

**Rayat Shikshan Sanstha's**  
**Yashavantrao Chavan Institute of Science, Satara (Autonomous)**  
**Department of Nanoscience and Technology**  
**B.Sc.-I, Semester II, Examination in June 2021-2022**  
**Paper code: BNTT – 201**  
**Subject Code: 50063**  
**Question Bank**

Question:

- 1) Statement and expression of coulombs law.
- 2) Nano-dielectrics.
- 3) Stoke's theorem of vectors.
- 4) Gauss-divergence theorem.
- 5) Statement and expression of gauss law
- 6) Obtain the equation for Capacitance of an isolated spherical conductor.
- 7) What is Electric field due to continuous charge distribution over a semicircle and cord?
- 8) Write a note on Concept of triple product of vectors and scalar triple product and its significance.
- 9) What is electric flux and explain gauss law with its expression?
- 10) Define the terms gradient, divergence, Curl, vector, scalar.
- 11) Write a short note on Nano ceramics.
- 12) What is electric field and obtain equation for Field due to point and continuous charges?
- 13) What is Dielectric polarization and Dielectric strength?
- 14) Write a note on Energy per unit volume in electrostatic field.
- 15) What is gradient?
- 16) Define Vector Quantity.
- 17) What is Divergence?
- 18) What is coulombs law?
- 19) Define Scalar quantity.
- 20) What is Electric field due to continuous charge distribution over an arc?

- 21) Explain briefly the Vector and scalar triple products and its significance.
- 22) What is Electric field due to continuous charge distribution over a rod?
- 23) Explain coulombs law and polarity of charges.
- 24) What is the statements for Stokes theorem of vectors, Gauss-divergence theorem also define Curl & Gradient.
- 25) Explain the dielectric polarization and Dielectric strength.
- 26) State the gauss law and prove it?
- 27) Explain briefly the Nano ceramics.
- 28) Write is the value of  $k$  and its dimensions and also find the electric force when two point Charge  $+1 \text{ nC}$  and  $2\text{nC}$  when the distance between them is  $10 \text{ m}$ .
- 29) Define electric flux.
- 30) Write is the value and dimensions of  $K$ .
- 31) Define electric field.
- 32) Define Scalar & vector quantity.
- 33) Write two sentences about area vector.
- 34) If a charge distributed uniformly over a rod then what is the net electric field at point P when placed at distance 'a' from rod?
- 35) Write down the equation for Capacitance of spherical conductor.
- 36) If a charge distributed uniformly over an arc then what is the net electric field at center 'o'?
- 37) How to calculate net electric flux through a closed 3-D surface. Prove your statement.
- 38) What is Nano-dielectrics? Explain it briefly.
- 39) Write a short note on electric filed.
- 40) What is the assumption of scientist coulomb about the electrostatic force and explain why electric field has same direction as of electrostatic force.
- 41) Define these 3 terms polarization, strength, constant in terms of dielectric.
- 42) Write is the value of  $\epsilon_0$  and its dimensions and also find the electric force when two point Charge  $+2 \text{ nC}$  and  $2\text{nC}$  when the distance between them is  $10 \text{ m}$ .
- 43) Write the equation for dielectric capacitance of isolated spherical conductor.
- 44) Write a note on electric field intensity.

- 45) Find the electric force when two point Charge  $-0.2 \text{ nC}$  and  $22 \text{ nC}$  when the distance between them is  $30 \text{ m}$ .
- 46) What is the difference between capacitor & battery?
- 47) Write a note on Dielectric Capacitance.
- 48) Write the difference between dielectric, ferroelectrics and magnetoceramics.
- 49) What is dielectric constant?
- 50) What is the Energy density?

**Rayat Shikshan Sanstha's**  
**Yashavantrao Chavan Institute of Science, Satara**  
**Department of Nanoscience and Technology**  
**Question Bank – BNTT 202-Elctricity and Magnetism at Nanoscale**

- 1) Define concept of current density
- 2) What is Friction? Explain frictional forces at nanoscale
- 3) Write a short note on Semiconductors.
- 4) Define Conductivity.
- 5) Explain concept of Magnetism .
- 6) What is classical free electron theory?
- 7) Obtain expression for root mean square velocity using classical theory
- 8) What is ionic and electronic conductivity?
- 9) Give classification of metals semiconductors and insulators.
- 10) Explain hysteresis curve in ferromagnetic materials.
- 11) Explain Magnetism and types of magnetic materials
- 12) What is magnetostriction
- 13) Explain Biot-Savarts law.
- 14) Give application of Biot-Savarts law in straight conductor.
- 15) Explain displacement current.
- 16) Obtain equation of continuity.
- 17) Define mutual and self Inductance phenomena.
- 18) What is domain? Explain fundamental of magnetization in hysteresis curve.
- 19) Explain Faraday's Law of electromagnetic induction.
- 20) What are the factors affecting superconducting state? Explain Meissner effect.
- 21) Explain merits and demerits of quantum theory of free electron
- 22) What is mean by polarization in emf propagation
- 23) State Amperes and faradays law.

