

Bridge Course

Duration: 6 months

SUBJECT TITLE: PHYSICS
SUBJECT CODE: PBNYS - 101

Total Number of Hrs.: 130 hours	Theory: 100 hours	Practical: 30 hours
Hrs./Week: 6 hours/week		
SCHEME OF EXAMINATION		
TOTAL MARKS: 100		
Theory: 70	Practical: 30	
Final Theory Exam	Final Practical Exam	
70	30	

Goals:

The goal of introducing physics to students is to make them understand the scientific terms of measurements of physical quantities and to orient them towards the application of physics knowledge in solving physical equations.

Course Objectives:

- Physical quantities, derived units and their measurement units in S.I, C.G.S and MKS units.
- Basic concepts of speed, laws of motion, vectors, forces, Newton's laws of gravity etc.
- Mechanism involved in fluid dynamics & thermodynamics.
- Principles of sound, waves, light, electrostatics.

Course Outcomes (Cos) :

At the end of the course, student should be able to:

- **CO 1** - Make use of units & dimensions to measure physical quantities.
- **CO 2** - Analyze & interpret the mechanism involved in work, power, speed, velocity & acceleration.
- **CO 3** - Demonstrate the skills of developing the capacitors, thermostats by using the knowledge of electrostatics.

THEORY: 100 hours

- 1. Physical World and Measurement:** **5 Hrs.**
 - a. Units and Measurements Kinematics
- 2. Kinematics:** **5 Hrs.**
 - a. Motion in a Straight Line
 - b. Motion in a Plane

3. Laws of Motion	5 Hrs.
4. Work, Energy and Power	5 Hrs.
5. Motion of System of Particles and Rigid Body:	5 Hrs.
a. System of Particles and Rotational Motion	
6. Gravitation	5 Hrs.
7. Properties of Bulk Matter:	5 Hrs.
a. Mechanical Properties of Solids	
b. Mechanical Properties of Fluids	
c. Thermal Properties of Matter	
8. Thermodynamics	5 Hrs.
9. Behaviour of Perfect Gases and Kinetic Theory of Gases: Kinetic Theory	5 Hrs.
10. Oscillations and Waves	5 Hrs.
11. Electrostatics:	5 Hrs.
a. Electric Charges and Fields	
b. Electrostatic Potential and Capacitance	
12. Current Electricity	5 Hrs.
13. Magnetic Effects of Current and Magnetism:	5 Hrs.
a. Moving Charges and Magnetism	
b. Magnetism and Matter	
14. Electromagnetic Induction and Alternating Currents	5 Hrs.
a. Electromagnetic Induction	
b. Alternating Current	
15. Electromagnetic Waves	5 Hrs.
16. Optics:	5 Hrs.
a. Ray Optics and Optical Instruments	
b. Wave Optics	
17. Dual Nature of Radiation and Matter	5 Hrs.
18. Atoms and Nuclei	5 Hrs.
19. Electronic Devices: Semiconductor Electronics: Materials, Devices and Simple Circuits	10 Hrs.

PRACTICALS: 30 hours

Experiments

1. To measure diameter of a small spherical/cylindrical body and to measure internal diameter and depth of a given beaker/calorimeter using Vernier Callipers and hence find its volume.
2. To measure diameter of a given wire and thickness of a given sheet using screw gauge.
3. To determine volume of an irregular lamina using screw gauge.
4. To determine radius of curvature of a given spherical surface by a spherometer.
5. To determine the mass of two different objects using a beam balance.
6. To find the weight of a given body using parallelogram law of vectors.
7. Using a simple pendulum, plot its graph and use it to find the effective length of second's pendulum.

