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Question Paper Code : 27474

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Second Semester

Pharmaceutical Technology

PH 6252 — PHYSICS OF MATERIALS

(Common to Biotechnology)

(Regulations 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write about the significance of phase diagram of a material.
2. State Fick's law.
3. Define density of energy states.
4. What is skin depth?
5. Distinguish between direct and indirect band gap.
6. Identify minority and majority carriers in a n-type semiconductor.
7. What are dielectrics? Why it is called so?
8. With the help of permeability μ , how will you classify magnetic materials?
9. Mention the important properties of metallic glasses.
10. What do you mean by 'bio compatibility' of a material?

PART B — (5 × 16 = 80 marks)

11. (a) Write a detailed note on the following :
 - (i) Phase and lever rule (8)
 - (ii) Homogeneous and Heterogeneous nucleation. (8)

Or

- (b) Draw a neat diagram and explain the Czochralski method of crystal growth and compare its merits with other methods of crystal growth. (16)

12. (a) (i) What are Metals, Semiconductors and Insulators? (6)
(ii) Discuss classical free electron theory of metals. (10)

Or

- (b) (i) Give the properties of type I and type II superconductors. (8)
(ii) Summarize the applications of superconducting materials. (8)
13. (a) (i) What are elemental and compound semiconductors? (4)
(ii) Derive the expression for electrical conductivity of an intrinsic semiconductor. (12)

Or

- (b) (i) Draw the schematic sketch of the Solar cell and explain its working. (12)
(ii) Calculate the Fermi energy of copper at 0 K. Atomic weight and density of copper are 63.54 and 8950 kg/m³ respectively copper crystallizes in fcc structure. (4)
14. (a) (i) Deduce Clausius-Mosotti equation. (10)
(ii) Explain various types of dielectric breakdown. (6)

Or

- (b) (i) Draw the hysteresis curve of soft and hard magnetic materials and compare its properties and uses. (10)
(ii) Write a note on Giant Magneto Resistance (GMR). (6)
15. (a) Mention the role of matrix and reinforcement elements in composites and write about the composition and uses of the following materials,
(i) FRP
(ii) Ni-Ti alloy. (16)

Or

- (b) (i) What are electro rheological fluids, explain its applications? (8)
(ii) Write a short note on biomaterials. Give few examples. (8)

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Question Paper Code : 77278

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Second Semester

Pharmaceutical Technology

PH 6252 — PHYSICS OF MATERIALS

(Common to Biotechnology)

(Regulation 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are invariant reactions? Give examples.
2. What are the degrees of freedom of a system of two components, when the number of phases are one and two?
3. What is the physical significance of wave function?
4. Why are superconductors called as perfect diamagnetics.
5. What is meant by effective mass of an electron?
6. Why is that when the temperature is increased, conductivity of a conductor decreases, while that of a semiconductor increases?
7. What is the classification of insulating materials?
8. Differentiate between hard and soft magnetic materials.
9. What are biomaterials? Give their applications.
10. What is a sensor? Give examples.

PART B — (5 × 16 = 80 marks)

11. (a) (i) What is meant by free energy of formation of a critical nucleus? Explain homogeneous and heterogeneous nucleation in detail. (12)
 (ii) Explain lever rule with an example (4)
 Or
- (b) (i) Explain the method of crystal growth by Czochralski and Bridgmann methods. (12)
 (ii) Write a note on sol-gel processing. (4)
12. (a) Derive Schrodinger's time independent wave equation. Solve it for the case of particle in a box (one dimension).
 Or
- (b) Derive an expression for the density of energy states and based on that determine the carrier concentration in metals.
13. (a) (i) Derive an expression for carrier concentration in an n-type semiconductor. (12)
 (ii) For intrinsic Gallium arsenide, the room temperature electrical conductivity is $10^{-6}(\Omega - m)^{-1}$ the electron and hole mobilities are 0.85 and 0.04 $m^2/V-s$ respectively. Compute the intrinsic carrier concentration at room temperature. (4)
 Or
- (b) (i) What is Hall effect? Derive an expression for Hall co-efficient. Describe the experimental setup for the measurement of Hall co-efficient. (12)
 (ii) A n-type Si semiconductor has a Hall co-efficient of $-3.854 \times 10^{-4} m^3/C$ and conductivity $2.46 \times 10^{-3} ohm^{-1}m^{-1}$. Calculate the charge carrier density and electron mobility at room temperature. (4)
14. (a) Explain in detail the various types of polarization mechanisms in a dielectric and obtain an expression for the total polarization in a dielectric material.
 Or
- (b) (i) Discuss in detail domain theory of ferromagnetism and based on that explain hysteresis in ferromagnetic materials. (12)
 (ii) Write a note on Giant Magneto Resistance Materials. (4)
15. (a) What are shape memory alloys? Explain their physical properties and discuss their applications.
 Or
- (b) What are metallic glasses? Explain the preparation, properties and applications of metallic glasses.

