R1043

Sub. Code
533201

M.Sc. DEGREE EXAMINATION, APRIL – 2024

Second Semester

Nanoscience and Technology

SYNTHESIS OF NANOMATERIALS

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective-type questions by choosing the correct option

1. The energy of an electron is upto ———— in electron beam heating. (CO1, K1)

   (a) 15eV

   (b) 15keV

   (c) 30eV

   (d) 30keV

2. ———— involves depositing successive layers of different substances to produce layered, crystalline films. (CO1, K1)

   (a) Atomic layer chemical vapour deposition

   (b) Combustion chemical vapour deposition

   (c) Low-pressure chemical vapour deposition

   (d) Plasma-enhanced chemical vapour deposition

3. The sol-gel is a ———— of solid particle. (CO2, K2)

(a) Sublimation

(b) Melting

(c) Colloidal suspension

(d) Cool down

4. ———— undergo hydrolysis and poly condensation reactions. (CO2, K2)

(a) Metal ions

(b) Metal carbonates

(c) Metal nitrates

(d) Metal oxides

5. Which one of the following neurotoxic effects comes under carbon nanotubes? (CO3, K2)

(a) Lipid peroxidization

(b) Apoptosis

(c) Both (a) and (b)

(d) None of the above

6. Which one of the following is an example of molecular nanowires? (CO3, K2)

(a) DNA

(b) Silicon dioxide

(c) Titanium dioxide

(d) None of the above

7. What kind of metals are used for milling operations? (CO4, K4)

(a) Soft and brittle

(b) Soft and elastic

(c) Hard and brittle

(d) Hard and elastic

8. For milling operations, what kind of environment is preferred? (CO4, K4)

(a) Acidic

(b) Basic

(c) Active

(d) Inert

9. The presence of phenol derivatives and ———— is essential for biological effects. (CO5, K3)

(a) Tannins

(b) Quinones

(c) Flavonoids

(d) Saponins

10. Green synthesis is affected by all of these except ———— (CO5, K3)

(a) Particle size

(b) Temperature

(c) Intensity of light

(d) pH

Part B (5 × 5 = 25)

Answer **all** questions not more than 500 words each.

11. (a) Write a short note on laser pyrolysis. (CO1, K1)

Or

(b) Describe electron beam evaporation and the parameters involved in optimizing the thickness. (CO1, K1)

12. (a) Differentiate between Sintering with Ostwald ripening. (CO2, K2)

Or

(b) Describe the synthesis of nanomaterials by colloidal precipitation with example. (CO2, K2)

13. (a) How will you group the Nanostructure Materials based on growth media? Illustrate. (CO3, K2)

Or

(b) Give a short note on Nanocrystals. (CO3, K2)

14. (a) What is melt quenching? (CO4, K4)

Or

(b) Write briefly about high-energy ball milling. (CO4, K4)

15. (a) What is green synthesis? Describe the various biological ingredients for synthesis of nanomaterials. (CO5, K3)

Or

(b) Write a short note on protein-based nanostructure formation. (CO5, K3)

Part C (5 × 8 = 40)

Answer **all** questions not more than 1000 words each.

16. (a) Explain the principle of dc sputtering with a neat sketch. How does the RF sputtering differ from dc sputtering? (CO1, K1)

Or

(b) Explain the steps of synthesis of nanomaterials by spray pyrolysis process. (CO1, K1)

17. (a) Discuss the main steps of sol-gel process. Explain how acid catalyst helps to increase the rate the hydrolysis in sol-gel process. (CO2, K2)

Or

(b) Describe the principle and experimental setup of the electrochemical deposition method. (CO2, K2)

18. (a) Discuss in detail the preparation, properties, and applications of quantum dots. (CO3, K2)

Or

(b) What are methods we can use for the synthesis of ZnS nanostructures? Add a note on the advantages, disadvantages, and applications of ZnS nanostructures. (CO3, K2)

19. (a) Explain the principle of the Planetary Mill. Compare the variation in product nature by different milling techniques. (CO4, K4)

Or

(b) How high energy ball milling is used to synthesize nanomaterials and discuss the limitations in getting the required grain size. (CO4, K4)

