



Mahila Vikas Sanstha's

**INDRAPRASTHA NEW ARTS  
COMMERCE & SCIENCE  
COLLEGE,** AT POST NALWADI, DIST. WARDHA (M.S.)

Accredited 'B' by NAAC

Approved by government  
of Maharashtra

Affiliated to Rashtrasant Tukadoji  
Maharaj Nagpur University, Nagpur

Recognised by U.G.C New Delhi  
under section 2 (f) & 12 (b) of  
UGC act 1956

## Bsc Physic Sem - II

### Paper 1 (Oscillations, Kinetic theory of gases and Thermodynamics)

#### Question Bank

##### Unit 1

1. What are Lissajous figures? Obtain an expression for resultant of two linear S.H.M. of frequencies  $\omega_1$  and  $\omega_2$  and of different amplitudes, different phases.
2. What is Restoring force? Obtain an expression for differential equation of linear simple harmonic oscillator.
3. For a damped harmonic oscillator show that average power dissipation is given by  $P_{\text{diss}} = 2bE$ .
4. Explain how Lissajous' figures can be demonstrated using CRO.
5. Show that for damped harmonic oscillator, total energy decreases exponentially with time.
6. What are the damped vibrations ? Obtain the differential equation of motion for damped harmonic oscillator and obtain an equation for its displacement.
7. Discuss the cases of critically damped motion and dead beat motion.
8. Derive an expression for K.E. and P.E. for a particle performing S.H.M.
9. Find the equation for resultant motion of a particle when it is subjected by two perpendicular S.H.M.s having same frequency but different amplitudes and phases.
10. What is damped harmonic oscillator? Derive the differential equation for it and obtain an equation for its displacement.
11. Obtain an expression for power dissipated in damped harmonic oscillators.
12. Define simple harmonic motion. Obtain general differential equation of simple harmonic motion
13. Show that the resultant of two SHMs at right angles to each other having equal periods and amplitudes but phase difference  $90^\circ$  is a circle.

##### Unit 2

1. Derive the differential equation of forced harmonic oscillator. Solve the differential equation to obtain steady state solution.
2. What is amplitude resonance ? Explain the effect of damping on it.
3. What is quality factor ? Give the physical significance of quality factor of forced oscillator
4. What is piezoelectric effect ? Discuss one of its application.
5. Obtain the differential equation for forced harmonic oscillations and deduce its general solution.
6. Derive an expression for the power absorbed by a forced oscillator.
7. Explain amplitude resonance in the forced oscillations.
8. What is forced oscillator ? Establish the differential equation for a forced oscillator. Distinguish between free and forced oscillations.
9. Explain the variation of amplitude with driving force frequency in a forced oscillation.
10. What is quality factor ? Give the physical significance of quality factor of a forced oscillator.



Mahila Vikas Sanstha's

**INDRAPRASTHA NEW ARTS  
COMMERCE & SCIENCE  
COLLEGE,** AT POST NALWADI, DIST. WARHDA (M.S.)

Accredited 'B' by NAAC

Approved by government  
of Maharashtra

Affiliated to Rashtrasant Tukadoji  
Maharaj Nagpur University, Nagpur

Recognised by U.G.C New Delhi  
under section 2 (f) & 12 (b) of  
UGC act 1956

11. Write the expression for displacement of a particle performing forced oscillations. Show that maximum

12. displacement is given by  $A_{\max} = \frac{f}{2b\sqrt{w^2 - p^2}}$

### Unit 3

1. Define viscosity. Obtain an expression for coefficient of viscosity in terms of mean free path of the molecules.
2. Obtain an expression for critical temperature, critical pressure and critical volume for a real gas.
3. Define mean free path. Discuss the effect of temperature and pressure on mean free path.
4. State and prove the law of equipartition of energy.
5. State van der Waals' equation of State of a real gas. What are its limitations ?
6. Explain the transport phenomenon of gases. Derive an expression for coefficient of viscosity of gas molecules. Hence discuss the effect of temperature and molecular size of the gas molecules.
7. State and prove the Law of equipartition of energy.
8. Define :
  - 1) Mean free path
  - 2) Collision cross section
  - 3) Van der Waals coefficient.
9. What are the transport phenomena in gases? Derive an expression for coefficient of diffusion of a gas.
10. State and prove law of equipartition of energy.
11. Define mean free path. Discuss the effect of temperature and pressure on mean free path.
12. Derive the expression for coefficient of viscosity of gas on the basis of transport phenomenon of gas.

### Unit 4

1. What is Joule-Thomson effect ? Derive the expression for Joule-Thomson co-efficient.
2. Define entropy. Show that change in entropy in reversible cycle is zero
3. Write down the difference between reversible process and irreversible process.
4. State first law of thermodynamics. Give the importance and limitations of it.
5. Show that in irreversible process, entropy always increases.
6. Explain intensive and extensive thermodynamic variables with suitable examples.
7. Explain Carnot's heat engine. Deduce an expression for total work done in a cycle.

State : First law of thermodynamics , Carnot's theorems.

8. What is a heat engine ? Describe Carnot's ideal heat engine with a neat diagram.
9. B Define 'entropy'. Give its physical significance.
10. Define mean free path. Discuss the effect of temperature and pressure on mean free path



**Mahila Vikas Sanstha's**

# **INDRAPRASTHA NEW ARTS COMMERCE & SCIENCE COLLEGE,**

AT POST MALWADI, DIST. WARDHA (M.S.)

**Accredited 'B' by NAAC**

Approved by government  
of Maharashtra

Affiliated to Rashtrasant Tukadoji  
Maharaj Nagpur University, Nagpur

Recognised by U.G.C New Delhi  
under section 2 (f) & 12 (b) of  
UGC act 1956