**SLR-RU – 812**

| Seat No. | |
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# M.Sc. (Nano-Technology) (Semester – II) (New) (CBCS) Examination, 2017
# CHARACTERIZATION TOOLS OF NANOMATERIALS

Day & Date: Wednesday, 19-04-2017 Max. Marks: 70

Time: 10.30 AM to 01.00 PM

***N. B. :*** *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**.*

## Part-I

**Q.1 A) Rewrite the sentence after choosing correct answer from the given alternatives:** **07**

1) A scanning tunneling microscope (STM) is an instrument for imaging surfaces at the _____.
   a) Atomic level b) Chemical level
   c) Magnetic level d) Physical level

2) Transmission electron microscopy (TEM) is microscopy technique in which a beam of electrons is transmitted through an _____ specimen, interacting with the specimen as it passes through it.
   a) Ultra-thin b) Single-thin
   c) Strong material d) Thick material

3) XRD is used to find the ____ structure of an unknown material.
   a) Crystalline b) Amorphous
   c) Gas phase d) Solid phase

4) Raman spectroscopy is a spectroscopic technique used to observe ____ rotational, and other low-frequency modes in a system.
   a) Stunning b) Tunneling
   c) Wagging d) Vibrational

5) Young's modulus, also known as the elastic modulus, is a measure of the _____ of a solid material.
   a) Hardness b) Smoothness
   c) Stiffness d) Rigidness

6) The Poisson's ratio in which a material tends to expand in directions ____ to the direction of compression.
   a) Rectangular b) Perpendicular
   c) Triangular d) Vertical

7) HRTEM is an imaging of the TEM that allows for ____ of the atomic structure of the sample.
   a) Indirect image b) Direct image
   c) Blur image d) None image

**Q.1 B) Definition:** **07**

1) SEM
2) EDAX
3) UV-Vis Spectroscope
4) XPS
5) SIMS
6) Young's modulus
7) HRTEM

## Part-II

**Answer any four of the following**

**Q.2** With a neat diagram explain SEM and give its important applications. **14**

**Q.3** What is meant by TEM and explain in detail TEM. **14**

**Q.4** What is meant by Raman spectroscopy and give a brief explanation on Raman spectroscopy. **14**

**Q.5** Give a brief account on NMR. **14**

**Q.6** Write a short note about **any two** **14**

a. DLS
b. DPI
c. EELS

**Q.7** Explain in detail about **any two** **14**

a. Poisson ratio
b. Bulge test
c. Non-linear Kerr effect

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# M.Sc. (Nano-Technology) (Semester – II) (New) (CBCS) Examination, 2017
# PROPERTIES OF NANOMATERIALS

Day & Date: Friday, 21-04-2017 Max. Marks: 70

Time: 10.30 AM to 01.00 PM

***N.B. :*** *1) part -**1, question 1iscompulsory.***
*2) Attempt **any four** questions from Part II.*
*3) Figures to the **right** indicate **full** marks.*
*4) Answers to the Part- 1 and Part –**II** are to written in Same answer booklet **only.***

## PART- I

**Q.1 A) Rewrite the sentence after choosing correct answer from the given alternatives** **07**

1) Fluorescence is the emission of light by a substance that has ___ light
   a) Absorbed b) Emit
   c) Desorb d) Color

2) As the surface area changes the ____ of nanomaterials changes
   a) Properties b) Behavior
   c) Size d) Color

3) Luminescence is _____ of light by a substance not resulting from heat
   a) Volume b) Emission
   c) Excitation d) Size dependent

4) Thermoluminescence is a form of luminescence that is exhibited by certain___
   a) Intermolecular bonds b) Absorption
   c) Excitation d) Size dependent

5) Magnetism is a class of physical phenomena that are mediated by ____-
   a) Domain b) Magnetic field
   c) Spin of electron d) Temperature

6) Light emission from any form of matter after the absorption of photons called____
   a) Photoluminescence b) Chemiluminescence

c) Thermoluminescence d) Discoloration

7) Particle size is a notion introduced for comparing ____ of solid particles
   a) Dimension b) Intermolecular
   c) Volume d) Size

**Q.1 B) Definitions** **07**

1) Exciton
2) Quantum dots
3) Nanoceramics
4) Magnetic domain
5) Nanodisc
6) Dielectric
7) Fluorescence

## PART II

**Answer any four of the following:**

**1)** Explain the size dependent properties & surface to volume ratio behavior of nanomaterial **14**

**2)** What are quantum dots? Explain the optical properties of quantum dots **14**

**3)** Explain the non-leaner optical susceptibility and properties of nanomaterial **14**

**4)** What is random anisotropy? Describe magnetic materials **14**

**5) Write notes on any two:** **14**

1) Optoelectronics
2) Magnetocrystalline anisotropy
3) Stimulated Raman scattering

**6) Answer any two.** **14**

1) Quantum confinement of supper lattice
2) Nanocrystalline ceramics
3) Dielectric constant of nanoscale silicon

