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PLUS ONE PHYSICS VOLUME-1 (QUESTION BANK)

UNIT - 1 Nature of Physical World and Measurement

Short Answer Questions (Book Back):

1. Briefly explain the types of physical quantities. (Pg-7)
2. How will you measure the diameter of the Moon using parallax method? (Pg-14)
3. Write the rules for determining significant figures. (Pg-28)
4. What are the limitations of dimensional analysis? (Pg-*)
   (i) This method gives no information about the dimensionless constants in the formula like 1, 2, ……..π,e, etc.
   (ii) This method cannot decide whether the given quantity is a vector or a scalar.
   (iii) This method is not suitable to derive relations involving trigonometric, exponential and logarithmic functions.
   (iv) It cannot be applied to an equation involving more than three physical quantities.
   (v) It can only check on whether a physical relation is dimensionally correct but not the correctness of the relation. For example using dimensional analysis, $s = ut + \frac{1}{3} at^2$ is dimensionally correct whereas the correct relation is $s = ut + \frac{1}{2} at^2$
5. Define precision and accuracy. Explain with one example. (Pg-19)

Additional Questions:

1. What is meant by Scientific method? (Pg-2)
2. What are the features involved in the scientific methods? (Pg-2)
3. What is meant by Unification and Reductionism. Give example. (Pg-2)
4. How can we relate physics with chemistry? (Pg-6)
5. What is the necessity of relating physics with biology? (Pg-6)
6. What is the necessity of relating physics with mathematics? (Pg-6)
7. What is the necessity of relating physics with astronomy? (Pg-6)
8. What is the necessity of relating physics with geology? (Pg-6)
9. What is the necessity of relating physics with oceanography? (Pg-6)
10. What is the necessity of relating physics with psychology? (Pg-7)
11. What is measurement? (Pg-7)
12. Define Physical quantity. Write its example. (Pg-7)
13. Define unit. What are its types? (Pg-8)
14. Distinguish between fundamental and derived units? (Pg-8)
15. What is the f.p.s system? (Pg-8)
16. What is the c.g.s system? (Pg-8)
17. What is the m.k.s system? (Pg-8)
18. What are the advantages of SI system? (Pg-8)
19. Define SI standard for length. (Pg-9)
20. Define SI standard for mass. (Pg-9)
21. Define SI standard for time. (Pg-9)
22. Name the SI unit for electric current and give a definition for it. (Pg-9)
23. What is the SI unit of temperature and define it. (Pg-9)
24. Define one mole. (Pg-9)
25. What is meant by one candela? (Pg-9)
26. Define one radian. (Pg-11)
27. Define steradian. (Pg-11)
28. What is macrocosm and microcosm.? (Pg-11)

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29. What is the principle of screw gauge? Write its least count. (Pg-12)
30. What is parallax? (Pg-13)
31. What is parsec? Write the value of parsec. (Pg-16)
32. Define light year. (Pg-16)
33. Define astronomical unit. (Pg-16)
34. What is called error? (Pg-818)
35. What are systematic errors? (Pg-20)
36. How to minimize the systematic error? (Pg-20)
37. What is personal error? (Pg-20)
38. What are least count errors? How is it minimized? (Pg-20)
39. What are Random errors? How is it minimized? (Pg-20)
40. What are Gross errors? How is it minimized? (Pg-21)
41. What is absolute error? (Pg-22)
42. What is mean absolute error? (Pg-22)
43. What is relative error or fractional error? (Pg-22)
44. What is percentage error? (Pg-22)
45. Explain an error in the sum of two quantities? (Pg-23)
46. Explain an error in the difference of two quantities? (Pg-24)
47. Explain an error in the product of two quantities? (Pg-24)
48. Explain an error in the division or quotient of two quantities? (Pg-25)
49. Explain an error in the power of a quantity? (Pg-26)
50. What is General rule? (Pg-26)
51. Define significant figure or digits. (Pg-27)
52. Explain arithmetical operations with significant figures? (Pg-29)
53. Define dimensions. (Pg-29)
54. Define Dimensional formula and dimensional equation. (Pg-*)
    - Dimensional formula is an expression which shows how and which of the fundamental units are required to represent the unit of a physical quantity. For example, $[M^0LT^{-2}]$ is the dimensional formula of acceleration.
    - When the dimensional formula of a physical quantity is expressed in the form of an equation, such an equation is known as the dimensional equation.
      Example, acceleration = $[M^0LT^{-2}]$.
55. Define dimensional constant and dimensionless constant. (Pg-32)
56. Define dimensional variable and dimensionless variable. (Pg-32)
57. Write principle of homogeneity of dimensions. (Pg-32)
58. What are the uses of dimensional analysis? (Pg-32)
59. Check the correctness of the equation $\frac{1}{2}mv^2 = mgh$ using dimensional analysis method. (Pg-33)

