BHARATHIAR UNIVERSITY, COIMBATORE

ALLIED PHYSICS PAPER FOR B. Sc MATHS / CHEMISTRY
2007-2008 BATH AND ONWARDS

ALLIED PHYSICS PAPER I

No.of Credit Hours: 4 per week

Subject Description:
This paper presents the basic principles of mechanics, heat and sound. This paper gives the Knowledge of depth for students regarding the motion of the particles, liquids and the propagation of heat and sound waves.

Goal:
To enable the students in order to learn the basic principles, theory and concepts of mechanics, heat and sound.

Objectives
To give the description for the students in order to
Learn motion of rigid bodies.
Acquire basic knowledge of heat energy.
Know about the propagation of sound waves.
Get a depth of knowledge of physics in day today life.

UNIT - I
Gravitation: Newton’s law of Gravitation-Determination of G by Boy’s method-
mass and density of earth – acceleration due to gravity- Determination of g by
compound pendulum.

Elasticity: Basic concepts – bending of beams – depression of cantilever-
Determination of Y by uniform and non-uniform bending method- Torsion in a wire-
Determination of rigidity modulus by torsional pendulum.

UNIT II
Heat and thermodynamics: Vanderwaal’s equation of state-critical constants of a
gas-derivation of critical constants in terms of Vanderwaal’s contants – Joule –
Thomson – effect – Theory of J-K effect – liquefaction of gases – Dewar’s method
and K-Onnes method.- properties of liquid Helium I and II.

Sound: Doppler effect – derivation and applications – determination of frequency of
alternating current by Sonometer – Ultrasonics – production, properties and
applications
UNIT III


UNIT IV

Electricity: Conversion of Galvanometer into Ammeter and voltmeter – figure of merit of a galvanometer – Ballistic Galvanometer – theory and charge of sensitiveness – measurement of capacitance – measurement of Thermo EMF and resistance by potentiometer – applications of electromagnetic induction - Transformers – theory, energy loss and applications

UNIT V

Magnetism: Basic concepts of magnetic materials – magnetic properties of Dia, Para and Ferro magnetic materials – Area of (B-H) loop – electric and magnetic circuits – Curie temperature – applications of Ferrites in computer memory

Books for references:

1. Properties of matter and sound – Brijlal subramaniam
2. Properties of matter and sound – R. Murugesan
4. Solar Energy Utilization – Sukhatme
5. Heat and Thermodynamics -- Brijlal subramaniam
6. Heat and Thermodynamics – Narayananamurthi and Nagarathinam
7. Sound -- Brijlal subramaniam
8. Sound – R.L. Seihgal
9. Electricity and magnetism — R. Murugesan
10. Electricity and magnetism — Narayananamurthi and Nagarathinam
11. Electricity and magnetism -- Brijlal subramaniam
ALLIED PHYSICS PAPER FOR B.Sc MATHS / CHEMISTRY 2007-2008 BATH AND ONWARDS

ALLIED PHYSICS PAPER II

No. of Credit Hours: 4 per week

Subject Description:
This paper presents the basic principles of mechanics, heat and sound. This paper gives the Knowledge of depth for students regarding the motion of the particles, liquids and the propagation of heat and sound waves.

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UNIT -I
Modern physics: Photo electric effect – Einstein’s photo electric equation – verification of Einstein’s photo electric equation by Millican’s experiment – photo electric cells – applications


UNIT -II

UNIT III

UNIT IV
UNIT V

Integrated Electronics: Steps in fabrication of Monolithic IC’s – General applications of IC’s – operational amplifiers as an adder and substractor.


BOOKS FOR REFERANCE
1. Modern physics – R. Murugesan
2. Engineering physics – Gaur & Gupta
3. Engineering physics – M. Arumugam
4. Laser Physics – Thiagarajan
5. Principles of Electronics – V.K. Metha
6. Basic Electronics – B.L. Theraja
7. Fundamentals of digital computers – Bartee
8. Digital principles and Applications – Malvino & Leech

