LEARNING OUTCOMES

1. Physical World

On successful completion of the chapter, the learner:

1.1. Defines science and physics
1.2. List steps involving scientific methods
1.3. Lists different branches of Physics
1.4. Explains and compares fundamental forces in nature.

2. Units and Measurements

2.1. Defines, classifies fundamental and derived units
2.2. List the different units and their symbols used in SI
2.3. Performs experiments to find large distance as well as the molecular size
2.4. Recognizes the range of length, mass and time
2.5. Explains light year, AU and parsec
2.6. Defines accuracy, precision and least count
2.7. Performs experiments of vernier calipers and screw gauge
2.8. Classifies different types of errors and solves problems related with errors in measurements
2.9. Identifies the number of significant figures of a number
2.10. Solves problems related with significant figures and rounding off in arithmetic operations
2.11. Selects appropriate dimensions of different physical quantities
2.12. Uses principle of homogeneity to check the correctness of equations and to deduce the relation among the physical quantities

3. Motion in a straight line

3.1. Defines frame of reference, motion, rectilinear motion and Kinematics
3.2. Explains position, pathlength and displacement and Interprets position-time graph
3.3. Distinguishes average speed and velocity.
3.4. Solves numerical problems of average speed and velocity.
3.5. Draws position-time graph and interprets it.

3.6. Solves numerical problems of instantaneous speed and velocity.

3.7. Formulates the concept that for uniform motion, velocity is same as the average velocity at all instants.

3.8. Establishes the relation between velocity and distance.

3.9. Draws and interprets (a-t) and (x-t) graphs

3.10. Solves numerical problem related with acceleration.

3.11. Formulates equations of kinematics using (v-t) graph.

3.12. Solves problems related with kinematic equations.

3.13. Applies the kinematic equations to different cases of free fall

3.14. Develops Galileo's law of Odd numbers, stopping distances of vehicles, concept of reaction time and solves problems related with them.

3.15. Explains relative velocity, draws graphs and solves problems related to it.

4. Motion in a Plane

4.1. Defines and distinguishes scalars and vectors, cites examples, explains multiplication of vectors by real numbers and classifies different types of vectors.

4.2. Describes Addition of Vectors (Triangle and Parallelogram methods of vector addition) and subtraction of vectors. (graphical method) ,solves numerical problems related with it and chooses the properties of vector addition and subtraction.

4.3. Explains resolution of vectors and solves numerical problems related with it.

4.4. Defines unit vectors and orthogonal unit vectors

4.5. Explains Rectangular components of vectors and solves numerical problems related with it.

4.6. Explains Vector addition by analytical method

4.7. Formulates Laws of sines and cosines using method of Parallelogram and solving numerical problems related with it

4.8. Explains Position vector, displacement, velocity and acceleration in a plane through graphical method and solves numerical problems related with them.

4.9. Explains Motion in plane with constant acceleration

4.10. Describes Relative velocity in two dimensions and solves problems related with it.

4.11. Discusses projectile motion, its trajectory, writes the derivations for maximum height, time of flight and horizontal range and solves problems related with them.

4.12. Describes uniform circular motion, writes the derivations for centripetal acceleration, angular speed, time period and frequency and solves numerical problems related with them.

5. Laws of Motion

5.1. Demonstrates Galileo's experiment on double inclined plane and explains the flaw of Aristotle's principle

5.2. Defines force and Inertia

5.3. Cites examples where inertia is utilized.

5.4. States Newton's first law of motion

5.5. Explain Newtons II Law of motion and formulates the equation for force.

5.6. Explains Newton's third law citing examples

5.7. States the law of conservation of momentum, citing examples from daily life situation and solves numerical problems

5.8. Explains the condition for equilibrium

5.9. Determines the mass of given body using Concurrent forces

5.10. Defines friction, Classifies the types of friction and explains why ball bearing are used.

5.11. States the laws of friction

5.12. Explains friction as a necessary evil

5.13. Collects data of advantages and disadvantages of friction and suggests methods to reduce friction in different situations

5.14. Explains the factors affecting centripetal force by citing examples and solves numerical problems related .....

5.15. Explains the different force that acts on a car moving on curved road.

5.16. Formulates the relation between friction and safe velocity of a car moving along circular road.

5.17. Defines banking of curves and explains the need of banking of curve

5.18. Derives expression for maximum safe velocity in terms of coefficient of friction and angle of banking.

6. Work Energy and Power

6.1. Defines work done, writes mathematical form of work done explains

6.2. negative, positive and zero work done and cites examples for work done.