Long Answer Questions (Book Back):

1. i) Explain the use of screw gauge and vernier caliper in measuring smaller distances.(Pg-12)
   ii) Write a note on triangulation method and radar method to measure larger distances. (Pg-13,15)
2. Explain in detail the various types of errors. (Pg-20,21)
3. What do you mean by propagation of errors? Explain the propagation of errors in addition and multiplication. (Pg-23,24)
4. Write short notes on the following.
   a) Unit (Pg-8) b) Rounding - off (Pg-27,28) c) Dimensionless quantities (Pg-32)
5. Explain the principle of homogeneity of dimensions. What are its uses? Give example. (Pg-32)

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Additional Questions:

1. Explain Scope and Excitement of physics? (Pg-5)
2. Explain how physics in relation to technology and society? (Pg-6)
3. Explain the conversion of physical quantity from one system of units to another with the examples. (i) Convert 76 cm of mercury into Nm^{-2} using the method of dimension. (ii) If the value of universal gravitational constant in SI is 6.6×10^{-11} Nm^2 kg^{-2} then find its value in CGS System? (Pg-32,33)
4. What do you mean by propagation of errors? Explain the propagation of errors in difference and division or quotient of two quantities. (Pg-24,25)
5. Explain error analysis? (Pg-22)
6. Obtain an expression for the time period T of a simple pendulum. The time period T depends on (i) mass 'm' of the bob (ii) length 'l' of the pendulum and (iii) acceleration due to gravity g at the place where the pendulum is suspended. (Constant $k = 2\pi$) (Pg-34)
7. The force F acting on a body moving in a circular path depends on mass of the body(m), velocity (v) and radius (r) of the circular path. Obtain the expression for the force by dimensional analysis method. (Take the value of k=1) (Pg-*)

UNIT – 2 Kinematics

Short Answer Questions (Book Back):

1. Explain what is meant by Cartesian coordinate system? (Pg-42)
2. Define a vector. Give examples (Pg-46)
3. Define a scalar. Give examples. (Pg-46)
4. Write a short note on the scalar product between two vectors. (Pg-53)
5. Write a short note on vector product between two vectors. (Pg-55)
6. How do you deduce that two vectors are perpendicular? (Pg-56)
7. Define displacement and distance. (Pg-60)
8. Define velocity and speed. (Pg-66)

   Velocity: The rate of change of displacement of the particle.

   Velocity = Displacement / time taken. Unit: ms^{-1}. Dimensional formula: LT^{-1}

   Speed: The distance travelled in unit time. It is a scalar quantity.
9. Define acceleration. (Pg-73)

   The acceleration of the particle at an instant is equal to rate of change of velocity. It is a vector quantity. SI Unit: ms^{-2}. Dimensional formula: $M^0L^1T^{-2}$
10. What is the difference between velocity and average velocity. (Pg-66)
11. Define a radian? (Pg-88)
12. Define angular displacement and angular velocity. (Pg-89)
13. What is non uniform circular motion? (Pg-92)
14. Write down the kinematic equations for angular motion. (Pg-94)
15. Write down the expression for angle made by resultant acceleration and radius vector in the non-uniform circular motion. (Pg-93)