ALLIED PHYSICS PRACTICALS
FOR B.SC (MATHS/CHEMISTRY)
2007-2008 BATCH AND ONWARDS

LIST OF EXPERIMENTS  (ANY 12 EXPERIMENTS ONLY)
1. Acceleration due to gravity-Compound pendulum method
2. Moment of inertia – Torsional pendulum method
3. Young’s modulus - Uniform bending - Optic lever method
4. Young’s modulus - Non-uniform bending - Pin and microscope
5. Rigidity modulus – Static torsion method.
6. Frequency of A.C - Sonometer
7. Thermal conductivity - Lee’s disc method.
8. Refractive index of a solid prism - Spectrometer
9. Refractive conductivity index of a liquid prism – Spectrometer
10. (i-d) curve - solid prism - Spectrometer
11. Wavelengths of spectral lines – Grating - Normal incidence - Spectrometer
12. Wavelength of spectral lines – Grating - Minimum deviation - Spectrometer
15. Surface tension - Drop weight method
16. Low range voltmeter calibration - Potentiometer
17. Low range ammeter calibration - Potentiometer
18. Construction of IC regulated power supply
19. Characteristics of Pn Junction diode
20. Characteristics of Zener diode
21. Construction of Hartley oscillator
22. Construction of Colpitt’s oscillator
23. Verification of truth tables of logic gates
1. According to Newton’s law of gravitation, the force of attraction between any two bodies is
   a) Inversely proportional to the product of their masses.
   b) directly proportional to the product of their masses.
   c) equal to the product of their masses
   d) equal to the sum of their masses.

2. The value of $G$ by Boy’s method was
   a) $6.6576 \times 10^{-11}$ N$m^2$ Kg$^{-2}$
   b) $6.6576 \times 10^{-11}$ N$m^2$ Kg$^{-3}$
   c) $6.6056 \times 10^{-11}$ N$m^2$ Kg$^{-2}$
   d) $6.6576 \times 10^{-12}$ Nm$^2$ Kg$^{-2}$

3. For a beam of rectangular cross section, moment of inertia $I_g$ is
   a) $bd^3$
   b) $bd^3/6$
   c) $bd^3/12$
   d) $bd^3/4$

4. Period of a Torsional pendulum $T$ is
   a) $2 \pi \sqrt{l/c}$
   b) $2 \pi \sqrt{1/c}$
   c) $2 \pi \sqrt{c/l}$
   d) $\frac{1}{2} \pi \sqrt{l/e}$

5) The Critical Temperature is given by
   a) $3b$
   b) $a/27b^2$
   c) $8a/27Rb$
   d) $8/3$

6) Linde’s process can be used to liquefy
   a) Oxygen
   b) Air
   c) Ethylene
   d) Nitrogen

7) The unit of solar constant is
   a) Js$^{-1}$m$^{-2}$
   b) Js$m^{-2}$
   c) Js$^{-1}$m$^{-1}$
   d) Js$^{-2}$m$^{-2}$

8) The device used to measure the solar radiation is called
   a) Pyranometer
   b) Pyroheliometer
   c) Solar collectors
   d) Solar cells

9) The first solar cooker was developed by
   a) Angstrom
   b) Abbot
   c) Eppley
   d) Ghosh
10) Figure of merit of a ballistic Galvanometer is related to
   a) Current   b) Voltage
   c) Resistance  d) Inductance

11) The Thermo emf produced by Copper – Constantan couple is of the order of
   a) microvolts  b) millivolts
   c) volts      d) centivolts

12. Transformer is based on
    a) self inductance  b) Resonance circuits
    c) mutual induction  d) Transistor action

13. Bismuth is an example of
    a) Diamagnetic  b) Paramagnetic
    c) Ferromagnetic  d) Ferrimagnetic

14) Area of B-H curve is an indication of
    a) Energy loss/cycle  b) magnetism lost
    c) Magnetism gained  d) magnetic induction

15) The reluctance in a magnetic circuit is proportional to
    a) $l$  b) $l/a$
    c) $a/l$  d) $1/\mu$

SECTION – B   
(5x4=20)

16) (a) Define Newton’s law of gravitation and also mention the value of gravitational
    constant   (or)

    (b) Define Neutral axis. Explain bendingcouple and internal bending moment.

17 (a) How can you differentiate temperature of inversion and critical temperature.
    (or)

    (b) Write the important properties of ultrasonic waves.

18 (a) Describe the working of Angstrom pyrheliometer.
    (or)

    (b) What are the general applications of solar energy.

19) (a) Briefly explain the charge sensitiveness of a ballistic galvanometer and state its unit.
    (or)

    (b) Explain thermo emf and thermo electric power.

