(6 pages)

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Code No. : 7821   **Sub. Code : WCHE 12/**
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M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2024.

First Semester

Chemistry

Elective – I — NANOMATERIALS AND
NANOTECHNOLOGY

(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. Carbon nanotube was invented by

    (a) Ligima   (b) C.N.R. Rao

    (c) Robert Curl   (d) Harry Croto

2. The diameter (approximate) of multi walled carbon nanotube

    (a) 30 nm   (b) 1 nm

    (c) 20 mm   (d) 1 mm

3. An example of bottom up process is

    (a) Ball milling   (b) Laser ablation

    (c) Sputtering   (d) CVD

4. The high surface energy of nanostructured materials thermodynamically

    (a) unstable   (b) stable

    (c) metastable   (d) both (a) and (c)

5. A covalent solid consists of atoms held together by

    (a) Ionic bond   (b) Covalent bond

    (c) Metallic bond   (d) Plasmonic nature

6. The surface energy order for fcc crystals

    (a) $\gamma_{111} < \gamma_{100} < \gamma_{hkl}$

    (b) $\gamma_{111} > \gamma_{100} > \gamma_{hkl}$

    (c) $\gamma_{110} < \gamma_{100} < \gamma_{hkl} < \gamma_{111}$

    (d) $\gamma_{110} > \gamma_{100} > \gamma_{hkl} > \gamma_{111}$

7. The ability of materials to sustain loads without failure is known as

(a) Mechanical strength

(b) Stiffness

(c) Toughness

(d) Ductility

8. Name the solvents probably act as the stabilizer in faradays method for gold nanoparticles is a ―――――

(a) CS_2 (b) alcohol

(c) toluene   (d) CCl_4

9. The properties of materials by which it can be rolled into sheets is called as

(a) plasticity   (b) elasticity

(c) malleability   (d) ductility

10. The density of charge carriers in a pure semiconductors is proportional to ―――――

(a) T (b) T^2

(c) $T^{3/2}$ (d) T^3

11. Which of the following is an semiconducting materials?

(a) Al   (b) Rubber

(c) Si   (d) P

12. Selenium is ――――― semiconductor.

(a) Intrinsic   (b) Extrinsic

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

13. In SEM, the electron beam is accelerated through a potential gradients is ―――――

(a) 30 Kev   (b) 12 KeV

(c) 280 KeV   (d) 420 KeV

14. The resolving power of TEM is determined by ――――― equation.

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

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

15. The atom which cannot be determined from the XRD analysis is

(a) H   (b) Cu

(c) La   (d) Ni

PART B — (5 × 4 = 20 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

16. (a) Examine the role of size in Nanoparticles synthesis.

Or

(b) Define nanocrystals and nanotube.

17. (a) Write short note on surface energy.

Or

(b) Generate the gold nanoparticles using the Turkevich – Frens technique.

18. (a) List out the thermal properties of nanomaterials.

Or

(b) Deduce the solution based chemical synthesis of gold nanoparticles.

19. (a) Discuss the principles of photovoltaic cell.

Or

(b) How will you identify n and p type semiconductors by using suitable methods?

20. (a) Write the advantages of AFM over SEM.

Or

(b) List out the biomedical application of nanoparticles.

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

21. (a) Compare the properties of gold at the nanostate and bulk state.

Or

(b) Discuss the application of nanomaterial's in versatile fields.

22. (a) Discuss the principles and application of CVD methods.

Or

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

23. (a) Analyze the different types of mechanical properties of commonly used nanoparticles.

Or

(b) Outline the synthesis and properties of SiO_2 nanoparticles.

24. (a) Give the application of following nanoparticles (NPs).

(i) CdS

(ii) CdSe

(iii) Ag NPs

(iv) Au NPs.

Or

(b) Derive an expression for the Hall voltage.

25. (a) Discuss the principle, instrumentation and mode of operation of TEM.

Or

(b) What are the probable hazardous in the use of nanoparticles?

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