Additional Questions:

1. What is Kinematics? (Pg-42)
2. Define frame of reference. (Pg-42)
3. What is meant by Right handed Cartesian co-ordinate system? (Pg-42)
4. What is point mass? (Pg-43)
5. Define linear motion. Give an example. (Pg-43)
6. Define circular motion. Give an example. (Pg-43)

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7. Define rotational motion. Give an example. (Pg-44)
8. Define vibrational motion. Give an example. (Pg-44)
9. What is meant by motion in one dimension? (Pg-45)
10. What is meant by motion in two dimensions? (Pg-45)
11. What is meant by motion in three dimensions? (Pg-45)
12. Define magnitude of a vector. (Pg-46)
13. What is meant by equal vectors? (Pg-46)
14. Define parallel and anti-parallel vectors. (Pg-46,47)
15. Define unit vector.(Pg-47)
16. What is meant by Orthogonal unit vectors? (Pg-47)
17. State triangular law of addition. (Pg-48)
18. Explain components of A vector? (Pg-50)
19. How are two vectors expressed in a Cartesian system? Explain the addition and subtraction using components. (Pg-51)
20. Write a note on multiplication of vector by a scalar. Give example. (Pg-52)
21. Give the properties of the components of vectors? (Pg-53)
22. Write a note on position vector? (Pg-58)
23. Explain displacement vector in Cartesian co-ordinate system? (Pg-60)
24. Explain differential calculus with an example. (Pg-61)
25. Explain Integral calculus with an example. (Pg-62)
26. Define average velocity and average speed. (Pg-66)
27. What is retardation? (Pg-73)
28. What is instantaneous velocity? (Pg-66)
29. Define momentum. (Pg-68)
30. What is called relative velocity. (Pg-70)
31. Distinguish between average acceleration and instantaneous acceleration? (Pg-73)
32. Write the kinetic equations for linear motion. (Pg-77)
33. Define free fall. (Pg-78)
34. What is meant by projectile? (Pg-81)
35. Give some examples for projectile motion. (Pg-81)
36. Define Time of flight.(Pg-82)
37. What is Horizontal range? (Pg-83)
38. Define maximum height. (Pg-85)
39. Define horizontal range. (Pg-86)
40. Define Time of flight. (Pg-86)
41. Define angular acceleration. (Pg-88)
42. Define Uniform circular motion. (Pg-91)
43. Write the assumptions need to study about the projectile motion. (Pg-81)
44. Define average velocity and represent it graphically. (Pg-66)
45. Obtain an expression for the area of triangle in terms of the cross product of vectors representing the two sides of the triangle. (Pg-57)
46. What does the slope of 'position-time' graph represent? Which physical quantity is obtained from it? (Pg-69)
47. Define the term relative velocity. How can it be obtained vectorially, When the two objects with uniform velocities move in same direction? (Pg-70)
48. Write the expression for the magnitude and direction of the relative velocity. (Pg-71)

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49. Derive the expression for a resultant velocity of the projectile at any instant when a projectile is fired horizontally? (Pg-83,84)
50. Derive the relation between linear velocity and angular velocity? (Pg-90)
51. Find the expressions tangential acceleration? (Pg-90,91)

Long Answer Questions (Book Back):

1. Explain in detail the triangle law of addition. (Pg-47,48)
2. Discuss the properties of scalar and vector products. (Pg-53,56,57)
3. Derive the kinematic equations of motion for constant acceleration. (Pg-76)
4. Derive the equations of motion for a particle (a) falling vertically (b) projected vertically. (Pg-77,78,80)
5. Derive the equation of motion, range and maximum height reached by the particle thrown at an oblique angle θ with respect to the horizontal direction. (Pg-81-84)
6. Derive the expression for centripetal acceleration. (Pg-91,92)
7. Derive the expression for total acceleration in the non uniform circular motion. (Pg-92,93)

Additional Questions:

