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Printed Page:-4 **Subject Code:- ABT0603**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)
B.Tech
SEM: VI - THEORY EXAMINATION (2025 - 2026)
Subject: Nanobiotechnology

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* ***three Sections -A, B, & C.*** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION-A 20

1. Attempt all parts:-

(1.1) The most important property of nanomaterials is (CO1, K1) 1

(a) force
(b) friction
(c) pressure
(d) temperature

(1.2) The hardest material found in nature is _____. (CO1, K1) 1

(a) steel
(b) topaz
(c) diamond
(d) quartz

(1.3) Endoherdral functionalization present in ---- (CO2, K1) 1

(a) Nanoparticles putting inside th CNTs
(b) Nanoparticles surface attached
(c) Without nanoparticles
(d) All the above

(1.4) Biological synthesis of NPs is called ------. (CO2, K1) 1

(a) Chemical synthesis
(b) Physical synthesis
(c) Green synthesis
(d) White synthesis

(1.5) Positive deviation from Beer's law is due to (CO3, K1) 1

(a) Absorption of stray radiation
(b) Non absorption of stray radiation
(c) It does not depend on stray radiation
(d) None of the above

(1.6) Absorption spectra is a plot of (CO3, K1) 1

(a) Absorbance Vs Concentration
(b) Absorbance Vs wavelength
(c) % T Vs Wavelength
(d) % T Vs Concentration

(1.7) Which term is used for a flexible tube that drains fluid from the body? (CO4, K1) 1

(a) Stent
(b) Pump
(c) Cannula
(d) Balloon

(1.8) Which of the following polymers of glucose is stored by animals? (CO4, K1) 1

(a) Cellulose
(b) Amylose
(c) Amylopectin
(d) Glycogen

(1.9) The magnetic biosensors are type of _____ based sensors? (CO5, K1) 1

(a) Nanoparticle
(b) Nanowire
(c) Nanotube
(d) None of the above

(1.10) Which one of the following is a biological material? (CO5, K1) 1

(a) Antibodies
(b) Amperometric electrodes
(c) Potentiometric electrodes
(d) Both a and b

2. Attempt all parts:-

(2.1) Write the two name of substrate materials used in microfabrication. (CO1, K2) 2

(2.2) Write the name of capping agents in the synthesis of AgNPs. (CO2, K2) 2

(2.3) What is TEM used for? (CO3, K2) 2

(2.4) Define the term of Ophthalmic solution. (CO4, K2) 2

(2.5) What are dendrimers used for? (CO5, K2) 2

SECTION-B 30

Answer any one of the following:-

(3.1) Outline the fundamental nanofabrication steps required to manufacture a semiconductor memory chip. (CO1, K2) 6

(3.2) Construct a detailed visual matrix or graphic that illustrates the physical scale 6

differences between macro, micro, and nano-dimensional objects. (CO1, K2)

Answer any one of the following:-

(3.3) Distinguish between carbon nanotubes (CNTs) and buckyballs based on their structural morphology, geometric shapes, and hybridization states. (CO2, K3) 6

(3.4) Explain the thermal, electrical, and mechanical properties of Carbon Nanotubes (CNTs) that make them highly versatile nanomaterials. (CO2, K3) 6

Answer any one of the following:-

(3.5) Analyze which chemical properties, molecular functional groups, and structural bonds can be identified using Fourier-Transform Infrared (FTIR) spectroscopy. (CO3, K4) 6

(3.6) Compare photoluminescence and chemiluminescence mechanisms, providing two practical real-world examples for each optical phenomenon. (CO3, K4) 6

Answer any one of the following:-

(3.7) Explain the concept of biomaterials. Appraise their biomedical applications by highlighting two major clinical uses. (CO4, K5) 6

(3.8) Critically appraise the clinical efficacy, structural stability, and biocompatibility of primary synthetic versus natural polymer families used as modern functional biomaterials. (CO4, K5) 6

Answer any one of the following:-

(3.9) Demonstrate the dynamic working mechanism of a functional nanobiosensor specifically engineered for continuous glucose monitoring. (CO5, K3) 6

(3.10) Explain the core signal transduction principle of a nanobiosensor and illustrate how it optimizes targeted crop and soil monitoring in agriculture. (CO5, K3) 6

SECTION-C 50

4. Answer any one of the following:-

(4.1) Critically analyze how coating traditional medical implants with gold nanorods improves their overall biocompatibility and integration. (CO1, K3) 10

(4.2) Categorize the various types of nanomaterials utilized in the cosmetics industry and explain the active mechanisms behind their application. (CO1, K3) 10

5. Answer any one of the following:-

(5.1) Describe the biological synthesis of silver nanoparticles. Justify that silver and gold nanoparticles have good antimicrobial materials against pathogenic bacteria? (CO2, K3) 10

(5.2) Write the key points of biological and chemical synthesis of metal nanoparticles. Draw a comparative table. (CO2, K3) 10

6. Answer any one of the following:-

(6.1) How does AFM work? What are various modes of operations of AFM? Discuss each mode with advantages and disadvantages of AFM modes. (CO3, K3) 10

(6.2) Explain with examples the surface plasmon resonance on nanoscale. (CO3, K3) 10

7. Answer any one of the following:-

(7.1) What are the common classes of materials used as biomedical materials? Explain each class of material in detail. (CO4, K4) 10

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(7.2)	Explain the physiological criteria defining a biomaterial and analyze how specific materials play an integral role in load-bearing orthopedic joint implants. (CO4, K4)	10

8. Answer any <u>one</u> of the following:-

(8.1)	Evaluate the multi-faceted role of nanotechnology in sustainable agriculture, focusing heavily on precision smart fertilizers and targeted pesticide delivery systems. (CO5, K4)	10
(8.2)	Explain the molecular configuration of liposomes and illustrate their targeted drug encapsulation and release capabilities using well-labelled structural diagrams. (CO5, K4)	10