20. (a) Write a short note on Magnetotactic bacteria for natural synthesis of magnetic nanoparticles. Mention their applications. (CO5, K3)

Or

(b) Describe the steps involved in the synthesis of nanoparticles by making use of bacteria. (CO5, K3)

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R1044

Sub. Code
533202

M.Sc. DEGREE EXAMINATION, APRIL – 2024

Second Semester

Nanoscience and Technology

CHARACTERIZATION OF NANOMATERIALS

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. Stress in a solid body is defined as ———— per unit area. (CO1, K1)
   (a) external force applied
   (b) strain
   (c) pressure
   (d) internal forces developed due to externally applied forces

2. Which one of the following is not a unit of Young's modulus? (CO1, K1)
   (a) Nm-1 (b) Nm-2
   (c) dyne cm-2 (d) mega pascal

3. By increasing the temperature, the specific resistance of a conductor and semiconductor (CO2, K2)
   (a) Increases for both
   (b) Decreases for both
   (c) Increases for a conductor and Decreases for a semiconductor
   (d) Decreases for a conductor and Increases for a semiconductor

4. The semiconductors have resistivity ————————. (CO2, K2)

(a) Between conductor and insulator

(b) More than insulators

(c) Less than conductors

(d) Cannot be determined

5. X-rays are generated by (CO3, K2)

(a) Geiger tube (b) Goniometer

(c) Coolidge tube (d) Rotameter

6. Electron Microscope can give a magnification up to (CO3, K2)

(a) 400,000X (b) 100,000X

(c) 15000X (d) 100X

7. A suitable material for audio and TV transformers is ————————. (CO4, K3)

(a) Ferrite (b) Fe- 4% Si

(c) Fe-30% Ni (d) Very pure Fe

8. The transition from the ferromagnetic to the paramagnetic state is named (CO4, K3)

(a) Neel (b) Curie

(c) Curie-Weiss (d) Debye

9. Which of the following factors does not affect the electrode potential of an electrode? (CO5, K4)

(a) Nature of the electrode (metal)

(b) Temperature of the solution

(c) Molarity of the solution

(d) Size of the electrode

10. What is the direction of flow of electrons in an electrolytic cell? (CO5, K4)

(a) Anode to cathode externally

(b) Anode to cathode internally

(c) Cathode to anode externally

(d) Cathode to anode in the solution

Part B ($5 \times 5 = 25$)

Answer **all** the questions not more than 500 words each.

11. (a) Write a short note on Nanoindentation. (CO1, K1)

Or

(b) Describe plastic nature of nanoceramics. (CO1, K1)

12. (a) Explain electrical conductivity as a function of temperature. (CO2, K2)

Or

(b) Describe the types of charge carriers. (CO2, K2)

13. (a) Explain the principle of Photoluminescence spectroscopy. (CO3, K2)

Or

(b) Differentiate FTIR and Raman spectroscopy. (CO3, K2)

14. (a) What is dia, para, and ferro magnetism? (CO4, K3)

Or

(b) Write briefly about the principle of ESR spectroscopy. (CO4, K3)

15. (a) What is ion-ion interaction in an electrochemical cell? (CO5, K4)

Or

(b) Write a shop note on cyclic voltammetry. (CO5, K4)

Part C (5 × 8 = 40)

Answer **all** questions not more than 1000 words each.

16. (a) Explain hardness and elasticity of nanomaterials. (CO1, K1)

Or

(b) Give a detailed description of abrasion and wear resistance. (CO1, K1)

17. (a) Explain the hall effect and determine the hall voltage. (CO2, K2)

Or

(b) Describe the principle and experimental setup for the electrical characterization of nanometerials. (CO2, K2)

18. (a) Discuss in detail the principle, working and applications of X-ray diffraction. (CO3, K2)

Or

(b) Compare SEM and TEM and explain the working principle of SEM with a neat diagram. (CO3, K2)

19. (a) Explain the principle and working of VSM. (CO4, K3)

Or

(b) Write briefly about the principle, working and applications of Nuclear magnetic resonance spectroscopy. (CO4, K3)

20. (a) Derive the Butler-Volmer equation in determining the kinetics of electrode reactions. (CO5, K4)

Or

(b) Describe the principle of electrochemical impedance spectroscopy and explain Nyquist plot. (CO5, K4)

———————

R1045	Sub. Code
	533203

M.Sc. DEGREE EXAMINATION, APRIL 2024.