8. To study variation of time period of a simple pendulum of a given length by taking bobs of same size but different masses and interpret the result.
9. To study the relationship between force of limiting friction and normal reaction and to find the co-efficient of friction between a block and a horizontal surface.
10. To find the downward force, along an inclined plane, acting on a roller due to gravitational pull of the earth and study its relationship with the angle of inclination θ by plotting graph between force and $\sin\theta$.
11. To determine Young's modulus of elasticity of the material of a given wire.
12. To find the force constant of a helical spring by plotting a graph between load and extension.
13. To study the variation in volume with pressure for a sample of air at constant temperature by plotting graphs between P and V, and between P and $1/V$.
14. To determine the surface tension of water by capillary rise method.
15. To determine the coefficient of viscosity of a given viscous liquid by measuring terminal velocity of a given spherical body.
16. To study the relationship between the temperature of a hot body and time by plotting a cooling curve.
17. To determine specific heat capacity of a given solid by method of mixtures.
18. To study the relation between frequency and length of a given wire under constant tension using sonometer.
19. To study the relation between the length of a given wire and tension for constant frequency using sonometer.
20. To find the speed of sound in air at room temperature using a resonance tube by two resonance positions.
21. To determine resistivity of two / three wires by plotting a graph for potential difference versus current.
22. To find resistance of a given wire / standard resistor using metre bridge.
23. To verify the laws of combination (series) of resistances using a metre bridge.
OR
To verify the laws of combination (parallel) of resistances using a metre bridge.
24. To determine resistance of a galvanometer by half-deflection method and to find its figure of merit.
25. To convert the given galvanometer (of known resistance and figure of merit) into a voltmeter of desired range and to verify the same.
OR
26. To convert the given galvanometer (of known resistance and figure of merit) into an ammeter of desired range and to verify the same.
27. To find the frequency of AC mains with a sonometer.
28. To find the value of v for different values of u in case of a concave mirror and to find the focal length.
29. To find the focal length of a convex mirror, using a convex lens.
30. To find the focal length of a convex lens by plotting graphs between u and v or between $1/u$ and $1/v$.
31. To find the focal length of a concave lens, using a convex lens.
32. To determine angle of minimum deviation for a given prism by plotting a graph

between angle of incidence and angle of deviation.

33. To determine refractive index of a glass slab using a travelling microscope.
34. To find the refractive index of a liquid using convex lens and plane mirror.
35. To find the refractive index of a liquid using a concave mirror and a plane mirror.
36. To draw the I-V characteristic curve for a p-n junction diode in forward and reverse bias.

Activities

1. To make a paper scale of given least count, e.g., 0.2cm, 0.5 cm.
2. To determine mass of a given body using a metre scale by principle of moments.
3. To plot a graph for a given set of data, with proper choice of scales and error bars.
4. To measure the force of limiting friction for rolling of a roller on a horizontal plane.
5. To study the variation in range of a projectile with angle of projection.
6. To study the conservation of energy of a ball rolling down on an inclined plane (using a double inclined plane).
7. To study dissipation of energy of a simple pendulum by plotting a graph between square of amplitude and time.
8. To observe change of state and plot a cooling curve for molten wax.
9. To observe and explain the effect of heating on a bi-metallic strip.
10. To note the change in level of liquid in a container on heating and interpret the observations.
11. To study the effect of detergent on surface tension of water by observing capillary rise.
12. To study the factors affecting the rate of loss of heat of a liquid.
13. To study the effect of load on depression of a suitably clamped metre scale loaded at (i) its end (ii) in the middle.
14. To observe the decrease in pressure with increase in velocity of a fluid.
15. To measure the resistance and impedance of an inductor with or without iron core.
16. To measure resistance, voltage (AC/DC), current (AC) and check continuity of a given circuit using multimeter.
17. To assemble a household circuit comprising three bulbs, three (on/off) switches, a fuse and a power source.
18. To assemble the components of a given electrical circuit.
19. To study the variation in potential drop with length of a wire for a steady current.
20. To draw the diagram of a given open circuit comprising at least a battery, resistor/rheostat, key, ammeter and voltmeter. Mark the components that are not connected in proper order and correct the circuit and also the circuit diagram.
21. To identify a diode, an LED, a resistor and a capacitor from a mixed collection of such items.
22. Use of multimeter to see the unidirectional flow of current in case of a diode and an LED and check whether a given electronic component (e.g., diode) is in working order.
23. To study effect of intensity of light (by varying distance of the source) on an LDR.
24. To observe refraction and lateral deviation of a beam of light incident obliquely on

a glass slab.

25. To observe diffraction of light due to a thin slit.
26. To study the nature and size of the image formed by a (i) convex lens, or (ii) concave mirror, on a screen by using a candle and a screen (for different distances of the candle from the lens/mirror).
27. To obtain a lens combination with the specified focal length by using two lenses from the given set of lenses.