1. Define the term motion and explain the different types of motion. (Pg-43,44)
2. Explain motion in one,two and three dimensions. (Pg-45)
3. Explain the subtraction of vectors. (Pg-49,50)
4. Find horizontal range and time of flight projectile in horizontal projection? (Pg-82,83)
5. A man moving in rain holds an umbrella inclined to the vertical though the rain drops are falling vertically. Why? (Pg-71)
6. Derive an expression for the centripetal acceleration of a body moving in a circular path of radius 'r' with uniform speed? (Pg-91,92)

UNIT - 3 Laws of motion

Short Answer Questions (Book Back):

1. Explain the concept of Inertia.Write two examples each for inertia of motion, inertia of rest and inertia of direction. (Pg-106,107)
2. State Newton's second law. (Pg-109)
3. Define one newton. (Pg-109)
4. Show that impulse is the change of momentum. (Pg-133,134)
5. Using free body diagram, show that it is easy to pull an object than to push it. (Pg-140)
6. Explain various types of friction. Suggest a few methods to reduce friction. (Pg-136)
   - **Static friction** is the force which opposes the initiation of motion of an object on the surface. When the object is at rest on the surface, only two forces act on it. They are the downward gravitational force and upward normal force. The resultant of these two forces on the object is zero.
   - If the external force acting on the object is greater than maximum static friction, the objects begin to slide. When an object slides, the surface exerts a frictional force called **kinetic friction (**also called sliding friction or dynamic friction).
   - **Rolling Friction:** The force of friction that comes into act when a wheel rolls over a surface. Methods to reduce friction:
     i) By using Lubricants friction ii) By using ball bearings.
7. What is the meaning by 'pseudo force'? (Pg-153)

   Centrifugal force is called as a 'pseudo force'. A pseudo force has no origin. A pseudo force is an apparent force that acts on all masses whose motion is described using non inertial frame of reference such as a rotating reference frame.

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8. State the empirical laws of static and kinetic friction. (Pg-137,139)
9. State Newton's third law. (Pg-110)
10. What are inertial frames? (Pg-108)
    - If an object is free from all forces, then it moves with constant velocity or remains at rest when seen from inertial frames.
    - Thus, there exists some special set of frames in which if an object experiences no force it moves with constant velocity or remains at rest.
11. Under what condition will a car skid on a leveled circular road? (Pg-151)

Additional Questions:

12. State Newton's First law. (Pg-106)
13. Define Inertia of rest, motion and direction. (Pg-107)
14. What is free body diagram? What are the steps to be followed for developing free body diagram? (Pg-114)
15. State the law of conservation of total linear momentum. (Pg-131)
16. Define impulse. (Pg-133)
17. What is the role of air bag in a car? (Pg-135)
18. Define frictional force. (Pg-136)
19. What is meant by static friction? (Pg-136)
20. What is meant by kinetic friction? (Pg-139)
21. Define Angle of Friction. (Pg-141)
22. Define Angle of repose. (Pg-142)
23. What are the applications of angle of repose? (Pg-143)
24. How does the rolling wheel's work in suitcase? (Pg-144)
25. Where does the friction force act? (Pg-145)
26. How did the ball bearing reduce kinetic friction? (Pg-145)
27. What is the reason for force changes the velocity of the particle? (Pg-147,148)
28. Define Centripetal force. (Pg-148)
29. How is the centripetal force act in whirling motion? (Pg-148)
30. How did the car move on circular track? (Pg-149)
31. What is called banking of tracks? (Pg-152)

Long Answer Questions (Book Back):

1. Prove the law of conservation of linear momentum. Use it to find the recoil velocity of a gun when a bullet is fired from it. (Pg-130,131,132)
2. What are concurrent forces? State Lami's theorem. (Pg-129)
3. Explain the motion of blocks connected by a string in i) Vertical motion ii) Horizontal motion. (Pg-126-128)
4. Briefly explain the origin of friction. Show that in an inclined plane, angle of friction is equal to angle of repose. (Pg-136,142)
5. State Newton's three laws and discuss their significance. (Pg-106,109,110,111)
6. Explain the similarities and differences of centripetal and centrifugal forces. (Pg-156)
7. Briefly explain 'centrifugal force' with suitable examples. (Pg-153,154)
8. Briefly explain 'rolling friction'. (Pg-144)
9. Describe the method of measuring angle of repose. (Pg-142)
10. Explain the need for banking of tracks. (Pg-152)
11. Calculate the centripetal acceleration of Moon towards the Earth. (Pg-150)
12. Explain centrifugal force due to rotation of the earth? (Pg-155)

