# MUTHAYAMMAL ENGINEERING COLLEGE

(An Autonomous Institution)

(Approved by AICTE, New Delhi, Accredited by NAAC & Affiliated to Anna University)

Rasipuram - 637 408, Namakkal Dist., Tamil Nadu


## Department of Physics

## Question Bank - Academic Year (2021-22)

**Course Code & Course Name : 21BSS03 & Bio and Nanomaterial Sciences**

### UNIT I BIOMATERIALS AND ITS APPLICATIONS

**Part-A (2 Marks)**

1. What are biomaterials?
2. Define biocompatibility.
3. What are the classifications of implant materials?
4. Give the examples of metallic implant materials with their applications.
5. Give the examples of ceramic implant materials with their applications.
6. Give the examples of polymeric implant materials with their applications.
7. Give the examples of composite implant materials with their applications.
8. Define shape memory alloys.
9. Define the austenite and martensite phases of SMA.
10. What is pseudo elasticity?

**Part-B (16 Marks)**

1. (i) Explain the properties and applications of shape memory alloys.(10)
   (ii) Write a short note on psedoelasticity
2. (i) Explain the various properties of NiTi alloy with their medical applications.(12)
   (ii) Write a short note on bio compatibility (4)
3. (i) Explain the preparation, properties and applications of alumina.(10)
   (ii) What are the materials used in the manufacture of contact lenses (6)
4. (i) Write a short note on classification of polymers.(8)
   (ii) Explain the applications of NiTinol (8)
5. (i) Explain the construction and working of heart and lung machine with its block diagram. (16)

## UNIT II INTRODUCTION TO NANOTECHNOLOGY

### Part-A (2 Marks)

1. Define Nanotechnology?
2. List out the Applications of Nanotechnology in electronics.
3. Write a short note on Nanomedicines
4. Define surface to volume ratio
5. What are the properties of nanomaterial?
6. Write different modes of classification of Nanotechnology.
7. List out challenges faced by Nanotechnology.
8. Define one dimensional nanomaterials
9. Define two dimensional nanomaterials
10. Define three dimensional nanomaterials

### Part-B (16 Marks)

1. (i) Explain the theory of Nanotechnology with example(10)
   (ii) Write a short note on surface volume ratio (6)
2. (i) Detail explanation about the classification Nanotechnology.(12)
   (ii) Write a short note on 0D nano materials (4)
3. Explain the applications of Nanotechnolgy in different field (16)
4. (i) Explain in detail Electrical, magnetic, optical, thermal, and mechanical properties of nano materials.(10)
   (ii) Write a short note on applications of Nano technology in Medicine (6)
5. Explain the classification of nanomaterials based on their dimension (16)

## UNIT III SYNTHESIS OF NANO MATERIALS

### Part-A (2 Marks)

1. What are nanomaterials?
2. What is top- down approach in nanotechnology?
3. What is bottom up approach in nanotechnology?
4. Distinguish between top down and bottom up process.
5. Mention the different types of synthesis of nanomaterials
6. Write the advantages of CVD.
7. Principle of Electro deposition techniques?
8. Write the principle of pulse laser deposition.

9. Name any three methods employed to produce nanophase materials.
10. Explain the importance of mechanical properties of Nanophase materials?

**Part-B (16 Marks)**

1. (i) Describe the construction, working and advantages of pulsed laser deposition method.(10)
   (ii) Write a short note on bottom up process(6)
2. (i) Define Chemical vapour depositin. Explain the construction, working and applications.(10)
   (ii) Write a short note on Top down process (6)
3. (i) Explain the construction, working electrodeposition method to prepare nanocoatings.(8)
   (ii) Describe electron beam lithography (8)
4. (i) Explain the Ball Milling technique for the preparation of nano particles.(10)
   (ii) Differentiate top-down process from bottom up process (6)
5. Explain the Properties and applications of Nanomaterials in different field(8+8)

## UNIT IV CHARACTERIZATION OF NANOMATERIALS

**Part-A (2 Marks)**

1. What is meant by Characterization on materials?
2. Mention the types of characterization of materials.
3. What is structural analysis of a material.
4. Give the importance of surface analysis of a material.
5. Differentiate the electron microscope from optical microscope.
6. What is the principle used in SEM.
7. What are the advantages of TEM.
8. Write the principle of Raman spectrometer?
9. What are the applications of DSC?
10. Write a short notes on Atomic force microscope.

**Part-B (16 Marks)**

1. (i) Explain the principle and working of X-ray diffractometer.(10)
   (ii) What are the application of diffractometer.(6)
2. (i) Explain the working of Raman spectrometer.(10)
   (ii) What are the advantages of electron microscope? (6)
3. Explain the principle,contruction and working of scanning electron microscope.(16)
4. Explain the principle,construction,working and advantages of TEM.(16)
5. (i) Explain the analysis technique involved in Atomic Force Microscope.(8)
   (ii) Write a short note on differential scanning caloriemetry.(8)

## UNIT V CARBON NANO MATERIALS

### Part-A (2 Marks)

1. What do you mean by bonding in carbon structures?
2. What is the classification of carbon nanotube?
3. Mention some properties of carbon nanotubes
4. Give any three applications of CNTs
5. What are the different structures of CNT?
6. How carbon forms bond?
7. Explain single walled carbon nanotube?
8. What is mean by Russian doll model?
9. Explain Parchment model.
10. Mention the advantages of Chemical Vapour Deposition (CVD) technology in the synthesis of CNTs

### Part-B (16 Marks)

1. (i) Explain the different types of Carbon nano tubes based on their structure (10)
   (ii) Write a short note on bonding in carbon structure (6)
2. (i) Differentiate SWCNT from MWCNT with their structure.(10)
   (ii) What are the advantages of chemical vapour deposition method (6)
3. Explain the construction, working of arc discharge method with neat diagram and also mention the advantages.(16)
4. Discuss the preparation of CNTs using chemical vapour deposition method with neat diagram.(16)
5. Briefly explain the various properties and applications of CNTs in different fields (8+8)

**Course Faculty** **HOD**