SUBJECT TITLE: CHEMISTRY

SUBJECT CODE: PBNYS-102

Total Number of Hrs.: 130 hours	Theory: 100 hours	Practical: 30 hours
Hrs./Week: 6 hours/week		
SCHEME OF EXAMINATION		
TOTAL MARKS: 100		
Theory: 70	Practical: 30	
Final Theory Exam	Final Practical Exam	
70	30	

Goals:

The goal of introducing Chemistry to students is to make them understand about atoms, elements, molecules, compounds and their bonding, reactivity to attain stability.

Course Objectives:

- Some basic concepts of chemistry, structure of atom and its sub- atomic particles
- Theories of chemical bonding, chemical reactions and equilibrium.
- Principles and techniques in Organic chemistry, IUPAC NOMENCLATURE.
- Process of extraction and isolation of elements and minerals from the ores.
- General characteristics of state of matter.

Course Outcomes (Cos) :

At the end of the course student should be able to:

- **CO 1** - Make use of indicators to Identify acids, bases and salts.
- **CO 2** - Application of radioactivity in X-rays for clinical purpose
- **CO 3** - Preparation of hydrocarbons, hydrogen peroxide, caustic soda and their uses in day-to-day life.
- **CO 4** - Balancing the chemical reaction by application of properties of elements and its periodicity.

THEORY - 100 HRS

1. Some Basic Concepts of Chemistry	5 Hrs.
2. Structure of Atom	5 Hrs.
3. Classification of Elements and Periodicity in Properties	5 Hrs.
4. Chemical Bonding and Molecular Structure	5 Hrs.
5. Chemical Thermodynamics	5 Hrs.
6. Equilibrium	5 Hrs.

7. Redox Reactions	5 Hrs.
8. Organic Chemistry: Some basic Principles and Techniques	5 Hrs.
9. Hydrocarbons	5 Hrs.
10. Solutions	5 Hrs.
11. Electrochemistry	5 Hrs.
12. Chemical Kinetics	5 Hrs.
13. d -and f -Block Elements	5 Hrs.
14. Coordination Compounds	5 Hrs.
15. Haloalkanes and Haloarenes	5 Hrs.
16. Alcohols, Phenols and Ethers	5 Hrs.
17. Aldehydes, Ketones and Carboxylic Acids	5 Hrs.
18. Amines	5 Hrs.
19. Biomolecules	10 Hrs.

PRACTICALS: 30 hours

- 1) Basic Laboratory Techniques
 1. Cutting glass tube and glass rod
 2. Bending a glass tube
 3. Drawing out a glass jet
 4. Boring a cork
- 2) Characterization and Purification of Chemical Substances
 1. Determination of melting point of an organic compound.
 2. Determination of boiling point of an organic compound.
 3. Crystallization of impure sample of any one of the following: Alum, Copper Sulphate, Benzoic Acid.
- 3) Experiments based on pH
 1. Any one of the following experiments:
 - Determination of pH of some solutions obtained from fruit juices, solution of known and varied concentrations of acids, bases and salts using pH paper or universal indicator.
 - Comparing the pH of solutions of strong and weak acids of same concentration.
 - Study the pH change in the titration of a strong base using a universal indicator.
 2. Study the pH change by common-ion in case of weak acids and weak bases.
- 4) Chemical Equilibrium

Any one of the following experiments:

 - Study the shift in equilibrium between ferric ions and thiocyanate ions by increasing/decreasing the concentration of either of the ions.
 - Study the shift in equilibrium between $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$ and chloride ions

by changing the concentration of either of the ions.

5) Quantitative Estimation

1. Using a mechanical balance/electronic balance.
2. Preparation of standard solution of Oxalic acid.
3. Determination of strength of a given solution of Sodium hydroxide by titrating it against standard solution of Oxalic acid.
4. Preparation of standard solution of Sodium carbonate.
5. Determination of strength of a given solution of hydrochloric acid by titrating it against standard Sodium Carbonate solution.

6) Surface Chemistry

1. Preparation of one lyophilic and one lyophobic sol
Lyophilic sol - starch, egg albumin and gum
Lyophobic sol – aluminum hydroxide, ferric hydroxide, arsenous sulphide.
2. Dialysis of sol-prepared in (a) above.
3. Study of the role of emulsifying agents in stabilizing the emulsion of different oils.

