

**R6747**

**Sub. Code**

**533201**

**M.Sc. DEGREE EXAMINATION, APRIL – 2022**

**Second Semester**

**Nanoscience and Technology**

**SYNTHESIS OF NANOMATERIALS**

**(CBCS – 2019 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** questions.

1. Define pyrolysis.
2. What is sputtering yield?
3. What is the principle of electrochemical synthesis?
4. What is Brownian motion?
5. List out some of the characteristics of an ideal hydrothermal autoclave.
6. What is forced hydrolysis?
7. What are the types of balls used in ball milling process?
8. List some of the advantages of mechanical methods.
9. Discuss the limitations biological synthesis method.
10. Differentiate DNA from RNA.

**Part B**

(5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Describe the Arc discharge method for the preparation of nanosized materials.

Or

- (b) Explain the principle and processes of RF sputtering method for the preparation of nanostructured thin films.

12. (a) Describe the kinetics of sol-gel process.

Or

- (b) With suitable examples, explain the growth of metal and semiconductor nanoparticles by colloidal precipitation method.

13. (a) How will you synthesis carbon nanotubes using hydrothermal route?

Or

- (b) Explain the formation of quantum dots by Schelnk synthesis method.

14. (a) Write a short note on melt quenching and annealing processes.

Or

- (b) Describe the severe plastic deformation process for the formation of nanostructure materials.

15. (a) Describe the phyto-synthesis method with suitable examples.

Or

- (b) Explain with suitable examples the mycosynthesis of nanoparticles.

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. Describe the e-beam evaporation and microwave plasma evaporation methods for nanomaterials preparation.
17. With neat sketches explain sonochemical and combustion techniques for the preparation of nanoparticles.
18. Elucidate the process involved in the preparation of nanotubes, nanorods, nanoflowers and nanocrystals of inorganic materials via hydrothermal method.
19. With suitable examples and illustrations explain high energy ball milling process for the preparation of nanomaterials.
20. Describe the following with suitable examples :
  - (a) Protein based nanostructure formation
  - (b) DNA-template based nanostructure formation.

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**R6748**

**Sub. Code**

**533202**

**M.Sc. DEGREE EXAMINATION, APRIL – 2022**

**Second Semester**

**Nanoscience and Technology**

**CHARACTERIZATIONS OF NANOMATERIALS**

**(CBCS – 2019 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** questions.

1. Define Hardness.
2. What is superplasticity?
3. Distinguish between resistivity and resistance.
4. Explain grain boundary capacitance with suitable example.
5. Explain the principle of Raman spectroscopy.
6. What is an interferogram?
7. What is chemical shift in NMR spectroscopy?
8. List the applications of ESR spectroscopy.
9. Write and explain Stokes-Einstein equation.
10. Give the principle of Chronoamperometry.

**Part B**

(5 × 5 = 25)

Answer **all** the questions choosing either (a) or (b).

11. (a) How do you determine mechanical properties of nanomaterials by nanoindentation method?

Or

- (b) Give a brief account on adhesion and friction properties of nanoparticles.

12. (a) Discuss the dc electrical conductivity properties of nanomaterials as a function of temperature.

Or

- (b) Briefly explain impedance spectroscopy for characterizing electrical properties of nanomaterials.

13. (a) Describe in detail about the principle and process of X-ray diffraction technique with neat sketch.

Or

- (b) Explain the importance of XPS data to characterize the nanomaterials.

14. (a) Discuss in detail the Mossbauer spectroscopy of Fe and Sn containing nanomaterials.

Or

- (b) Describe the working of Vibrating sample magnetometer with a suitable block diagram.

15. (a) Explain the principle and working of Galvanostatic charge-discharge method.

Or

- (b) Describe Chronopotentiometry with suitable diagrams.

