Master of Science – (Nanotechnology) Examination: Oct / Nov 2016
Semester – I (New CBCS)

SLR No.	Day & Date	Time	Subject Name	Paper No.	Seat No.
SLR – ST-745	Wednesday 16/11/2016	10.30 AM to 01.00 PM	Fundamentals of None Technology in Physics	HCT-1.1	

Instructions:
1) **Part- I is compulsory.**
2) **Attempt any Four question from Part-II.**
3) **Figures to right indicate full marks.**
4) **Answer to the Part- I and Part- II are to be written in same answer book.**

Total Marks: 70

Part– I

Q.1 A) Rewrite the following sentences by selecting correct answers from given alternative. **07**

1) X-rays are electromagnetic waves with wavelength ranging between _____
   a) 0.02 A & 100 A
   b) 0.01 A and 98 A
   c) 0.05 A and 90 A
   d) 2A and 20A

2) The question _____ represents the mass action law for semiconductors
   a) $np = n^2_i$
   b) $np = n_i$
   c) $n/p = n_i$
   d) $np = 2n_i$

3) Nano scale semiconductor materials tightly confine _____.
   a) Neutrons
   b) Electrons
   c) Electric field
   d) Protons

4) Ionic solids possess net dipole moment even in the absence of _____.
   a) Internal electric field
   b) External electric
   c) Positive electric field
   d) Negative electric field

5) Orientation polarization is given by the expression _____
   a) $\alpha_0 = \mu^2/ 2KT$
   b) $\alpha_0 = \mu^2/ 3KT$
   c) $\alpha_0 = \mu^2/ 4KT$
   d) $\alpha_0 = \mu^2/ 1KT$

6) As surface area changes the _____ of nanoparticles changes.
   a) Properties
   b) Application
   c) Electronic
   d) Atomic level

7) Quantum dots are _____ nanomaterials.
   a) Zero dimensional
   b) One dimensional
   c) Two dimensional
   d) Three dimensional

B) Define the following terms: **07**

1) Diffraction of x-rays
2) Semiconductor
3) Laser
4) Optical absorption
5) Internal fields
6) Optical memory
7) Nano structured

Part–II

Q.2 What are the two types of semiconductors? How are they distinguishes?. **14**

Q.3 What are Miller indices? How do we calculate them? **14**

Q.4 Explain construction of Quantum Cascade laser. **14**

Q.5 With a neat diagram explain internal or local fields in solid and liquids. **14**

Q.6 **Answer any TWO of the following:** **14**

a) What are applications of electro luminescence?
b) Magnetic materials.
c) What is Lorentz force? Explain.

Q.7 **Write short notes on any TWO of the following:** **14**

a) Optical properties of nanomaterials.
b) Magnetic materials
c) Thermal properties of nanomaterial.

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SLR No.	Day & Date	Time	Subject Name	Paper No.	Seat No.
SLR – ST 746	Friday 18/11/2016	10:30 AM to 01:00 PM	Fundamentals of Nanotechnology in Chemistry	HCT 1.2	

Instructions:
1) **Part I Question is compulsory.**
2) **Attempt any four questions from part – II.**
3) **Figures to the right indicate full marks.**
4) **Answers to the part – I and part – II are to be written in same answer booklet only.**

Total Marks: 70

Part – I

Q.1 A) Rewrite the sentences after choosing the correct answer from the given alternatives: **08**

1) _____ do not follow the octer rule for election distribution.
   a) H_2O b) PH_3
   c) CH_4 d) PCI_5

2) The region is space around the nucleus in which probability of finding an electron is maximum is called an _____
   a) Orbital b) Orbit
   c) Sub-shell d) Shell

3) The formal charge on an atom of an element is equal to _____
   a) 0 b) 1
   c) 2 d) 3

4) The maximum number of electrons in sub-shells is given by formula
   a) $2n^2$ b) $n(l+1)$
   c) $2(2l+1)$ d) n^2

5) The term nano was coined by _____
   a) Robert boyle b) Richard Feyman
   c) J.J. Thomas d) Irvin L

6) Properties of Nanoparticles are based on
   a) Size b) Surface area
   c) Mass d) Elasticity