7) Chemical Kinetics

1. Effect of concentration and temperature on the rate of reaction between Sodium Thiosulphate and Hydrochloric acid.
2. Study of reaction rates of any one of the following:
 - Reaction of Iodide ion with Hydrogen Peroxide at room temperature using different concentration of Iodide ions.
 - Reaction between Potassium Iodate, (KIO₃) and Sodium Sulphate: (Na₂SO₃) using starch solution as indicator (clock reaction).

8) Thermochemistry

Any one of the following experiments

- Enthalpy of dissolution of Copper Sulphate or Potassium Nitrate.
- Enthalpy of neutralization of strong acid (HCl) and strong base (NaOH).
- Determination of enthalpy change during interaction (Hydrogen bond formation) between Acetone and Chloroform.

9) Electrochemistry

Variation of cell potential in $\text{Zn/Zn}^{2+} \parallel \text{Cu}^{2+}/\text{Cu}$ with change in concentration of electrolytes (CuSO₄ or ZnSO₄) at room temperature.

10) Chromatography

1. Separation of pigments from extracts of leaves and flowers by paper chromatography and determination of R_f values.
2. Separation of constituents present in an inorganic mixture containing two

cations only (constituents having large difference in R_f values to be provided).

11) Preparation of Inorganic Compounds

1. Preparation of double salt of Ferrous Ammonium Sulphate or Potash Alum.
2. Preparation of Potassium Ferric Oxalate.

12) Preparation of Organic Compounds

Preparation of any one of the following compounds

1. Acetanilide
2. Di-benzalAcetone
3. p-Nitroacetanilide
4. Aniline yellow or 2 - Naphthol Aniline dye.

13) Tests for the functional groups present in organic compounds Unsaturation, alcoholic, phenolic, aldehydic, ketonic, carboxylic and amino (Primary) groups.

14) Characteristic tests of carbohydrates, fats and proteins in pure samples and their detection in given foodstuffs.

15) Determination of concentration/ molarity of KMnO₄ solution by titrating it against a standard solution of:

1. Oxalic acid,
2. Ferrous Ammonium Sulphate

(Students will be required to prepare standard solutions by weighing themselves).

16) Qualitative analysis Determination of one anion and one cation in a given salt :

Cations: **Pb²⁺** , **Cu²⁺** , **Al³⁺** , **Fe³⁺** , **Mn²⁺** , **Ni²⁺** , **Zn²⁺** , **Co²⁺** , **Ca²⁺** , **Sr²⁺** **Ba²⁺** , **Mg²⁺** , **NH⁴⁺** .

Anions: **CO₃²⁻** , **S²⁻** , **SO₃²⁻** , **NO₃⁻** , **NO₂⁻** , **Cl⁻** , **Br⁻** , **I⁻** , **SO₄²⁻** , **PO₄³⁻** , **CH₃COO⁻** , **C₂O₄²⁻** .

SUBJECT TITLE: BIOLOGY
SUBJECT CODE: PBNYS-103

Total Number of Hrs.: 130 hours	Theory: 100 hours	Practical: 30 hours.
Hrs./Week: 6 hours/week		
SCHEME OF EXAMINATION		
TOTAL MARKS: 100		
Theory: 100		Practical: 30
Final Theory Exam		Final Practical Exam
70		30

Goals:

The goal of introducing biology to students is to make them understand about living world, process of evolution, classifications of animal and plant kingdoms, bio-diversity & ecosystem.

Course Objectives:

- Living world, its characteristics of growth, evolution,
- Structure and function of the cell and its organelles.
- Digestion, absorption and assimilation of nutrients and its consequences of malnutrition.
- Molecular mechanism of gene expression, regulation and mutations
- Various aspects of metabolism and their regulatory pathways.

Course Outcomes (Cos) :

At the end of the course, the student should be able to demonstrate and understanding:

- **CO 1** - To analyze the nutritional status in health and disease
- **CO 2** - Demonstrate the skill of prevention in air pollution, sound pollution and soil pollution. There by preventing the diseases in human beings.