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. (a) Give a brief account on fatigue and fracture toughness of nanomaterials.  
(b) Discuss in detail about the plastic deformation behaviour of nanomaterials.
  17. What is Hall effect? With necessary diagrams, explain the experimental determination of electrical properties of nanomaterial by Hall effect measurement.
  18. Explain the function of an atomic force microscope with the help of a well labeled diagram.
  19. Describe the nuclear magnetic resonance (NMR) spectroscopy with neat sketches and discuss the various applications of NMR methods.
  20. Describe the Cyclic-Voltammetric techniques with suitable diagrams.
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**R6749**

**Sub. Code**

**533203**

**M.Sc. DEGREE EXAMINATION, APRIL – 2022**

**Second Semester**

**Nanoscience and Technology**

**APPLICATIONS OF NANOMATERIALS**

**(CBCS – 2019 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** the questions.

1. Draw and label the MEMS device.
2. Explain the basic principle of dye sensitized solar cells.
3. Write a short note on targeted drug delivery.
4. What is hyperthermia?
5. Mention name of any four nanomaterials used for catalysis applications.
6. What are ceramic valves?
7. What is nanotoxicology?
8. Explain the principle of DNA sensor.
9. What are dendrimers?
10. What is self-assembly?

**Part B**

(5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) With a neat sketch explain photolithography process.

Or

- (b) Discuss in detail about CMOS technology.

12. (a) Write a short essay on nanomaterials based high energy density batteries.

Or

- (b) Explain in detail the role magnetic nanoparticles in biological applications.

13. (a) Enumerate the applications of nanomaterials in aerospace.

Or

- (b) Discuss in detail the role of hydroxyapatite in dental and bone substitutes applications.

14. (a) Give a brief account on the applications of nanotechnology in textile and leather industries.

Or

- (b) With suitable diagram, explain the principle and operation of nanomaterial based varistor.

15. (a) Write a short note on nanobiosensor.

Or

- (b) Discuss in detail the role of nanoparticle in targeted cancer therapy applications.



**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. Describe the following devices with suitable schematics.
  - (a) CNT based MOSFET
  - (b) Low cost flat panel displays.
17. Explain the characteristics of soft and hard magnets and discuss their applications in high speed and high density memories.
18. Narrate the applications of nanomaterials in water, blood and air purification process.
19. Describe the principle and operations of the following with suitable diagram.
  - (a) Gas sensor
  - (b) Lightning arrestor.
20.
  - (a) Write about bio-functionalization of CNTs and their biological applications.
  - (b) What is tissue culture? Discuss the role of nanomaterials in tissue culture applications.

**R6750**

**Sub. Code**

**533508**

**M.Sc. DEGREE EXAMINATION, APRIL – 2022**

**Fourth Semester**

**Nanoscience And Technology**

**NANOTOXICOLOGY**

**(CBCS – 2019 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** questions.

1. What is aero gel?
2. What is Nanomaterials used for?
3. What is cell interaction?
4. Definition of Oxidative stress?
5. What are examples of Nanomaterials?
6. What is the function of a biological membrane?
7. What are the disadvantages of nanotoxicity?
8. What is in vitro test?
9. What is the important protocol?
10. What are the functions of protocols?

**Part B**

(5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Difference between natural source and anthropogenic source?

Or

- (b) Explain about the Nano pollution?

12. (a) Write the short note on physicochemistry?

Or

- (b) Explain detail about the reactive oxygen species mediated toxicity?

13. (a) Details about the energy routes into the human body?

Or

- (b) Describe the translocation of Nanoparticle in liver?

14. (a) Write the note exposure via GI tract and skin?

Or

- (b) Write the note on Exposure via GI tract and spleen?

15. (a) Explain about portals of entry and target tissue?

Or

- (b) Explain detail about Risk assessment and execution?

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. Difference between natural source and anthropogenic source occupational exposure?
  17. Write the briefly interaction of Nanoparticle with cells and their cellular nanotoxicity?
  18. Explain detail about studies of natural translocation to the circulatory and lymphatic system?
  19. Write the briefly methodology for nanotechnology? Advantage and disadvantage?
  20. Explain detail about development of test protocols for Nanomaterials and their uses?
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