- 24) Give expression for the magnetic induction along the axis of toroid.
- 25) Obtain derivation for magnetic induction at a point inside the solenoid.
- 26) Obtain expression for electrical conductivity in metal.
- 27) Define Energy Density.
- 28) Define EM radiation.
- 29) Explain Metal, Diamagnetism and Paramagnetism.
- 30) What is quantum free electron theory? Give merits and demerits of quantum theory over classical theory
- 31) Explain fundamental of magnetization in hysteresis curve.
- 32) Explain phenomenon of superconductivity.
- 33) Explain Magnetism and types of magnetic materials.
- 34) What are Maxwells equations.
- 35) Give classification between paramagnetic, diamagnetic and ferromagnetic materials.
- 36) Obtain divergence and curl of magnetic field.
- 37) Why divergence of magnetic induction is zero?
- 38) Find an expression for  $\Delta \cdot \mathbf{B} = 0$
- 39) Find expression for ampere circular law.
- 40) Explain intrinsic and extrinsic semiconductors.
- 41) How domains are formed in magnetic materials.
- 42) Explain hysteresis curve in hard ferromagnetic materials
- 43) Explain hysteresis curve in soft ferromagnetic materials
- 44) Explain Meissner effect.
- 45) How superconductors are made?
- 46) Give the conditions for superconducting state.
- 47) Explain concept of magnetism in materials.
- 48) Explain concept of resistivity and resistance.
- 49) Obtain expression for current density
- 50) Give the necessity of quantum theory of free electron .

**Rayat Shikshan Sanstha's**  
**Yashvantrao Chavan Institute of Science, Satara**  
**B. Sc I Nanoscience and Technology Semester- II Examination**  
**Physical Chemistry (BNTT-203)**  
**Subject Code: 50013**

1. Explain the laws of thermodynamics?
2. Explain degree of ionization?
3. Short note on preparation of buffer solution?
4. Explain briefly the solubility & solubility product of soluble salts?
5. Explain the derivation of first order reaction?
6. Write short note on unit of rate constant?
7. Explain briefly second law of thermodynamics?
8. Explain common ion effect?
9. Write short note on carnot cycle?
10. Derive the equation for rate constant of second order reaction?
11. Explain spontaneous process?
12. Derive Carnot's theorem?
13. Explain exothermic and endothermic reactions?
14. Write a note on characteristics of first order reaction?
15. Explain ionization of weak acid and bases?
16. Write a short note on buffer solutions?
17. Explain order and molecularity of reaction?
18. Derive efficiency of carnot's cycle with definition?
19. Explain different approaches of nanothermodynamics?
20. Write a short note on degree of ionization?
21. Explain surface thermodynamics?
22. Explain factors affecting degree of ionization?
23. Explain in details ionization of weak acids and bases?
24. Write a short note on pseud –unimolecular reactions?
25. Write short note on common ion effect?
26. Explain in details spontaneous and non-spontaneous?
27. Explain properties of nanoclusters-Hill's approaches to nano thermodynamics?
28. Explain in detail characteristics of second order reaction?
29. Write short note on endothermic process?

30. Write short note on exothermic process?
31. Explain solubility product of sparingly soluble salt?
32. Explain size dependent interface energy of thermodynamics?
33. Write short note on approach of quasi chemical description of solid nanoparticles?
34. Explain in brief order and molecularity of a reaction?
35. Write a short note on ionization of weak acids and bases?
36. State principle and definition of thermochemistry?
37. Derive efficiency of heat engine?
38. Write short note on hydrolysis of methyl acetate?
39. Write note on principle of thermochemistry?
40. Explain concept of free energy?
41. Explain in brief ionization constant and ionic product of water?
42. Explain in brief second order of reaction?
43. Write short note on concept of free energy?
44. State efficiency of heat engine?
45. Explain concept of ionization of weak acids and bases?
46. Explain hydrolysis of methyl acetate?
47. Explain rate of reaction in brief?
48. Write short note on factors affecting rate of reaction?
49. Write short note on ionic products of water?
50. Write short note on efficiency of heat engine?