THEORY- 100 HOURS

- | | |
|---|----------------|
| 1. Diversity of Living Organisms: <ul style="list-style-type: none"> a. The Living World b. Biological Classification c. Plant Kingdom d. Animal Kingdom | 10 Hrs. |
| 2. Structural Organization in Plants and Animals: <ul style="list-style-type: none"> a. Morphology of Flowering Plants b. Anatomy of Flowering Plants c. Structural Organisation in Animals | 10 Hrs. |
| 3. Cell: Structure and Function: | 10 Hrs. |

- a. Cell-The Unit of Life
- b. Biomolecules
- c. Cell Cycle and Cell Division
- 4. Plant Physiology: 10 Hrs.**
 - a. Photosynthesis in Higher Plants
 - b. Respiration in Plants
 - c. Plant - Growth and Development
- 5. Human Physiology: 10 Hrs.**
 - a. Breathing and Exchange of Gases
 - b. Body Fluids and Circulation
 - c. Excretory Products and their Elimination
 - d. Locomotion and Movement
 - e. Neural Control and Coordination
 - f. Chemical Coordination and Integration
- 6. Reproduction: 10 Hrs.**
 - a. Sexual Reproduction in Flowering Plants
 - b. Human Reproduction
 - c. Reproductive Health
- 7. Genetics and Evolution: 10 Hrs.**
 - a. Principles of Inheritance and Variation
 - b. Molecular Basis of Inheritance
 - c. Evolution
- 8. Biology and Human Welfare: 10 Hrs.**
 - a. Human Health and Diseases
 - b. Microbes in Human Welfare
- 9. Biotechnology and its Applications: 10 Hrs.**
 - a. Biotechnology - Principles and Processes
 - b. Biotechnology and its Applications
- 10. Ecology and Environment: 10 Hrs.**
 - a. Organisms and Populations
 - b. Ecosystem
 - c. Biodiversity and its Conservation

PRACTICALS: 30 hours

1. Study of microscope, microscopic study of typical cell,
2. Study of common medical devices (stethoscope, sphygmomanometer, thermometer, oxygen cylinder),
3. Charts and models of organs and organ system (digestive, respiratory, circulatory, reproductive, excretory, nervous)

A. List of Experiments

1. Study and describe locally available common flowering plants, from family Solanaceae (Poaceae, Asteraceae or Brassicaceae can be substituted in case of particular geographical location) including dissection and display of floral whorls, anther and

ovary to show number of chambers (floral formulae and floral diagrams), type of root (tap and adventitious); type of stem (herbaceous and woody); leaf (arrangement, shape, venation, simple and compound).

2. Preparation and study of T.S. of dicot and monocot roots and stems (primary).
3. Study of osmosis by potato osmometer.
4. Study of plasmolysis in epidermal peels (e.g. *Rhoeo*/lily leaves or flashy scale leaves of onion bulb).
5. Study of distribution of stomata on the upper and lower surfaces of leaves.
6. Comparative study of the rates of transpiration in the upper and lower surfaces of leaves.
7. Test for the presence of sugar, starch, proteins and fats in suitable plant and animal materials.
8. Separation of plant pigments through paper chromatography.
9. Study of the rate of respiration in flower buds/leaf tissue and germinating seeds.
10. Test for presence of urea in urine.
11. Test for presence of sugar in urine.
12. Test for presence of albumin in urine.
13. Test for presence of bile salts in urine.
14. Prepare a temporary mount to observe pollen germination.
15. Study the plant population density by quadrat method.
16. Study the plant population frequency by quadrat method.
17. Prepare a temporary mount of onion root tip to study mitosis.
18. Isolate DNA from available plant material such as spinach, green pea seeds, papaya, banana etc.