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Additional Questions:

1. Explain particle moving in an inclined plane find i) acceleration ii) speed of the sliding object using free body diagram? (Pg-122,123)
2. How will you confirm Newton's third law by the way of two bodies in contact on a horizontal surface? (Pg-124,125)
3. Write the salient features of Static and Kinetic friction. (Pg-140)
4. Briefly explain what are all the forces act on a moving vehicle on a leveled circular road?(Pg-150)

UNIT - 4 Work, Energy and Power

Short Answer Questions (Book Back):

1. Explain how the definition of work in physics is different from general perception. (Pg-167)
   - The term work is used in diverse contexts in daily life. It refers to both physical as well as mental work. In fact, any activity can generally be called as work.
   - But in Physics, the term work is treated as a physical quantity with a precise definition. All the mind activities and other activity without physical displacement Cannot be considered as work in science.
2. Write the various types of potential energy. Explain the formulae. (Pg-176)
3. Write the differences between conservative and Non-conservative forces. Give two examples each. (Pg-182)
4. Explain the characteristics of elastic and inelastic collision. (Pg-194)
5. Define the following a) Coefficient of restitution (Pg-200) b) Power(Pg-190) c) Law of conservation of energy (Pg-183) d) loss of kinetic energy in inelastic collision. (Pg-199)

Additional Questions:

6. Explain Work done. (Pg-167,168)
7. When does work done becomes zero? (Pg-168)
8. Define Work done by a constant force? (Pg-170)
9. Define Work done by a variable force? (Pg-172)
10. Give the graphical representation of the Work done by a variable force? (Pg-173)
11. Define Energy, Kinetic energy and potential energy. (Pg-173)
12. Write the significance of kinetic energy in the work – kinetic energy theorem. (Pg-175)
13. Define Work – kinetic energy theorem. (Pg-175)
14. Define elastic potential energy. (Pg-178)
15. Define Conservative force. (Pg-181)
16. Define Non-conservative force. (Pg-182)
17. Define Average power. (Pg-190)
18. Define Instantaneous power. (Pg-191)
19. Define unit of power or watt? (Pg-191)
20. What is meant by collision? (Pg-193)
21. Distinguish between Elastic Collision and Inelastic Collision? (Pg-193)

Long Answer Questions (Book Back):

1. Explain with graphs the difference between work done by a constant force and by a variable force. (Pg-170,172)
2. State and explain work-energy principle. Mention any three examples for it. (Pg-174,175)
3. Arrive at an expression for power and velocity. Give some examples for the same.(Pg-192)
4. Arrive at an expression for elastic collision in one dimension and discuss various cases.(Pg-194)
5. What is inelastic collision? In which way it is different from elastic collision. Mention few examples in day to day life for inelastic collision. (Pg-193,198-200)

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Additional Questions:

1. Deduce the relation between momentum and kinetic energy. (Pg-175)
2. Explain the potential energy near the surface of the earth? (Pg-176,177)
3. Explain elastic potential energy with spring mass system? (Pg-178,179)
4. Write a note on Force- displacement graph for a spring? (Pg-179)
5. Write a note on Potential energy-displacement graph for spring? (Pg-180)
6. What is conservative force? State how it is determined from potential energy? (Pg-181)
7. State and prove the law of conservation of energy. (Pg-183)
8. Derive an expression for the velocity of the body moving in a circle and also find a tension at the bottom and the top of the circle. (Pg-187-190)
9. Explain Coefficient of restitution(e)? (Pg-200)

UNIT -5 Motion of System of Particles and Rigid Bodies

Short Answer Questions (Book Back):