6.3. Defines work energy theorem and formulates work energy theorem.

6.4. Formulates an expression for work done for variable force and writes it in vector form.

6.5. Derive an expression for energy stored in a spring and proove spring force as conservative.

6.6. States conservation of mechanical energy, formulates give mathematical proof for conservation of mechanical energy for a freely falling body and draw grpahical variation of P.E, KE and T.E

6.7. Derive an expression for minimum velocities at different positions for vertical circular motion.

6.8. Define hooks law and derive energy stored in a spring

6.9. Defines power,

6.10. writes relation between power and work done.

6.11. Explains electrical energy

6.12. Explains different forms of energy (heat, chemical, electrical nuclear) and conservation of energy.

6.13. Defines power and writes relation between power and work done.

6.14. Defines elastic collision and in elastic collision,

6.15. Derives velocities after one dimensional elastic collison and

6.16. Write momentum and KE relation after collision in two dimension.

7. System of particles and Rotational Motion

7.1. Distinguishes pure translational and rotational motion Cites examples for precessional motion

7.2. Defines and identifies center of mass of bodies of regular shape

7.3. Determines the centre of mass of two particle systems

7.4. Illustrate and explains the velocity acceleration of the center of mass of rigid bodies as well as system of particles

7.5. Cites examples likes binary stares where center of mass appears to be at rest.

7.6. Defines vector product

7.7. List out the direction and properties of vector product

7.8. Defines torque

7.9. Explains the daily experiences where torque come into play

7.10. Defines angular momentum and explains its physical significance

7.11. Determines the magnitude of angular momentum by determinant method

7.12. Relates torque and angular momentum
7.13. State and explains principle of moments
7.14. Determines the mass of body using moment bar
7.15. Defines moment of inertia and radius of gyration
7.16. State the parallel axis theorem and perpendicular axis theorem
7.17. Evaluate the moment of inertia of a body about different axis applying the theorems
7.18. States laws of conservation of angular momentum
7.19. Explains and illustrates the law using daily life situations (Circus, acrobat etc)
7.20. Explains the motion of a body with out slipping
7.21. Relates velocity gained by a body rolling down an inclined plane

8. Gravitation

8.1. Compares different theories, distinguishes the correct one and values the painstaking efforts of scientists
8.2. States Kepler's three laws and develops the second law mathematically
8.3. States and formulates expression for the Universal law of Gravitation; and solves numerical problems
8.4. Writes the numerical value, SI Unit and dimension of G
8.5. Formulates the Expression for acceleration due to gravity at the surface of Earth
8.6. Formulates the Expressions for acceleration due to gravity above and below the surface of the Earth, Illustrates graphs showing the variations of g and Solves Numerical problems
8.7. Formulates the expression for Gravitational Potential Energy and Potential of Earth; PE difference near the surface of Earth
8.8. Defines and formulates expression for escape speed; and solves Numerical problems
8.9. Formulates and compares expressions for Period, Orbital Speed & Energy of Satellites; and solves Numerical Problems
8.10. Differentiates different types of satellites and appraises the discoveries of Satellites
8.11. Describes the life without gravity and explains the situations of weightlessness

9. Mechanics of Solids

9.1. Defines elasticity, deforming and restoring forces

9.2. Defines stress and strain

9.3. States Hooke's law

9.4. Classifies and formulates three types of stress and strain, and solves problems related with them

9.5. Draws stress-strain graph and explain its different points

9.6. Defines Young's Modulus, Shear Modulus and Bulk Modulus; and solves problems related with them.

9.7. Experiments to find the Young's Modulus

9.8. Defines Poisson's ratio and formulates its equation

9.9. Formulates equation for Elastic Potential Energy

9.10. Explains buckling, saging and different situations related with elastic properties of materials

10. Mechanical Properties of Fluids

10.1. Formulates the equation of gauge pressure and absolute pressure.

10.2. Explains the working of Barometer and open tube manometer.

10.3. States Pascal's law and explain the working of hydraulic machines and solve problem related to it

10.4. Distinguishes steady flow and turbulent flow

10.5. State explain the equation of continuity

10.6. Formulates bernoullis equation, velocity of efflux, toricellis law and speed fluid using venturimeter

10.7. States and explain bernoullis principle applied varius life situations

10.8. Formulates equation of coefficient of viscosity

10.9. Defines viscous force, buoyant force and state stokes law

10.10. Experiments to find terminal velocity

10.11. Discuss various parameters depending Reynolds number and define critical velocity

10.12. Define surface tension and angle of contact

10.13. write equation of surface tension ,pressre difference of drop and bubble and height of capillary raise

