(6 pages)

Reg. No. : ....

Code No. : 7773   Sub. Code : WCHE 12

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2023.

First Semester

Chemistry

Elective I — NANO MATERIALS AND NANO
TECHNOLOGY

(For those who joined in July 2023 onwards)

Time : Three hours   Maximum : 75 marks

PART A — (15 × 1 = 15 marks)

Answer ALL questions.

Choose the correct answer :

1. The first talk about Nanotechnology was given by

    (a) Albert Einstein   (b) Newton

    (c) Gordon E. Moore   (d) Richard Feynman

2. State Braggs Law

    (a) $n\lambda = 2d\cos\theta$ (b) $n\lambda = 2d\sin^2\theta$

    (c) $n\lambda = 2d\cos^2\theta$ (d) $n\lambda = 2d\sin\theta$

3. Greeks and Romans had used nanoparticles in the manufacturing of

    (a) Cosmetics for eyes   (b) Medicines

    (c) Metal articles   (d) Hair dye

4. Ionic, Covalent and Coordinate Covalent bond are collectively found in which the following compounds

    (a) Ammonium chloride

    (b) Sodium chloride

    (c) Diamond

    (d) Nitrate ion

5. An ionic solid consists of atoms held together by

    (a) Ionic bond   (b) Covalent bond

    (c) Metallic bond   (d) Plasmonic nature

6. Approximate surface energy of diamond is

    (a) 9820   (b) 3000

    (c) 1250   (d) 800

7. Which one of the following is an amorphous materials?

    (a) Lead   (b) Glass

    (c) Brass   (d) Zinc

8. Which is the most important properties of nanomaterial?

   (a) Pressure   (b) Friction

   (c) Temperature   (d) Force

9. The ability of a materials to withstand bending without fracture is known as

   (a) Mechanical strength (b) Melting

   (c) Toughness   (d) Ductility

10. Which types of electron pair exists in a semiconductors?

   (a) Ionic   (b) Non Ionic

   (c) Homopolar   (d) Hetropolar

11. Which of the following is not a semiconductor?

   (a) Se   (b) SiC

   (c) Silica   (d) GaAs

12. Silicon doped with gallium is ——————— semiconductor.

   (a) Intrinsic   (b) Extrinsic

   (c) n-type   (d) p-type

13. Electron microscope can give magnification upto

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

   (c) 15,000 X   (d) 100 X

14. Resolving power of TEM is determined by ——————— equation.

   (a) Abbe's   (b) Snell's

   (c) Faraday's   (d) Wie's

15. The cathode of transmission electron microscope consists of

   (a) Tungsten wire   (b) Bulb

   (c) Iron filament   (d) Gold wire

PART B — (5 × 4 = 20 marks)

Answer ALL questions, choosing either (a) or (b).

16. (a) Describe the salient features of one dimensional Nanoparticles.

   Or

   (b) Expand the following acronyms and give anyone analytical value :

   (i) STM   (ii) XRD

   (iii) FTIR   (iv) AAS

17. (a) Write short note on Microwave Assisted Synthesis.

   Or

   (b) Prepare the gold nanoparticles by Brust-Schiffrin method.

18. (a) Write any four thermal properties of nanomaterials.

Or

(b) Deduce the solution based chemical synthesis of iron oxide.

19. (a) Discuss synthetic route of CdS and GaAs nanoparticles.

Or

(b) Locate the three configuration with neat circuit in the transistor amplifier.

20. (a) Define metal-ceramic and polymer matrix Nanocomposites.

Or

(b) Summarize the principle and advantages of SEM.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

21. (a) Describe the four methods of formulating consolidation of Nanopowders.

Or

(b) Discuss the use of nanomaterials in biomedical field.

22. (a) Discuss the principles, synthesis, advantages and disadvantages of electrochemical synthesis.

Or

(b) Compare the arc discharge, laser ablation and CVD methods used to produce carbon nanotubes.

23. (a) Discuss briefly about the techniques to study mechanical properties of nanomaterials.

Or

(b) Write down synthesis of following nanoparticles :

(i) Silica   (ii) Alumina

24. (a) (i) Classify the materials based on conductivity with suitable examples.

(ii) Define Resistivity.

Or

(b) Define Hall effect. Derive an expression for the Hall voltage.

25. (a) Examine the principle, instrumentation and mode of operation of AFM.

Or

(b) Discuss the principle, instrumentation and application of TEM.

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