**Rayat Shikshan Sanstha's**  
**Yashavantrao Chavan Institute of Science, Satara (Autonomous)**  
**Department of Nanoscience and Technology**  
**Class: B.Sc.-I Sem II**  
**Subject: Functional organic chemistry**  
**Subject code: 50014**  
**BNTT-204**

- 1) Write short note on Molecular Weight
- 2) Write short note on Alkyl halide
- 3) Explain Friedel craft reaction Mechanism and applications
- 4) Explain in detail Structure and classification of alkyl halide
- 5) Explain in detail Aromatic nucleophilic substitution
- 6) Calculate molality of a solution when 4 g of NaOH is dissolved in 100g of water.
- 7) Explain Modern theory of aromaticity
- 8) Explain Nitration reaction
- 9) Write short note on Huckel's rule of Aromaticity
- 10) Write short note on term Solution
- 11) Explain in detail Supersaturated solution
- 12) Write short note on Mole fraction and Weight fraction
- 13) Write short note on Nucleophilic substitution of aryl halide
- 14) Write short note on Structure of benzene
- 15) Write short note on Normality
- 16) Explain in detail Haloalkanes
- 17) Explain in detail Aromatic compound
- 18) Write short note on Saturated solution
- 19) Write short note on Molality
- 20) Explain in detail Non aromatic compound
- 21) Explain in detail Equivalent weight
- 22) Write short note on Solvent
- 23) Write short note on Molarity
- 24) Explain in detail Unsaturated solution
- 25) Explain the stability of benzene with help of resonance structure
- 26) Explain in detail Aromatic nucleophilic substitution
- 27) Explain in detail Structure and classification of aryl halide
- 28) Explain in detail Structure and classification of alkyl halide
- 29) Explain the stability of benzene with help of resonance structure
- 30) Write short note on Polar and Non-Polar solution and its examples
- 31) Write short note on Nucleophilic substitution of aryl halide
- 32) Explain Aromatic and Non aromatic compound
- 33) Calculate Normality of a solution when 5.6 g of KOH is dissolved in 1dm<sup>3</sup> solution (Eq.wt of KOH-56)
- 34) Write short note on Addition of hypohalous acids
- 35) Write short note on Mole fraction, Molality & Normality
- 36) Write short note on Basicity of acid and Acidity of base
- 37) Write short note on SN1 reaction of alkyl halide
- 38) Calculate Molarity of a solution when 4.9 g of H<sub>2</sub>SO<sub>4</sub> dissolved in 1dm<sup>3</sup> solution



(Mol.wt.H<sub>2</sub>SO<sub>4</sub>-98)

- 39) Explain Types of Nucleophilic Substitution reaction
- 40) Write short note on Addition of hypohalous acids
- 41) Write short note on Percentage solution in ppt, ppm, ppb
- 42) Write short note on Physical Properties of alkyl halide.
- 43) Write short note on uses of aryl halide
- 44) Write short note on Physical Properties of aryl halide.
- 45) Write short note on uses of alkyl halide.
- 46) Explain in detail Classification of hydrocarbon.
- 47) Explain in detail method of preparation of alkyl halide
- 48) Write short note on antiaromaticity.
- 49) Explain in detail method of preparation of aryl halide
- 50) Write short note on Basicity of acid.

**Rayat Shikshan Sanstha's**  
**Yashvantrao Chavan Institute of Science, Satara**  
**B. Sc. I Nanoscience and Technology Semester-II Examination**  
**MAMMALIAN PHYSIOLOGY-I (BNTT-205)**  
**Subject Code: 50015**

1. Explain mechanism of coagulation of blood?
2. Write note on circulatory system & give one example of disease /
3. Write brief note on Reciprocates?
4. Write short note cardiac heartbeats?
5. Explain plasma proteins and their role?
6. Define circulatory system & give one example?
7. Explain gastric and interstitial diseases?
8. Give application of nanotechnology in cardiovascular nanomedicine?
9. Explain artificial red cells?
10. State the mechanism of coagulation of blood?
11. Explain term salivary enzyme?
12. Write note on plasma proteins?
13. Explain in brief blood composition?
14. Write short note on composite of bile?
15. Write short note on haemopoiesis?
16. Explain function of intestinal juice?
17. Write note on plasma proteins?
18. Explain in brief concept of cell composition?
19. Explain the mechanism of conduction of heartbeat?
20. Define circulatory system? explain composition of blood?
21. Write short note on saliva?
22. Explain concept of leukocytes?
23. Short note on cardiac output?
24. Explain in brief Respiratory system?