Second Semester

Nanoscience and Technology

APPLICATION OF NANOMATERIALS

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. Choose the correct order of increasing minimum size of feature obtained in photolithography by different lights (CO1, K1)

   (a) UV light> X-Rays> Blue Light > Red Light

   (b) UV light

   (c) X-Rays> UV tight> Blue Light > Red Light

   (d) X-Rays < UV light <Blue Light <Red Light

2. Which of the following is true for photo lithography photoresist- PR (CO1, K1)

   (a) Negative PR is hardened by UV Radiation

   (b) UV Radiations soften Negative PR

   (c) Positive Photoresist is hardened by UV Radiation

   (d) Both Positive and Negative PR works in same way

3. Which of the following describes a natural magnet? (CO2, K2)

(a) A bar magnet

(b) Horse - shoe magnet

(c) Magnetite of Lodestone

(d) More than one of the above

4. For a magnet, a domain refers to _____. (CO2, K2)

(a) the region between the poles of the magnet

(b) the space around the magnet that is affected by the magnetic field.

(c) the region within the magnet in which the magnetic poles of individual atoms are aligned.

(d) the region from which the magnetic material is mined.

5. Which of the following are the advantages of Nano-composite materials? (CO3, K2)

(a) Decreased thermal expansion coefficients.

(b) Reduced gas permeability

(c) Increased solvent resistance.

(d) All the above

6. Bone mineral is modified (CO3, K2)

(a) Calcium

(b) Hydroxyapatites

(c) Collagen

(d) Ossein

7. Bacterial assemblage can help in the degradation of ———————— (CO4, K2)

(a) alcohol (b) carbonic acid

(c) water (d) organic pollutants

8. Which of the following factors is not used to determine the response of aquatic environment water and sediment biota to pollutants? (CO4, K2)

(a) Altered growth rate

(b) Fermentation

(c) Physiological activity at cellular level

(d) Physiological activity at organism level

9. Lower limits of detection by sensors is important. Which method of detection is more sensitive than glass electrode used for pH measurement? (CO5, K4)

(a) Absorption spectroscopy

(b) Refractive index

(c) Circular dichroism

(d) Fluorescence spectroscopy

10. Poly (vinyl alcohol) (PVA) is a derivative of ———————— (CO5, K4)

(a) Poly (vinyl acetate)

(b) Collagen

(c) Poly (lactic acid)

(d) Polythene

Part B (5 × 5 = 25)

Answer **all** questions not more than 500 words each.

11. (a) Explain Molecular electronics and Nano electronics (CO1, K2)

Or

(b) Brief about CNT based MOSFET (CO1, K2)

12. (a) Difference between Soft and hard magnet.(CO2, K2)

Or

(b) Explain high-energy-density batteries using hard magnets (CO2, K2)

13. (a) How nanocomposites are used for the purification of water. (CO3, K3)

Or

(b) Explain nanoceramics used for aerospace applications (CO3, K3)

14. (a) Describe nanotechnology application for removal of bacteria and microbes (CO4, K4)

Or

(b) Write about gas sensors. (CO4, K4)

15. (a) What is meant by artificial scaffolds? (CO5, K4)

Or

(b) Write a short note on Prosthetic and medical implants (CO5, K4)

Part C (5 × 8 = 40)

Answer **all** questions not more than 1000 words each.

