

NOVEMBER/DECEMBER 2019

**MPH41 — MATERIALS SCIENCE AND  
LASER PHYSICS**

Time : Three hours

Maximum : 75 marks

SECTION A — ( $5 \times 6 = 30$  marks)

Answer ALL questions.



- (a) What are point imperfections? Explain how Schottky defect is formed with the help of neat diagram.

Or

- (b) The energy required to remove a pair of ions  $\text{Na}^+$  and  $\text{Cl}^-$  from  $\text{NaCl}$  is  $\sim 2\text{eV}$ . Calculate the approximate number of Schottky imperfections present in the  $\text{NaCl}$  crystal.
2. (a) What is photoconductivity? How does it arise? Mention few applications of the phenomenon.

Or

- (b) Describe the electronic transitions in photoconductors like Traps and capture.



3. (a) Explain about the polymerization mechanism with suitable illustration.

Or

- (b) What are ceramics? Describe any two phases of ceramics.

4. (a) Classify the nanomaterials on the basis of dimensions.

Or

- (b) Explain the ball milling method of synthesis of nanomaterials.

5. (a) Distinguish spontaneous and stimulated emission.

Or

- (b) Discuss about the three level system population using energy level diagram.

SECTION B — ( $3 \times 15 = 45$  marks)

Answer any THREE questions.

6. Explain the effect of grain size and solute atoms in dislocation motion.
7. What is internal field in dielectrics? Derive the Claussius – Mossotti equation for local field.

8. Explain the atomic model of elastic behavior. What do you mean by anelastic and visco elastic behavior?

9. Describe the construction and working of TEM and give the theory to analyse the nanomaterials.

10. What are the basic requirements to make any laser device? List out the various properties of laser light. Derive Einstein's coefficients.