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**M.Sc. Nano-Technology (Semester – II) (New) (CBCS)**
**Examination, 2017**
**CARBON AND NANOFORMS OF CARBON**

Day & Date: Monday, 24-04-2017 Max. Marks: 70

Time: 10.30 AM to 01.00 PM

***N.B. :*** *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**.*

**PART I**

**Q.1 A) Rewrite the sentence after choosing correct answer from the given alternatives:** **07**

1) Graphite archaically referred to as plumbago, is a ____ form of carbon.
   a) Crystalline b) Semi crystalline
   c) Amorphous d) Agglomerated

2) Carbon nanotubes are allotrope of carbon having ____ nanostructure.
   a) Cylindrical b) Spherical
   c) Cubic d) Tube type

3) Nanotubes are members of the structural family ____
   a) Nanowire b) Nano cones
   c) Fullerene d) Nanoring

4) Activated carbon, also called as activated _____
   a) Charcoal b) Chocolate
   c) Coal d) Coal tar

5) CVD is a chemical process used to produce high quality, high-performance_____
   a) Solid materials b) Liquid materials
   c) Gas d) Semi solid materials

6) Pulsed laser deposition beam is focused inside a ____ chamber.
   a) Vacuum b) Inert c) Air d) Gas

7) Diamond-like carbon is a class of _____ material.
   a) Crystal carbon b) Amorphous carbon
   c) Semi crystal carbon d) Grapheme carbon

**Q.1 B) Define:** **07**

1) Diamond
2) Activated carbon
3) Carbon black
4) M WCNT.
5) Graphite.
6) Fibers.
7) CNF.

PART II

**Answer any four of the following:**

**Q.2** What is active carbon fiber? Explain its structure and give the uses. **14**

**Q.3** Write the different forms of carbon and write a note on “Diamond like carbon”. **14**

**Q.4** What are carbon nanomaterials? Explain the different types of carbon nanotubes. **14**

**Q.5** What is Arc discharge method? Explain the synthesis of carbon nanomaterials by this method. **14**

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

a. Pulsed laser deposition.
b. Diamond like carbon.
c. Structure of graphene.

**Q.7 Explain in detail about any two.** **14**

a. Carbon dots.
b. Arc discharge.
c. Opening of Fullerene Cage.

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## M.Sc. Nano-Technology(Semester – II) (New) (CBCS) Examination, 2017
## NANO-ELECTRONICS

Day & Date: Monday, 24-04-2017 Max. Marks: 70

Time: 10.30 AM to 01.00 PM

***N.B. :*** *1) part -**1, question 1iscompulsory.***
*2) Attempt **any four** questions from Part II.*
*3) Figures to the **right** indicate **full** marks.*
*4) Answers to the Part- 1 and Part –**II** are to written in Same answer booklet **only.***

**PART I**

**Q.1 A) Rewrite the sentence after choosing correct answer from the given alternatives** **07**

1) Molecular scale electronics is also called ____ molecule electronics.
   a) Single b) Double
   c) Three d) Four

2) Microelectromechanical system (MEMS) is the technology of _____ devices
   a) Microscopic b) Macroscopic
   c) Electroscopic d) None of these

3) An electrical insulator is a material whose internal electric charges ____ freely.
   a) Flow b) Do not flow
   c) Move d) Cross

4) A laser is a device that emits light through a process of optical amplification based on the stimulated emission of ____radiation.
   a) X-ray b) IR-ray
   c) Gama-ray d) Electromagnetic

5) Schottky junction is a ____ barrier for electrons formed at a metal-semiconductor junction.
   a) Voltage energy b) Current energy
   c) Potential energy d) Magnetic energy

6) A fuel cell is a device that converts the ____ from a fuel into electricity.
   a) Mechanical energy b) Chemical energy
   c) Physical energy d) Electro energy

7) Hybrid materials are _____ consisting of two constituents at the nanometer or molecular level.
   a) Ceramics  b) Composites
   c) Metals  d) Non-metal

**Q.1 B) Define/Explain the following in one word or one sentence.** **07**

1) Optical lithography
2) Semiconductor
3) MEMS
4) Optical amplifiers
5) LED
6) PN-Junction
7) Thermodynamics

## PART II

**Answer any four of the following**

**Q.2** What is meant by molecular electronics? Explain properties of molecular electronics. **14**

**Q.3** Give a detailed note on semiconductors and insulators. **14**

**Q.4** What is meant by laser? Explain in detail, the applications of LED. **14**

**Q.5** What is electron field emission? Explain in detail, applications of electron field emission. **14**

**Q.6** Write note on **any two** of the following. **14**

a. PN-Junction
b. Semiconductor
c. Carbon solar cell

**Q.7** Explain in detail on **any two** of the following. **14**

a. Thermodynamics of conversion of chemical energy into electrical energy
b. Design of fuel cell
c. Types of metal hybrids.