GOVERNMENT OF GUJARAT

LUKHDHIRJI ENGINEERING COLLEGE, MORBI

Mechanical Engineering Department

Subject: Nanotechnology and Surface Engineering (3171931)
Class: 7th Semester

QUESTION BANK (2022-23)

WEAK STUDENTS

Sr. No.	Questions	COs
1.	Give examples for 1D, 2D and 3D nanomaterials and describe their unique properties.	CO-1
2.	Explain engineering scale of nano technology.	CO-1
3.	Discuss engineering applications of nano technology and its merits.	CO-1
4.	Enlist different tools used in characterization of nano-materials.	CO-3
5.	Compare CVD and PVD.	CO-2
6.	What do you mean by synthesis of nano materials?	CO-2
7.	What is nanoscience and what is nanotechnology?	CO-1
8.	Are there nano objects around you? Are there such objects in your body? Name a few.	CO-1
9.	Discuss the application of nanotechnology in cosmetics and consumer goods.	CO-1
10.	Why nanolithography? What are the methods of conventional lithography?	CO-2
11.	List commonly found nanomaterials in nature.	CO-1
12.	Explain plasma spray coating method. Give advantages and applications.	CO-4
13.	State the requirement of coating by giving suitable example of applications.	CO-4
14.	Which are the important properties of IVD coating?	CO-5
15.	Discuss the role of nanotechnology in water treatment and environment control.	CO-1
16.	Describe the different operating modes in an AFM.	CO-3
17.	Explain the hydrothermal and solvo thermal methods for nano synthesis. How they differ from each other?	CO-2
18.	Discuss the principle and applications of vapor condensation method for nano materials synthesis.	CO-2
19.	Discuss the scope and importance of surface engineering for different engineering materials.	CO-4
20.	Explain the principle, working and application of spray pyrolysis method.	CO-2
21.	Explain the principle of atomic force microscope.	CO-3
22.	Differentiate between Nano material and bulk material.	CO-1
23.	Briefly explain which properties of materials enhance at nano scale.	CO-1
24.	Explain principle, working and application of sol-gel method.	CO-2
25.	Explain the principle, working and construction of XRD.	CO-3
26.	Explain sand blasting process for surface preparation.	CO-4
27.	Explain sputtering method of Physical vapour Deposition.	CO-2

28.	Explain ion implantation method.	CO-5
29.	What are scanning and transmission electron microscopies?	CO-3
30.	Define ‘top-down’ and ‘bottom-up’ approaches for the synthesis of nanomaterials.	CO-2
31.	Why chemical methods? Why physical methods?	CO-2
32.	Describe the following methods: 1) Shot blasting and 2) Hydro-blasting.	CO-4
33.	Explain Sputtering using schematic.	CO-5
34.	List examples of components made using thermal spray coatings.	CO-4
35.	List the different coating defects, their causes and remedies.	CO-4
36.	Explain the significance of surface coating.	CO-4

BRIGHT STUDENTS

Sr. No.	Questions	COs
1.	State the application of nanotechnology in security, life sciences and electronics.	CO-1
2.	Why are the nanoparticles inherently unstable? How do they attain stability?	CO-1
3.	Explain the effect of nanometer length scale on diffusivity, melting point and solubility of materials.	CO-1
4.	Write a note on the application of nanotechnology for energy production, storage and enhancing energy efficiency of buildings/appliances.	CO-1
5.	Discuss the usefulness of nanotechnology in surface engineering.	CO-1/CO-4
6.	Describe the distinctive features of a self-assembled nanostructure.	CO-2
7.	It is desired to synthesize yttria nanoparticles of about 2–3 nm in size. Discuss the suitability of the following techniques for the purpose with reasoning. (a) Mechanical milling, (b) Electron beam evaporation, (c) CVD, (d) Sol–gel	CO-2
8.	Explain the effect of nanometer length scale on diffusivity, melting point and solubility of materials.	CO-1
9.	Discuss the principle of lithographic process with schematic diagram. Can lithography be considered as a combination of top down and bottom up approach? Why?	CO-2
10.	What parameters one should consider in choosing a given method for synthesis of nanomaterials ?	CO-1
11.	Explain the reasons for change in the melting point of a nanoparticle with respect to its bulk melting point based on thermodynamic principles.	CO-1
12.	Classify the surface coatings and treatments methods based on i) Corrosion resistance ii) Wear and abrasion resistance iii) aesthetic appearance	CO-5
13.	Suggest the treatment given to metals to improve its wear resistance.	CO-5
14.	Select an appropriate technique for characterization of a fractures sample and explain the technique.	CO-3
15.	FCC copper has a cubic lattice constant value a=3.6Å. What is the d-spacing of the (200) Bragg reflection?	CO-3
16.	The Bragg angle corresponding to the first order reflection from (111) planes of a crystal is 30 degrees, when X-rays of wavelength 1.75Å are used. What is the interplanar spacing?	CO-3
17.	What controls the properties of quantum dots? What are the most popular applications of quantum dots?	CO-1
18.	What is the application of surface sensitivity of secondary electron emission?	CO-3
19.	State the type of Surface Engineering on the following engineering components 1. Stainless Steel Dishes and Bowl 2. Car body 2. Springs 3. Silver religious idols 4.Garden Sprinkler 5. Door Knob 6. I.C engine Cylinder liners 7. Bicycle sprocket.	CO-4
20.	List the various properties developed on the surface due to surface coatings along with name of coating.	CO-4
21.	Distinguish between aluminium coating and cadmium plating.	CO-5