B. Study and Observe the following (spotting):

1. Parts of a compound microscope.
2. Specimens/slides/models and identification with reasons - Bacteria, *Oscillatoria*, *Spirogyra*, *Rhizopus*, mushroom, yeast, liverwort, moss, fern, pine, one monocotyledonous plant, one dicotyledonous plant and one lichen.
3. Virtual specimens/slides/models and identifying features of - *Amoeba*, *Hydra*, liver fluke, *Ascaris*, leech, earthworm, prawn, silkworm, honey bee, snail, starfish, shark, rohu, frog, lizard, pigeon and rabbit.
4. Mitosis in onion root tip cells and animal's cells (grasshopper) from permanent slides.
5. Types of inflorescence (cymose and racemose).
6. Human skeleton and different types of joints with the help of virtual images/models only.
7. Flowers adapted to pollination by different agencies (wind, insects, birds).
8. Pollen germination on stigma through a permanent slide or scanning electron micrograph.
9. Identification of stages of gamete development, i.e., T.S. of testis and T.S. of ovary through permanent slides (from grasshopper/mice).
10. Meiosis in onion bud cell or grasshopper testis through permanent slides.
11. T.S. of blastula through permanent slides (Mammalian).
12. Mendelian inheritance using seeds of different colour/sizes of any plant.
13. Prepared pedigree charts of any one of the genetic traits such as rolling of tongue, blood

groups, ear lobes, widow's peak and colour blindness.

14. Controlled pollination - emasculation, tagging and bagging.
15. Common disease-causing organisms like *Ascaris*, *Entamoeba*, *Plasmodium*, any fungus causing ringworm through permanent slides, models or virtual images or specimens. Comment on symptoms of diseases that they cause.
16. Model's specimens showing symbiotic association in lichens, root nodules of leguminous plants, and parasitic mode of nutrition shown by *Cuscuta* on host.
17. Flash cards / models showing examples of homologous and analogous organs.

SUBJECT TITLE: SANSKRIT
SUBJECT CODE: PBNYS-104

Total Number of Hrs.: 70 hours	Theory: 70 hours	Practical
Hrs./Week: 4hours/week		
SCHEME OF EXAMINATION		
TOTAL MARKS: 100		
Theory: 100		Practical: 30
Final Theory Exam	Viva Voce	
70	30	

GOALS AND OBJECTIVES

Goal:

The goal of teaching Sanskrit to undergraduate students is to provide a comprehensive knowledge of Sanskrit in order to be able to study, understand, comprehend and utilize the knowledge contained in Indian traditional texts in their professional practice, especially in the field of Yoga.

Course Objectives:

- Demonstrate knowledge of complete Sanskrit script;
- Describe kinds of nouns, verbs, pronouns, etc. with examples;
- Illustrate kinds of gender, number, and declensions employed in Sanskrit,
- Demonstrate skill in pronunciation of different kinds of Sanskrit words, phrases and sentences.

Course Outcomes (Cos) :

After the completion of the course, the student shall be able to

- **CO 1** - Read and understand Sanskrit with respect to script and basic grammar.
- **CO 2** - Familiarize themselves with various texts and compositions such as Madhurashtakam, Vaidyakeeyasubhashitasahityam, etc.;
- **CO 3** - Speak fluently in Sanskrit after having learnt the various peculiar pronunciations.

THEORY (70Hours.)

इकाई- प्रथमा

(20 Hrs)

1. वर्णोच्चारण शिक्षा (वर्ण, शब्द)
2. रचनानुवाद कौमुदी- (1-15 अभ्यासः)
3. माहश्चेरसूत्राणि

इकाई- द्वितीया

(15 Hrs.)

1. संज्ञा-प्रकरणम् गुणः, वृद्धिः, संहिता, धातुः, संयोगः ह्रस्व दीर्घ प्लुतः, अनुनासिकः, पदम् उपसर्गः
2. कारक-प्रकरणम्-वि भक्ति वचनम् (संक्षिप्त-पाठनम्)

इकाई - तृतीया

(20 Hrs.)

1. सुबन्त प्रकरणम् - अकारान्त पुल्लिङ्ग आकारान्त स्त्रीलिङ्ग
2. तिङन्त प्रकरणम् (परस्मैपदम्)
3. अव्यय-प्रकरणम् . च, सह, सार्धम्, अपि, खलु, एव

इकाई -चतुर्थी

(15 Hrs.)

1. निबन्धाः- संस्कृत भाषा, गीता सुगीता कर्तव्या आरोग्यम्,

Recommended books:

1. Vyakarna Pravesha
2. Prarambhik Rachana anuvad kaumidi, Kapil ji
3. Vivek Vairagya Shloka sanghrah
4. Shreemad Bhagwat Geeta
5. Vadik Shukta Sangharh
6. Vaman Sivaram Apte, Samskrata – English Dictionary, Samskrata Academy