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Question Paper Code : 80841

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Second Semester

Pharmaceutical Technology

PH 6252 — PHYSICS OF MATERIALS

(Common to Biotechnology)

(Regulations 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is Phase diagram?
2. State the principle of solution growth.
3. Write any four merits of classical theory.
4. Mention some properties of superconductors.
5. The intrinsic carrier density is $2.5 \times 10^{16}/\text{m}^3$. If the electron and hole mobilities are 0.13 and $0.05 \text{ m}^2 \text{ V}^{-1} \text{ s}^{-1}$, calculate its electrical conductivity.
6. What are the applications of LED?
7. Define dielectric constant of a material.
8. Enunciate Magnetic bubbles.
9. What are ceramic fibers?
10. Mention some applications of Biomaterials.

PART B — (5 × 16 = 80 marks)

11. (a) Explain lever rule and Gibb's phase rule. (16)

Or

- (b) Explain Czochralski method of growing a single crystal. Mention merits and demerits. (16)

12. (a) (i) What is meant by density of energy states? Obtain an expression for the same.
- (ii) Fermi temperature of metal is 24,600 K. Calculate the Fermi velocity. (12 + 4)

Or

- (b) Explain the following :
- (i) Meissner effect (4)
- (ii) Type I and Type II superconductors (6)
- (iii) Principle of magnetic levitation. (6)
13. (a) Derive an expression for density of electrons in an intrinsic semiconductor. (16)

Or

- (b) What is Hall effect? Derive an expression of Hall Coefficient For n type semiconductor. Describe the experimental determination of Hall coefficient. (16)
14. (a) Explain in detail dielectric loss and different types of dielectric breakdown in dielectric materials. (6 + 10)

Or

- (b) Discuss domain theory of ferromagnetism and based on that explain hysteresis in ferromagnetic materials. (10 + 6)
15. (a) Explain the characteristics, properties and applications of SMA with neat sketch.

Or

- (b) Explain the following : (6 + 5 + 5)
- (i) Scintillation detectors
- (ii) Bio materials
- (iii) Hydroxyapatite.
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Question Paper Code : 97255

B.E./B.Tech. DEGREE EXAMINATION, DECEMBER 2015/JANUARY 2016.

Second Semester

Pharmaceutical Technology

PH 6252 — PHYSICS OF MATERIALS

(Common to Biotechnology)

(Regulation 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish between homogeneous and heterogeneous nucleation.
2. State Gibb's phase rule.
3. What are the essential features of classical free electron theory?
4. An electron is bound in a potential well of infinite height. The energy of the electron in its lowest energy state is 6 eV. How much energy is needed to raise the electron to its first excited state.
5. Distinguish between rest mass and effective mass of an electron.
6. How does a LED emit light?
7. How does a GMR sensor senses the magnetic field?
8. What is dielectric loss?
9. What are biosensors? Give examples.
10. How does a liquid crystal acts as a display device?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain Bridgman method of growing single crystals. Give the advantages and limitations of the method. (10)
- (ii) What is a phase diagram? Give the significance of phase diagram. (6)

Or

- (b) (i) Explain the PVD method of preparing thin films. What are the advantages and limitations of this method? (10)
- (ii) What is annealing? How does it change the properties of the materials? (6)
12. (a) Define Schrodinger time - independent wave equation and time dependent wave equations. Give the significance of wave function.

Or

- (b) What are superconductors? Explain the important properties exhibited by superconductors. Explain magnetic levitation and SQUIDS.
13. (a) Derive an expression for conduction electron and hole densities and hence obtain an expression for intrinsic carrier concentration. Discuss the variation of carrier concentration with temperature and band gap of the material.

Or

- (b) (i) Explain Hall effect in semiconductors. Derive an expression for Hall Co-efficient. (12)
- (ii) A rectangular bar of n-type germanium of thickness 2 mm is placed in a transverse magnetic field of 0.1 T. The free electron concentration is 3×10^{21} electrons/m³. When a current of 20 mA flows across the semiconductor bar, what will be the Hall voltage? (4)
14. (a) Derive an expression for internal field in dielectrics. Hence obtain Clausius - Mosotti equation.

Or

- (b) (i) What are ferromagnetic and ferrimagnetic materials? Explain the hysteresis property exhibited by them. (10)
- (ii) How are magnetic materials classified as hard and soft magnetic materials? Give their properties and applications. (6)

15. (a) (i) What are metallic glasses? Explain the properties exhibited by them and their applications. (8)
- (ii) Write a note on bio-materials. (8)

Or

- (b) (i) What are shape memory alloys? What are the characteristic properties exhibited by these materials? (8)
- (ii) Write a note on ceramic materials. (8)

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