16. (a) Give an elaborate on photolithography and its working mechanism. (CO1, K2)

Or

(b) Explain MEMS and NEMS Technology (CO1, K2)

17. (a) Explain in detail about soft magnets for high-speed memories. (CO2, K3)

Or

(b) Describe High power magnets and its biological applications. (CO2, K3)

18. (a) Illustrate the nanocomposites used for the purification of water, blood, and Air. (CO3, K4)

Or

(b) Explain the role of nanoceramics for tooth and bone substitutes. (CO3, K4)

19. (a) Describe the nanotechnology-based detoxification of organic pollutants from textile and leather industries. (CO4, K3)

Or

(b) Write essay and Applications of gas sensors. (CO4, K3)

20. (a) Explain the key concept of biomedical applications of nanomaterials. (CO5, K3)

Or

(b) Write a detail about the artificial scaffolds. (CO5, K3)

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R1046

Sub. Code
533503

M.Sc. DEGREE EXAMINATION, APRIL – 2024

Second Semester

Nanoscience and Technology

Elective – INFORMATION STORAGE MATERIALS AND DEVICES

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer the following objective type questions by choosing the correct option.

1. ———————— made of an alloy of iron and nickel are being used to create dense memory devices. (CO1, K1)

   (a) Conducting nanowires

   (b) Magnetic nanowires

   (c) Dielectric nanowires

   (d) Insulating nanowires

2. ———————— is a type of computer storage media that stores data electronically and has no moving parts. (CO1, K1)

   (a) Optical storage

   (b) Magnet storage

   (c) Solid-state storage

   (d) None of the above

3. A _____ disk consists of a circular disk, which is coated with a thin metal or some other material that is highly reflective. (CO2, K2)

(a) Magnetic

(b) Optical

(c) Compact

(d) Hard

4. Which of the following is not a type of optical disk? (CO2, K2)

(a) DVD

(b) CD

(c) WORM

(d) Winchester

5. Basic source of magnetism ————————. (CO3, K2)

(a) Charged particles alone

(b) Movement of charged particles

(c) Magnetic dipoles

(d) Magnetic domains

6. Example for ferro-magnetic materials (CO3, K2)

(a) Super conductors

(b) Alkali metals

(c) Transition metals

(d) Ferrites

7. ———————— are based on the phenomenon of anisotropic magneto resistance first, discovered by Lord Kelvin in 1856. (CO4, K5)

(a) AMR heads

(b) Write heads

(c) GMR heads

(d) Super paramagnetic limit

8. GMR heads are more sensitive than AMR heads. (CO4, K5)

(a) True

(b) False

9. Quantum information is information stored in very small structures called ————————. (CO5, K4)

(a) Kilobytes

(b) Megabits

(c) Qubits

(d) Bits

10. ———————— is a form of non-volatile storage that operates by changing the resistance of a specially formulated solid dielectric material. (CO5, K4)

(a) CRAM

(b) RRAM

(c) FeRAM

(d) DRAM

Part B (5 × 5 = 25)

Answer **all** questions not more than 500 words each.

11. (a) Define optical memory. (CO1, K1)

Or

(b) List the role of nanotechnology in data storage. (CO1, K1)

12. (a) Explain the write and read techniques. (CO2, K2)

Or

(b) Illustrate the key components for optical pickups heads. (CO2, K2)

13. (a) Compare the ferromagnetic and anti-ferromagnetic material. (CO3, K2)

Or

(b) Explain the magnetic hysteresis. (CO3, K2)

14. (a) Evaluate the GMR effect in Magnetic media. (CO4, K5)

Or

(b) Compare the AMR and GMR head. (CO4, K5)

15. (a) Write any two categories of spin and phase change-based memories. (CO5, K4)

Or

(b) Distinguish between the molecular and atomic memory. (CO5, K4)

Part C (5 × 8 = 40)

Answer **all** questions not more than 1000 words each.

16. (a) Describe the different types of information technology. (CO1, K1)

Or

(b) Explain the essential principles of semiconductor device and electron transport properties. (CO1, K1)

17. (a) Classify the principles of read and write in optical data storage. (CO2, K2)

Or

(b) Write brief about Write and read techniques, optical pickup heads. (CO2, K2)

18. (a) Describe the basics of magnetism for magnetic data storage. (CO3, K2)

Or

(b) Illustrate the types of magnetic material and super Para magnetism. (CO3, K2)

19. (a) Evaluate the basics of quantum structures and their application in magnetic media storage. (CO4, K5)

Or

(b) Explain about the thin film technology and Superparamagnetic limit. (CO4, K5)

20. (a) Explain the various categories of spin and phase change-based memories. (CO5, K4)