25. Explain characteristics and types of nanomaterials in gastro intestine?
26. Application of nanotechnology in circulatory system?
27. State mechanism of cardiac system and conduction of heartbeat?
28. Explain functions off large intestine?
29. Define term haemopoiesis with their role?
30. Write short note on mechanism of bleeding of blood?
31. Explain the term platelets?
32. Explain in brief mechanism of working of heart?
33. Write short note on origin and conduction of heartbeat?
34. Explain mechanism of bleeding of blood?
35. Write note on leukocytes and erythrocytes?
36. Explain pathway for blood coagulation?
37. Give diagrammatic representation of haemopoiesis?
38. Explain in brief white blood cells and their role?
39. Write short note on plasma protein and their role?
40. Explain in brief red blood cells and their functions?
41. Explain term artificial cell?
42. Draw diagram of overview of heart?
43. Write short note on coagulation of blood?
44. Give any five applications of nanotechnology in cardiovascular nanomedicine?
45. State the functions of red blood cells?
46. Explain in brief plasma protein and their role?
47. Write note on blood coagulation pathway?
48. Explain in brief cardiac output?
49. Explain the different types of nanomaterials in gastro intestine?
50. Explain the function of large intestine?



**Rayat Shikshan Sansthas**

**Yashavantrao Chavan Institute of science (Autonomous), Satara**

**Department Of Nanoscience and Technology**

**B. Sc I Professional Science Semester II Examination, April 2022**

**Mammalian Physiology II (BNTT-206)**

**Subject code: 50016**

**Question Bank**

1. Explain a term Nerve cells
2. Short note on Synapsis gap
3. Define a term Hormones
4. In brief explain term Antigen
5. Explain structure and function of Immunoglobulin
6. Explain term monoclonal Antibodies with suitable diagram
7. Define immunity and their types with one example
8. Explain nervous system and term nerve cells with suitable diagram
9. Short note on Innate immunity
10. Define antibody with their five classes
11. Short note on nanotechnology in neurosciences
12. Explain concept of immunogenicity
13. Short note on different endocrine glands
14. Explain role of nanotechnology in tissue engineering
15. Define a term Dendrimers
16. Short note on Telomers
17. Function Immunoglobulin E
18. Explain a term Antigenicity
19. Define term Immunoglobulin
20. Explain immunity system and how mechanism work defence
21. Define antibody and their types with suitable diagram
22. Define nervous system and explain nerve cells with suitable diagram
23. Short note on Inherited immunity
24. Define immunoglobulin and antigen with their interaction
25. Short note on role of nanotechnology in osmoregulation
26. Explain concept of immunogen
27. Short note on different endocrine glands

28. Explain mechanism of monoclonal antibodies
29. Define term Nerve fibres
30. Synapsis
31. Toxicity of nanoparticles
32. Antigen
33. Polyclone
34. Define term monoclonal Antibodies with suitable diagram
35. Overview of immune response's and their types with one example
36. Define Nerve system and term nerve cells with suitable diagram
37. Short note on acquired immunity
38. Explain basic structure of antibody
39. Short note on advance nanotechnology in neuroscience
40. Explain concept of inborn immunity
41. Short note on different endocrine glands
42. Define tissue and cells of nanotechnology in tissue engineering
43. Difference between monoclonal and polyclonal Antibodies
44. Short note on nanoscale
45. Define hormaonal disorders with suitable examples
46. Explain pituitary glands
47. Explain antigen antibody complex
48. Short note on types of immunity
49. Explain in brief factor affecting to antigen
50. Short note on glands and their types

**B. Sc- I Nanoscience and Technology Semester- II Examination**  
**Linear Integrated Circuits (BNTT- 209)**  
**Question Bank**

- 1) Explain in brief Integrator?
- 2) Explain Frequency response of Op- Amp?
- 3) Explain A-D conversion characteristics?
- 4) Explain in brief Concept of Virtual ground?
- 5) Explain IC 555 with Block diagram?
- 6) Explain Inverting Amplifier?
- 7) Explain Characteristics of an Ideal and Practical Operational Amplifier?
- 8) Explain Inverting and non-inverting amplifiers?
- 9) Explain in brief Wein bridge oscillator?
- 10) Write short note on Amplifier?
- 11) Write short note on Virtual Ground?
- 12) Write short note on CMRR?
- 13) Write short note on Op- Amp?
- 14) Write short note on Frequency Response?
- 15) Explain in brief Concept of Virtual ground?
- 16) Explain in brief Concept of CMRR?
- 17) Explain Frequency Response of OP- Amp?
- 18) Explain in brief Wein bridge oscillator?
- 19) Explain IC 555 with Block diagram?
- 20) Explain mono-stable multi-vibrator circuit?
- 21) Explain Open and closed loop configuration of Op- Amp?
- 22) Explain Summing and Difference Amplifier?
- 23) Explain in brief A-D conversion characteristics?
- 24) Write short note on Operational Amplifier?
- 25) Write short note on CMRR?
- 26) Write short note on Integrator?