7) They are _____ types of dimensions in nanomaterials.
   a) Four
   b) Five
   c) Six
   d) Seven

B) Define the following: **07**

1) Pauli exclusion principle
2) Aufbau's principle
3) Resonance
4) Carbon
5) Surface energy
6) Nanoparticles
7) Thin film

Part – II

Q.2 Explain molecular orbital theory in detail with respect to N_2 molecule. **14**

Q.3 Explain Bohr's atomic theory, radius and energy level of hydrogen atom. **14**

Q.4 Explain Line spectra of hydrogen atom. Calculate frequency of α, β & γ line of Balmer – paschen series. **14**

Q.5 Explain the development of nanotechnology. **14**

Q.6 **Answer any two from the following:** **14**

a) Application of carbon nanomaterials

b) Describe chalcogenides

c) Describe nano – metals

Q.7 **Write short notes on: (any two)** **14**

a) Nano –crystal

b) Quantum dots

c) Nanowires

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SLR No.	Day & Date	Time	Subject Name	Paper No.	Seat No.
SLR – ST – 747	Monday 21/11/2016	10.30 AM to 01.00 PM	Nano-materials Fabrication	HCT 1.3	

Instructions:
1) **Question 1 and 2 are compulsory**
2) **Attempt any three questions from Q. 3 to Q.7**
3) **All questions carry equal marks.**

Total Marks: 70

Q.1 A) Rewrite the sentences after choosing the correct answer from the given alternatives: **08**

1) The size of nanoparticles usually ranges from _____
   a) 1nm – 100 nm
   b) 100nm – 200nm
   c) 200nm – 300 nm
   d) 300 nm – 400nm

2) The Laser Ablation method is the _____
   a) Chemical
   b) Physical
   c) Biological
   d) Hybrid

3) Nucleation is the first step in the formation _____
   a) Deposition
   b) Cluster
   c) Atomic assembly
   d) Self-assembly

4) Sliver nanoparticles can be prepared by using
   a) Silver nitrate
   b) Silver chloride
   c) Citrate
   d) Citrate buffer

5) Plasma processing is a _____ based materials processing technology.
   a) Impact and attrition
   b) Strain
   c) Heat
   d) Plasma

6) Hot wire CVD consists of _____
   a) Liquid
   b) Filament
   c) Solid
   d) Mixture of Solid & liquid

7) _____ are used to nanoparticles by biogenic method.
   a) Bacteria
   b) Virus
   c) Metal
   d) Flux

B) Define the following **07**

1) Nanomaterials
2) 1D Nano structure
3) Ultra-thin film
4) CVD
5) Nucleation
6) Sputtering
7) Intracellular

Q.2 Attempt the following.

a) Explain laser ablation technique **05**
b) Explain molecular beam epitaxy **05**
c) Write a note on active efflux **04**

Q.3 **a)** Explain different types of nanomaterials synthesis. **08**
b) Explain self-assembly **06**

Q.4 **a)** Explain the different types of CVD methods. **08**
b) Explain Arc discharge. **06**

Q.5 **a)** Explain the phase transformation. **08**
b) Write a note on Sol-gel process. **06**

Q.6 **a)** Explain preparation of nanomaterials using Electrodeposition method. **08**
b) Write a note on synthesis of nanomaterials by bacteria. **06**

Q.7 **a)** Write a note on Intercellular synthesis of nanomaterials. **08**
b) Write a note on synthesis of nanomaterials by fungi. **06**

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SLR No.	Day & Date	Time	Subject Name	Paper No.	Seat No.
SLR – ST – 748	Wednesday 23/11/2016	10.30 AM to 01.00 PM	Fundamentals of Biotechnology	SCT 1.1	

Instructions:
1) **Part I, Question 1 is compulsory.**
2) **Attempt any four questions from Part II.**
3) **Figures to the right indicate full marks.**
4) **Answers to the Part-I and Part-II are to be written in same answer Booklet only.**

Total Marks: 70

PART I

Q.1 A) Rewrite the sentences after choosing the correct answers from the given alternative. **07**