11. Thermal Properties of Matter

11.1. Distinguishes the difference between temperature and heat.

11.2. Converts temperature between different scales.

11.3. Defines α_l , and and formulate the relation between them.

11.4. Explains the importance of anomalous expansion.

11.5. Defines Boyles law, Charles law and formulate the relation between them.

11.6. Explains about absolute temperature.

11.7. Defines specific heat capacity and molar specific heat capacity.

11.8. Explain the use of water as coolant and hot water in water bags.

11.9. Defines and explains melting point, boiling point and latent heat.

11.10. Explains the constancy of temperature during phase change.

11.11. Defines thermal conductivity

11.12. Explains land breeze and sea breeze.

11.13. States and explains newtons law of cooling weins displacement law and stefans law.

11.14. Defines emissivity.

11.15. Identifies the importance of Green house effect.

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12. Thermodynamics

12.1. Defines Thermodynamics

12.2. Explains thermal equilibrium

12.3. States and explains

12.4. Zeroth law of thermo dynamics

12.5. IE and work

12.6. Explains internal energy and its relation with heat and work.

12.7. State I law of Thermo dynamics and solves numerical problems related to that.

12.8. Formulates the relation connecting Cp and Cv

12.9. Explains Thermo dynamic variables and equation of state.

12.10. Illustrates different Thermodynamic processes

12.11. Formulate equations of isothermal and adiabatic processes.

12.12. Describes the working and principle of heat engine and refrigerator

12.13. States and explains second law of thermo dynamics

12.14. By citing examples distinguish between reversible and irreversible processes

12.15. Sketch carnots' cycle and illustrate the principle and working of carnotes engine.

13. Kinetic Theory

13.1. Explains molecular theory
13.2. Explains ideal gas equation
13.3. Explain the required conditions to behave a real gas as ideal gas.
13.4. Defines Daltons Law of partial pressure.
13.5. Solves numerical problems related to ideal gas equation and Daltons law of partial pressure.
13.6. Explains the kinetic theory of gases.
13.7. Derives pressure due to ideal gas
13.8. Kinetic interpretation of temperature
13.9. Derives Daltons law of partial pressure from pressure
13.10. Define law of equipartitian of energy
13.11. Defines degrees of freedom
13.12. Derives specific heat capacity of different gases and solids.
13.13. Defines mean free path and derives an expression for mean free path

14. Oscillations

14.1. Defines period, frequency, identifies simple harmonic motion as a special case of periodic motion and solves numerical problems
14.2. Identifies SHM as a projection of uniform circular motion, formulates equations for displacement, velocity and acceleration
14.3. Identifies linear harmonic oscillator and non-linear oscillator
14.4. Identifies that the total energy of SHM is a constant and draws graph of energy vs displacement, formulates equations for KE,PE and Total energy.
14.5. Defines spring constant and formulates its relation with period, and solves simple problems involving k and T
14.6. Formulates equations for period of oscillation of simple pendulum and solves problems related to it
14.7. Identifies damped oscillations , formulates equation for damped oscillator writes the equations for displacement angular frequency and energy
14.8. Identifies forced oscillation. Writes expression for forced oscillation and explains two different cases cite example for resonance

15. Waves

15.1. Explains different types of waves by citing examples

15.2. Identifies the properties required the medium for the propagation of mechanical waves.

15.3. Explains displacement relation for waves propagating in +ve and -ve direction

15.4. defines and identifies different parameters related to displacement relation

15.5. Formulates the relation connecting velocity, angular frequency, and phase

15.6. Solves problems related to speed of travelling wave

15.7. Formulates the equation for speed of transverse wave in a stretched string and speed of longitudinal waves

15.8. Explains the factors effecting the velocity of sound

15.9. solves numerical problems related to speed of transverse wave in a stretched string and speed of longitudinal waves

15.10. Explains the super position principle of waves and interference and solves problems related with them.

15.11. Formulates equations of reflected waves from rigid boundary and open boundary and identifies the phase difference between incident and reflected wave.

15.12. Formulates equation of standing waves in a stretched string, identifies nodes, antinodes, and harmonics and solves problems related to them.

15.13. Performs expt. of sonometer

15.14. Formulates the equation of the frequency of standing waves.

15.15. Draws standing waves in an open and closed pipe and solved problem related to them.

15.16. Explains beats and solves numerical problems related to it.

15.17. Defines Doppler effect and solves problems related to it.

15.18. Formulates the equation of apparent frequency