20. (a) What do you understand by electric circuits and magnetic circuits
    (or)

    (b) Outline the properties of Diamagnetic materials.

SECTION :C   
(5X8=40)

21. (a) With a Neat Sketch, how can you determine the value of acceleration due to gravity $g$
    by using Boy’s method.

    (or)
(b) How will you determine the rigidity modulus of the material of the wire by using torsional oscillation method.

22. (a) Define critical constants. How will you obtain the values of critical constants in terms of vanderwaal’s constants.

(or)

(b) How can you produce ultrasonic waves by using the principle of piezo-electric effect and mention some of the important applications of ultrasonic waves.

23. (a) With a Neat diagram, explain the construction and working of a solar flat plate collector. Mention some of its advantages and disadvantages.

(or)

(b) Explain the principle, construction and operation of a solar photovoltaic cell with a suitable sketch.

24. (a) Describe the method of measuring Thermo emf by potentiometer.

(or)

(b) Describe with necessary theory, the construction and action of a transformer.

25. (a) Compare the magnetic properties of dia, para and ferro magnetic materials in detail.

(or)

(b) Calculate the work done in taking a unit volume of a magnetic material through a complete cycle of magnetization.
5. Nucleon refers to the
   a) nucleus
   b) proton
   c) neutron
   d) both (b) and (c)

6. Complete the following nuclear reaction
   \[ _{17}^{35}\text{Cl} + \text{---------} \rightarrow _{16}^{32}\text{S} + _2^4\text{He} \]
   a) \( _1^1\text{H} \)
   b) \( _0^1\text{n} \)
   c) \( _1^2\text{H} \)
   d) \( _2^4\text{He} \)

7. In population inversion,
   a) number of atoms in the ground state is more
   b) number of atoms in the excited state is more
   c) number of atoms same in both states.
   d) number of atoms are different in both states

8. Stokes lines have a wavelength
   a) greater than that of the parent line.
   b) less than that of the parent line
   c) equal to that of the parent line
   d) equal to zero.

9. Helium – Neon laser is a _______ level laser
   a) two
   b) three
   c) four
   d) five

10. Light emitting diodes are made up of
    a) Silicon
    b) Gallium Arsenide
    c) Germanium
    d) Carbon

11. Zener diode is used as a
    a) rectifier
    b) filter
    c) voltage regulator
    d) amplifier

12. The frequency deviation in frequency modulation is directly proportional to
    a) \( E_m \)
    b) \( f_{min} \)
    c) \( W_m \)
    d) \( E_c \)

13. Monolithic Ic’s are fabricated within
    a) soft stone
    b) Single stone
    c) silicon layer
    d) Ceramic base

14. According to the law of Boolean algebra, \((1+1)\) equals
    a) 0
    b) 1
    c) 0 (or) 1
    d) None of these

15. The only function of a NOT gate is to
    a) stop signal
    b) recombine a signal
    c) invert an input signal
    d) magnify an input signal
SECTION-B

16. (a) How does a photoemissive cell works?
  (or)
  (b) Derive the expression for deBroglie wavelength

17. (a) What are Nuclear forces. Mention their important properties.
  (or)
  (b) Explain the Artificial transmutation by $\alpha$ - particles

18. (a) Explain spatial and temporal coherence
  (or)
  (b) Describe the conditions for laser action.

19. (a) Give the principle of antennas.
  (or)
  (b) What are the important applications of RADAR

20. (a) What do you mean by an Integrated circuits? Write some of its advantages.
  (or)
  (b) Describe the working of a half adder with suitable circuit diagram

SECTION – C

21. (a) Describe Millikan’s experimental verification of photo electric laws.
  (or)
  (b) Explain how the wave nature of matter is verified by G.P. Thomson’s experiment.

22. (a) With a Neat sketch, explain the construction and working of a betatron.
  (or)
  (b) Write an essay on elementary particles.

23. (a) Describe with suitable diagram the working of the He-Ne Laser.
  (or)
  (b) Explain the elementary theory of Raman effect.

24. (a) Explain with a circuit, the characteristics of zener diode and also its function in the construction of voltage regulator.
  (or)
  (b) Explain with a block diagram, the different stages of a superheterodyne receiver.

25. (a) Describe the various steps involved in the fabrication of Integrated Circuits.
  (or)
  (b) State and prove DeMorgan’s theorems.