of the methods you mentioned earlier? (25 marks)

3) What are the properties, production methods and applications of these nanomaterials?

a. nanocrystalline materials (20 marks)

b. nanoemulsions (20 marks)

c. nanocomposites (20 marks)

d. nanocatalysts (20 marks)

e. nanoencapsulated materials (20 marks)

4) a. Why nanomaterials should be considered with a risk? (25 marks)

b. Airborne nanoparticles can cause serious effects. Give five (05) methods that can cause airborne nanoparticles to be produced in your lab/plant.

(25 marks)

c. Write down the three paths through which nanomaterials can enter the body through the skin. How can you prevent this?

(20 marks)

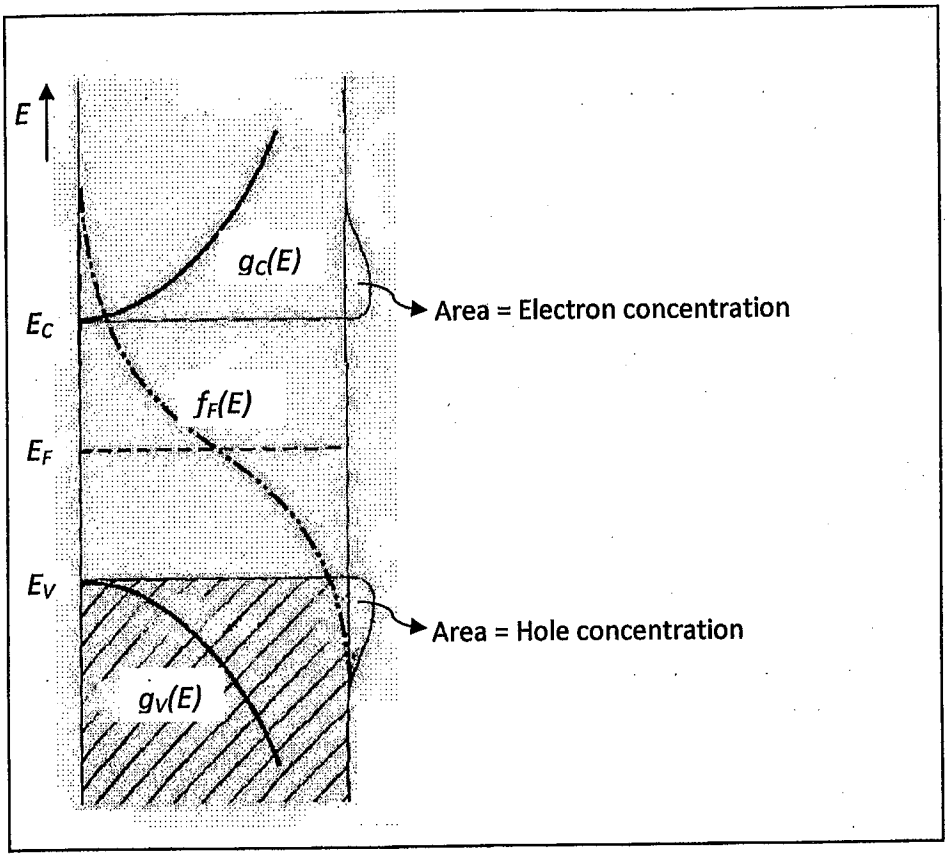
d. Discuss the good working practices that are essential with Nanomaterials.

(30 marks)

5) a. Electrical properties of materials depend upon their energy band structures. Briefly explain the different types of possible energy band structures for conductors, insulators and semiconductors.

(30 marks)

b. Density of state function, Fermi-Dirac probability function, electron and hole concentration of a intrinsic semiconductor material can be graphically represented as follows.



Explain the effect on adding

i. donor impurity atoms

ii. acceptor impurity atoms

to above semiconductor material.

(All symbols have their usual meaning).

(40 marks)

c. Briefly describe the "Built-in potential barrier" of a p-n junction diode.

(30 marks)

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