Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – May / June 2026

Date: 25-05-2026 **Time:** 01:00pm – 04:00pm

School: SOCSE	**Program:** B. Tech.	
Course Code: CHE3003	**Course Name:** Introduction to Nanotechnology and Applications	
Semester: VI	**Max Marks**:100	**Weightage**: 50%

CO - Levels	CO1	CO2	CO3	CO4	CO5
Marks	14	12	14	24	36

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **10Q x 2M=20M**

1.	Define nanotechnology.	**2 Marks**	**L1**	**CO1**
2.	Define core–shell nanoparticles.	**2 Marks**	**L1**	**CO2**
3.	What are ceramic nanomaterials?	**2 Marks**	**L2**	**CO3**
4.	List two examples of metal nanoparticles.	**2 Marks**	**L1**	**CO3**
5.	State how the band energy of a nanoparticle changes with size.	**2 Marks**	**L2**	**CO4**
6.	Define surface plasmon resonance (SPR).	**2 Marks**	**L1**	**CO5**
7.	Name nanomaterials used in sunscreen.	**2 Marks**	**L1**	**CO5**
8.	Differentiate between passive and active RFID (any 2 points)	**2 Marks**	**L2**	**CO5**
9.	Define magic numbers in nanomaterials.	**2 Marks**	**L1**	**CO4**
10.	Explain top-down approach used in nanomaterial synthesis.	**2 Marks**	**L2**	**CO1**

Part B

Answer the Questions. **Total Marks 80M**

11.	**a.**	Differentiate between bulk materials and nanomaterials.	**5 Marks**	**L2**	**CO1**
	b.	Explain the size-dependent properties of nanomaterial.	**5 Marks**	**L2**	**CO1**
		Or			
12.	**a.**	Discuss in detail the bottom-up approaches for the synthesis of nanomaterials with suitable examples.	**5 Marks**	**L2**	**CO1**
	b.	Calculate the surface-to-volume ratio of a spherical nanomaterial of radius 33 nm.	**5 Marks**	**L3**	**CO1**

13.	**a.**	Describe the classification of nanomaterials as 0D, 1D, 2D, and 3D, with examples.	**6 Marks**	**L2**	**CO2**
	b.	Determine the emission wavelength of quantum dots having an effective band gap of 3.5 eV.	**4 Marks**	**L3**	**CO2**
		Or			
14.	**a.**	Calculate the quantum confinement energy change when the radius of a quantum dot is decreases from 20 nm to 5 nm.	**5 Marks**	**L3**	**CO2**
	b.	Discuss the types of nanocomposites in details.	**5 Marks**	**L2**	**CO2**

15.	**a.**	Define carbon nanotubes (CNTs), mention their chirality, and distinguish between single-walled and multi-walled carbon nanotubes.	**10 Marks**	**L2**	**CO3**
		Or			
16.	**a.**	Define metal oxide nanoparticles, give examples, and explain their properties, applications, and challenges.	**10 Marks**	**L2**	**CO3**

17.	**a.**	Discuss the optical properties of nanomaterials. Explain how size influences optical behavior and relate it to blue and red shift.	**10 Marks**	**L2**	**CO4**
		Or			
18.	**a.**	Explain the concept of quantum confinement and analyze its effect on the energy levels of nanomaterials.	**10 Marks**	**L2**	**CO4**

19.	**a.**	Calculate the number of atoms in tetrahedral close-packed nanoclusters for n=3, 6, and 9 using the appropriate formula. Compare the results and determine which cluster is more stable.	**10 Marks**	**L4**	**CO4**
		Or			

20.	**a.**	Analyze the relative stability of 147, 150, and 309 atom gold nanoparticles based on closed-shell configurations.	**10 Marks**	**L4**	**CO4**

21.	**a.**	Explain Radio Frequency Identification (RFID) and discuss its working principle with the help of a neat diagram.	**10 Marks**	**L2**	**CO5**
		Or			
22.	**a.**	Explain how nanotechnology is used in solar cells and how it improves their efficiency.	**10 Marks**	**L2**	**CO5**

23.	**a.**	Describe the construction and the working principle of electrochemical glucose sensors, including the relevant chemical reactions.	**10 Marks**	**L2**	**CO5**
		Or			
24.	**a.**	Explain the construction and working principle of an electrochemical methanol (VOC) sensor with chemical reactions.	**10 Marks**	**L2**	**CO5**

25.	**a.**	Discuss the advantages of using nanomaterials in drug delivery and how drugs are loaded onto nanomaterials.	**10 Marks**	**L2**	**CO5**
		Or			
26.	**a.**	Explain superabsorbent nanomaterials. Mention the materials used, their properties, and applications in health and hygiene.	**10 Marks**	**L2**	**CO5**