Or

(b) Write a short note on probe storage, molecular, atomic memory, and quantum information storage. (CO5, K4)

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R1047

Sub. Code
533401

M.Sc. DEGREE EXAMINATION, APRIL – 2024

Fourth Semester

Nanoscience and Technology

NANOTOXICOLOGY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. ———————— is the process of overgrowth of plants and algae in lakes. (CO1, K1)

   (a) Photosynthesis (b) Eutrophication

   (c) Reproduction (d) Transpiration

2. Which of the following materials is bio-degradable? (CO1, K1)

   (a) Glass bottle (b) Wool

   (c) Aluminum foil (d) All the above

3. Which one of the following insecticides is an organophosphorus compound? (CO2, K2)

   (a) Endrin (b) DDT

   (c) BHC (d) Malathion

4. ———————— is a blistering war gas. (CO2, K2)

   (a) Chlorine gas (b) Mustard gas

   (c) HCN gas (d) Tabun

5. Toxicity of nanomaterials is not primarily dependent on (CO3, K2)

(a) Surface chemistry

(b) Particle size and shape

(c) Thermal conductivity

(d) Surface area

6. What is the best way to clean up a small nanoparticle spill on the floor? (CO3, K2)

(a) Swiping

(b) Wet towel cleaning

(c) Washing with water

(d) Dusting and vacuuming

7. ———————— refers to an estimate of the amount of poison that, under control conditions, will be a lethal dose to 50% of many test animals of a particular species. (CO4, K5)

(a) LD80 (b) TD50

(c) LD50 (d) MD80

8. ———————— is a multidisciplinary field that studies the effects of toxic chemicals on biological organisms. (CO4, K5)

(a) Ecotoxicology (b) Nanotoxicology

(c) Genotoxicity (d) Mutagenicity

9. Nano pharmacology involves using nanoparticles to improve ———————— of drugs to their target site. (CO5, K3)

(a) Pharmacokinetics

(b) Proximity

(c) Phenotypic measures

(d) None of the above

10. The father of nanotechnology is (CO5, K3)

(a) Richard Feynman (b) Bose

(c) Albert Einstein (d) Galileo

Part B ($5 \times 5 = 25$)

Answer **all** questions not more than 500 words each.

11. (a) Explain Nano pollution. (CO1, K1)

Or

(b) Brief about physiochemical characteristics of nanomaterials. (CO1, K1)

12. (a) Describe Cellular Nanotoxicology. (CO2, K2)

Or

(b) Explain genotoxicity and immunotoxicity. (CO2, K2)

13. (a) How neuronal translocation from UFPs from respiratory tract? (CO3, K2)

Or

(b) Explain translocation of NSPs in the spleen. (CO3, K2)

14. (a) Describe methods of Nanotoxicology. (CO4, K5)

Or

(b) Write about LD50 and LD90 determination. (CO4, K5)

15. (a) What is meant by Inhaled nanoparticle dosimetry? (CO5, K3)

Or

(b) Write a short note on test protocols for nanomaterials. (CO5, K3)

Part C (5 × 8 = 40)

Answer **all** questions not more than 1000 words each.

16. (a) Give an elaborate on diverse dimensions of nanomaterials and its interaction with the environment. (CO1, K1)

Or

(b) Explain nanomaterials impact in environmental pollution. (CO1, K1)

17. (a) Explain in detail about cellular toxicology and Reactive oxygen species mediated toxicity. (CO2, K2)

Or

(b) Describe the mode of cellular entry of nanoparticles and its mechanism of action. (CO2, K2)

18. (a) Illustrate the Toxic effect of nanomaterials to human health. (CO3, K2)

Or

(b) Explain the properties of nanomaterials with their transport, uptake, reactivity, and toxicity in human system. (CO3, K2)

19. (a) Describe the Leo toxicologic studies and Methodology for nanotoxicology. (CO4, K5)

Or

(b) Write essay about In vivo toxicity testing. (CO4, K5)

20. (a) Explain the ethical, legal and social implication, developments of test protocols for Nanotechnology. (CO5, K3)

Or

(b) Write a detail about the information on ethics laws and regulation of nanomaterials. (CO5, K3)

———————