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**M.Sc. DEGREE EXAMINATION, MAY 2022**  
Fourth Semester

**18PCY4EB – MATERIALS CHEMISTRY**

*(For the candidates admitted during the academic year 2018-2019 onwards)*

Time: Three hours

Max. Marks: 100

**PART – A ( $5 \times 5 = 25$  Marks)**

Answer ANY FIVE Questions

1. What is hydrogel? Write the procedure for hydrothermal synthesis by co-precipitation method.
2. Mention the advantages and disadvantages for both the top-down and bottom up method.
3. Define bright field imaging and z-contrast.
4. Give the differences between SEM and TEM.
5. How the nanoparticles can be synthesized by solution combustion technique?
6. Illustrate by a single figure the concept of 0D, 1D, 2D and 3D confinement.
7. Explain the changes in the properties and characteristics of metals due to size reduction with suitable examples.
8. Write a note on quantum dots.

**PART – B ( $5 \times 15 = 75$  Marks)**

9. a. Define crystal defects and discuss about the types of point defects in crystals with neat diagram.

**(OR)**

- b. Explain in detail the crystal structures and representation of crystal structures.
10. a. Discuss about the change in band structure at nanoscale.

**(OR)**

- b. Explain the conductivity and superconductivity of alkaline doped graphite.
11. a. Discuss on the classification of nanomaterials based on dimensions and explain in detail the properties with examples.

**(OR)**

- b. Explain in detail about top-down and bottom up approach for synthesizing of nanomaterials.
12. a. Explain pyroelectricity. Piezoelectric and reverse piezoelectric effect.

**(OR)**

- b. Explain the types of magnetism and the properties of anti-ferro and ferrimagnetic materials.
13. a. Explain in detail about structural determination by X-ray diffraction.

**(OR)**

- b. Explain the working principle and application of X-ray photoelectron spectroscopy (XPS) with neat diagram.

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