	Sanjay Ghodawat University, Kolhapur Established as State Private University under Govt. of Maharashtra. Act No XL, 2017	2018-19 EXM/P/09/00
Year and Program-2018-19 Second Year MSc. (Nanoscience)	School of Science	Department-Physics
Course Code - PHN608	Course Title- Semiconductor Nanostructures and Nanoparticles	Semester – IV
Day and Date : Tuesday 28/5/2019	Examination: Sem IV	Time: Max Marks: 100 2.30 to 3.00 pm

Instructions: 1) All questions are compulsory.

Q.1a Select the correct alternative

	Marks	Bloom's Level	CO
1. In quantum dots , there is usually ----- confinement	01	L1	CO1
a) rectangular b) spherical c) square d) triangular			
2. What is graphene ?	01	L1	CO1
a) A new material made from SP2 bonded carbon atoms arranged in hexagonal structure. b) A one atom thick sheet of gold c) Thin film made from silver d) A software tool			
3. In a superlattice, the potential V has a new periodicity in the Z direction with periodicity	01	L3	CO3
a) $L \ll a$ b) $L \gg a$ c) $L = a$ d) $L = 0$			
4. The correct relation between meter and nanometer is	01	L2	CO2
a) $1\text{m} = 10^6 \text{ nm}$ b) $1\text{m} = 10^7 \text{ nm}$ c) $1\text{m} = 10^9 \text{ nm}$ d) $1\text{m} = 10^4 \text{ nm}$			

ESE

Page 1/5

5. Chemical vapour deposition method is an example of ... 01 L2 CO2
- a) Biological method b) Physical method
- c) Chemical method d) Hybrid method
6. Silicon has indirect bandgap energy equal to -----eV 01 L4 CO4
- a) 2.4 b) 2.7
- c) 1.1 d) 0.5
7. Chemical vapor deposition (CVD) technique consists of vaporizing 01 L2 CO2
furnace which requires of temperature ----- °C.
- a) 50 b) 2000
- c) 400 d) 1000
8. In an electrodeposition, deposition occurs on ----- 01 L2 CO2
- a) an anode b) a cathode
- c) both anode and cathode d) A glass
9. Quantum dots are nanoparticles / nanostructures that exhibit ----- 01 L3 CO3
dimensions confinement.
- a) 1 b) 2
- c) 3 d) 4
10. The bandgap of spherical quantum dot is increased from its bulk value 01 L3 CO3
by a factor of -----, where R is radius of the particle.
- a) $1/R^2$ b) $1/R^3$
- c) $1/R$ d) R
- Q.1b Fill in the blanks.**
1. In a Chemical vapor deposition (CVD) formation of beads / fibers/ 01 L2 CO2
CNTs is a function of -----
2. Potential of standard calomel electrode (SCE) w.r.t. normal hydrogen 01 L4 CO4
electrode (NHE) is ----- V.
3. Bandgap energy of CdTe is..... eV. 01 L4 CO4
4. Condition to absorb a photon in a semiconductor is that photon 01 L4 CO4
energy..... bandgap energy.
5. Maximum value of fill factor is..... 01 L4 CO4

ESE

Page 2/5

6. Material is said to be in a nanosize when particle is size in the range 01 L3 CO3
..... to nm.

Q.1c State true or false

1 Melting point of a material reduces with its increase of size. 01 L3 CO3


2 The CdS has monoclinic structure. 01 L4 CO4

3 According to Pauli exclusive principle no two electrons have same set of quantum numbers. 01 L2 CO2

4 Surface energy in nanoparticles goes on increasing with decrease in size of nanoparticles. 01 L3 CO3

ESE

Page 3/5

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28/05/2019

(B)

3.00 to 5.30 pm

Q.2	Attempt the following questions.	Marks	Bloom's Level	CO
a)	Using Fermi Dirac statistics show that Fermi Energy level lies exactly mid way between valence and conduction bands in case of an intrinsic semiconductor.	12	L2	CO2
b)	Explain in brief the ball milling method for nanomaterial synthesis.	4	L3	CO3
Or				
b)	Draw the diagram of experimental set up of electro- deposition and label its different parts.	4	L2	CO2

Q.3	Attempt the following questions.	12	L2	CO2
a)	Explain concept of quantum dot and variation in band gap energy with decrease in size of the particle.			
b)	Explain chemical vapor deposition method.	4	L2	CO2
Or				
b)	Explain in brief melting point of nanoparticles.	4	L3	CO3

ESE

Page 4/5

Q.4.				
a)	Describe solid state phase transformation.	2	L3	CO3
b)	From the following data calculate percentage conversion efficiency of a Solar cell if Maximum current I_m and voltage V_m are 5 mA and 300 mV while input power given to the solar cell is 75 Watt /m ²	8	L4	CO4
Or				
b)	Explain in brief any five properties of nanomaterials.	8	L3	CO3
c)	Explain role of Nanotechnology in the field of Solar cell.	4	L4	CO4

Q.5	Explain different methods for producing Polymer nanoparticles and doping of Nanoparticles.	12	L3	CO3
a)				
b)	Explain direct recombination Process in an indirect band gap semiconductor.	8	L3	CO3
Or				
b)	Explain Photovoltaic Effect. Draw suitable figures.	8	L4	CO4
c)	Draw equivalent circuit diagram of a solar cell. State origins of Series and shunt resistances .	4	L4	CO4