- 27) Write short note on Butterworth filter?
- 28) Write short note on Ideal Op- Amp?
- 29) Explain a stable multi-vibrator circuit?
- 30) Explain in brief Differentiator?
- 31) Explain Characteristics of an Ideal operational Amplifier?
- 32) Explain in brief Wein bridge oscillator?
- 33) Explain in brief Frequency Response?
- 34) Explain concept of Virtual Ground.?
- 35) Explain Open and closed loop configuration of Op- Amp?
- 36) Explain in brief A-D conversion characteristics?
- 37) Explain Inverting and non-inverting amplifiers?
- 38) Write short note on Zero Crossing Detector?
- 39) Write short note on Practical Op- Amp?
- 40) Write short note on Butterworth filter?
- 41) Write short note on Comparator?
- 42) Explain Open Loop Configuration of Op-Amp?
- 43) Explain Difference between Inverting and Non- Inverting Amplifier?
- 44) Write Applications of OP- Amp?
- 45) Write Short Note on IC 555?
- 46) Difference Between Stable & Monostable Multivibrator circuits?
- 47) Write Short Note on IC 741?
- 48) Explain R-2R and D-A converters?
- 49) Difference Between ADC and DAC?
- 50) Difference between Integrator and Differentiator?



**B. Sc- I Nanoscience and Technology Semester- II Examination**  
**Digital Electronics (BNTT- 210)**  
**Question Bank**

- 1) Explain in brief octal and Hexadecimal Code?
- 2) Explain Signed and Unsigned Numbers?
- 3) Explain NAND and XOR Gate with Truth tables?
- 4) Write Basic postulates of Boolean Algebra?
- 5) Explain 2's Complement Method?
- 6) Explain in brief Universal Gates?
- 7) Explain Decimal, Binary, Octal and Hexadecimal number systems?
- 8) Explain Logic gates- OR, AND, NOT with Truth tables?
- 9) Explain Half Adder and Full Adder?
- 10) Write short note on BCD Code?
- 11) Write short note on Logic Gates?
- 12) Write short note on Boolean Algebra?
- 13) Write short note on Number System?
- 14) Write short note on Binary Number?
- 15) Explain in brief BCD Code?
- 16) Difference Between Signed and Unsigned Numbers?
- 17) Explain NOR and XNOR Gate with Truth tables?
- 18) Write Fundamental Theorems of Boolean Algebra?
- 19) Explain 1's and 2's Complement Method?
- 20) Explain in brief Half and Full Subtractor?
- 21) Explain Signed and Unsigned Numbers?
- 22) Explain Logic gates- OR, AND, NOT with Truth tables?
- 23) Explain in brief Universal Gates with Truth Table?
- 24) Write short note on Universal Gates?
- 25) Write short note on Boolean Algebra?
- 26) Write short note on Logic Gates?

- 27) Write short note on Hexadecimal Number System?
- 28) Write short note on Octal Number?
- 29) Explain in brief Half and Full Adder?
- 30) Difference between Encoders and Decoders?
- 31) Explain OR and NOT Gate with Truth tables?
- 32) Explain in brief De-multiplexers?
- 33) Explain 1's and 2's Complement Method?
- 34) Explain in brief Master-slave JK Flip-Flop?
- 35) Explain Basic postulates and fundamental theorems of Boolean algebra?
- 36) Explain Logic gates- NAND, XOR and XNOR with Truth tables?
- 37) Explain in brief Representation of signed and unsigned numbers?
- 38) Write short note on Encoders?
- 39) Write short note on Multiplexers?
- 40) Write short note on Boolean Algebra?
- 41) Write short note on Binary Number System?
- 42) Write short note on Number System?
- 43) Difference Between Encoders and Decoders?
- 44) Explain Basic Logic Gates with Diagram?
- 45) Write Short Note on Half Subtractor?
- 46) Write Short note on Full Subtractor?
- 47) Difference Between SOP and POS?
- 48) Explain Karnaugh Map of 4 variables?
- 49) Define the term Flip- Flops?
- 50) Explain 4 variables of SOP?