1) Scientist _____ discovered cells while looking at the thin slice of cork.
   a) Antonie van Leeuwenhoek b) Theodor Schwann
   c) Rudolf Virchow d) Robert hooke

2) According to chargaffs' rule the amount of purines in a given DNA molecule will be about the same as _____
   a) Phosphates b) Pyrimidines
   c) Adenine d) Guanine

3) _____ is type of sexual reproduction in prokaryotes
   a) Conjugation b) Binary fission
   c) Budding d) Fragmentation

4) Programmed cell death is known as _____
   a) Cancer b) Apoptosis
   c) Necrosis d) Metastasis

5) In RNA, pentose sugar is _____
   a) De-oxyribose b) Glucose
   c) Ribose d) Galactose

6) _____ in plants directly connects neighboring cells.
   a) Gap junction b) Ligands
   c) Receptors d) Plasmodesmata

7) _____ is the largest cytoskeletal fibers.
   a) Intermediate filaments b) Microtubules
   c) Microfilaments d) Protofilament

B) Definitions: **07**

1) Cell capsule
2) Amino acid
3) Cell surface receptors
4) Kinases
5) Pyrimidines
6) Adaptive immunity
7) ATP

PART II

Answer any four of the following.

Q.2 What are cell organelles? Explain in detail about various cell organelles with their functions. **14**

Q.3 What is cell signaling? Explain the different forms of signaling. **14**

Q.4 What is DNA? Explain the structure and components of DNA. **14**

Q.5 What is cell junction? Explain briefly about types of cell junctions. **14**

Q.6 **Write notes on any two :** **14**

a) Hydrophobic amino acid
b) G protein coupled receptors
c) Mitosis

Q.7 **Answer any two :** **14**

a) Life cycle of HIV
b) Write a short note on central dogma.
c) Endocytosis.

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SLR No.	Day & Date	Time	Subject Name	Paper No.	Seat No.
SLR – ST – 749	Wednesday 23/11/2016	10.30 AM to 01.00 PM	Introduction to Nanoscience and Nanotechnology	SCT 1.2	

Instructions:
1) **Part I, Question 1 is compulsory.**
2) **Attempt any four questions from Part II.**
3) **Figures to the right indicate full marks.**
4) **Answers to the Part-I and Part-II are to be written in same answer Booklet only.**

Total Marks: 70

PART I

Q.1 A) Rewrite the sentences after choosing the correct answers from the given alternative. **07**

1) The nanoparticles size usually ranges from _____
   a) 1nm – 100 nm b) 100nm – 200nm
   c) 200nm – 300nb d) 300nm – 400 nm

2) The term nano was coined by _____
   a) Robert boyle b) Norio Taniguchi
   c) J. J. Thomas d) Irvin L

3) The gathering of entities without any external influence called _____
   a) Self – assembly b) Isomerization
   c) Degradation d) Biodegradation

4) Nanoparticle changes its properties based on _____
   a) Size b) Surface area
   c) Area d) Elasticity

5) They are _____ types of dimensions in nanomaterials
   a) Four b) Five
   c) Six d) Seven

6) Pnp is a type of _____
   a) Conductor b) Insulator
   c) Semiconductor d) Dielectric

7) TiO_2 is best example of _____
   a) Metal b) Metal oxide
   c) Semiconductor d) Insulator

B) Definitions: **07**

1) Nanoscience
2) Nanotechnology
3) Graphene
4) Nucleation
5) Nanocrystal
6) Semiconductor
7) Sensor

PART II

Answer any four of the following.

Q.2 What is nucleation rate? What is its influence on the size of nanocrystals? Write detail account of types of nanocrystals? **14**

Q.3 What are the challenges of nanotechnology? Explain one and two dimensional nanostructure? **14**

Q.4 What is CNT? Describe size dependent physical, chemical and optical properties of nanomaterials. **14**

Q.5 What are ceramic semiconductors? Explain in details properties of metal oxide. **14**

Q.6 **Answers any two :** **14**

a) Applications of CNT
b) Describe Lipids
c) Working principle of membrane based water purification

Q.7 **Answer any two :** **14**

a) Top down approach
b) Nanocrystal defects
c) Chemical synthesis of nanomaterials