Reg. No. : ....

Code No. : 5870   **Sub. Code : PPHE 43**

M.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2020.

Fourth Semester

Physics

Elective — MATERIAL SCIENCE

(For those who joined in July 2017 onwards)

Time : Three hours   Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The lever rule is a ——————— analogy to the mass balance calculation

    (a) Thermal   (b) Mechanical

    (c) Vibration   (d) Solubility

2. Select the Gibbs phase rule

    (a) $P + F = C + 1$ (b) $P + F = C + 2$

    (c) $P - F = C + 1$ (d) $P + F = C - 2$

3. Elastic behaviour is

    (a) Irreversible   (b) Size-dependent

    (c) Reversible   (d) Size-independent

4. Time dependent recoverable deformation under load is called

    (a) Elasticity   (b) Modulus

    (c) Anelasticity   (d) Plasticity

5. Diamond possesses ————————— hybridization

    (a) SP^2 (b) SP^3

    (c) SP (d) Pd^2

6. Select a natural polymer

    (a) Nylon   (b) Starch

    (c) Teflon   (d) PVC

7. Point imperfections is ————————— dimensional defects

    (a) Zero   (b) One

    (c) Two   (d) Three

8. The three dimensional defects creates
    ————————in crystals

    (a) point   (b) planar

    (c) voids   (d) dislocation

9. Creep is a ———————— deformation under the
    applied load

    (a) time-independent (b) time-dependent

    (c) twinning   (d) slip

10. Corrosion converts the material into ————————
    form

    (a) Unstable   (b) Stable

    (c) Reduced   (d) Elastic

            PART B — (5 × 5 = 25 marks)

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

        Each answer should not exceed 250 words.

11. (a) Define various invariant reactions and
         sketch the schematic with symbolic
         equations for binary systems.

                        Or

    (b) State the procedures of lever rule and Gibbs
         phase rule.

12. (a) Explain the atomic model for elastic behaviour.

     Or

    (b) Explain anelastic behaviour of materials.

13. (a) How the solids are classified on the basis of bonding types and compare their properties.

     Or

    (b) How the polymers are classified based on the structure?

14. (a) How does the crystal imperfections are classified?

     Or

    (b) What are the properties of dislocations?

15. (a) Explain the mechanisms of oxidation with an example.

     Or

    (b) Explain plastic deformation by slip process.

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Explain micro structural changes during cooling with the help of neat sketches.

Or

(b) Explain the kinetics of heterogenous nucleation process.

17. (a) Discuss about the modulus as a parameter in designing rubber like materials.

Or

(b) Explain-spring-dashpot models of elasticity.

18. (a) Write a note on ionic and metallic solids with neat diagrams.

Or

(b) Discuss the classification of polymers based on moleuclar forces.

19. (a) Discuss edge dislocation in detail with neat sketches.

Or

(b) What is a point imperfection in crystals? Discuss the effect of this imperfection in crystals.

20. (a) Discuss the stress-strain curve in detail.

Or

(b) Explain ductile and brittle fractures in detail.

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