1. Define center of mass. (Pg-209)
2. Find out the center of mass for the given geometrical structures.
   a) Equilateral triangle - Lies in center b) Cylinder - Lies on its central axis
   c) Square Lies in center - lies at their diagonals meet (Pg-*)
3. Define torque and mention its unit. (Pg-217)
4. What are the conditions in which force can not produce torque? (Pg-219)
5. Give any two examples of torque in day-to-day life. (Pg-217)
6. What is the relation between torque and angular momentum? (Pg-226)
7. What is equilibrium? (Pg-227)
8. How do you distinguish between stable and unstable equilibrium? (Pg-228)
9. Define couple. (Pg-230)
10. State principle of moments. (Pg-231)

    When the body is at equilibrium, the sum of clockwise moments and the sum of anti-clock moments about the point of pivot is zero. Both the net force and net torque acting on a body are zero.

    Total clock wise moment = Total anti-clock wise moment

    $$d_1F_1 = d_2F_2$$

11. Define center of gravity. (Pg-231)
12. Mention any two physical significance of moment of inertia. (Pg-234)
    - In translational motion, mass is a measure of inertia; in the same way, for rotational motion, moment of inertia is a measure of rotational inertia.
      The unit of moment of inertia is, kg m^2. Its dimension is M L^2.
    - In general, mass is an invariable quantity of matter (except for motion comparable to that of light). But, the moment of inertia of a body is not an invariable quantity.
    - It depends not only on the mass of the body, but also on the way the mass is distributed around the axis of rotation.
13. What is radius of gyration? (Pg-237)
14. State conservation of angular momentum. (Pg-247)
15. What are the rotational equivalents for the physical quantities, (i) mass and (ii) force? (Pg-250)
16. What is the condition for pure rolling? (Pg-256)
17. What is the difference between sliding and slipping? (Pg-254)

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Additional Questions:

18. What is rigid body? (Pg-208)
19. Define Point Mass. (Pg-209)
20. State the rule which is used to find the direction of torque. (Pg-217)
21. When will a body have a precession? (Pg-222)
22. When a rigid body is said to be in mechanical equilibrium? (Pg-227)
23. State Parallel axis theorem. (Pg-239)
24. State Perpendicular axis theorem. (Pg-240)
25. Give the scalar relation between torque and angular acceleration. (Pg-224)
26. Give the relation between rotational kinetic energy and angular momentum. (Pg-249)
27. Obtain an expression for the power delivered by a torque. (Pg-250)
28. What are the conditions for neutral equilibrium? (Pg-228)
29. Explain the principle of moments? (Pg-230,231)
30. Write the principles used in beam balance and define Mechanical advantage. (Pg-231)
31. Find the expression for radius of gyration. (Pg-237,238)
32. Derive an expression for work done by torque. (Pg-248)
33. Write the comparison of translational and rotational quantities? (Pg-250)

Long Answer Questions (Book Back):

1. Explain the types of equilibrium with suitable examples. (Pg-228)
2. Explain the method to find the center of gravity of a irregularly shaped lamina. (Pg-231)
3. Explain why a cyclist bends while negotiating a curve road? Arrive at the expression for angle of bending for a given velocity. (Pg-232,233)
4. Derive the expression for moment of inertia of a rod about its center and perpendicular to the rod. (Pg-234,235)
5. Derive the expression for moment of inertia of a uniform ring about an axis passing through the center and perpendicular to the plane. (Pg-236)
6. Derive the expression for moment of inertia of a uniform disc about an axis passing through the center and perpendicular to the plane. (Pg-236,237)
7. Discuss conservation of angular momentum with example. (Pg-246,247)
8. State and prove parallel axis theorem. (Pg-239)
9. State and prove perpendicular axis theorem. (Pg-240)
10. Discuss rolling on inclined plane and arrive at the expression for the acceleration.(Pg-256)

Additional Questions:

11. Derive an expression for the position vector of the center of mass of particle system. (Pg-209)
12. Derive an expression for the center of mass of two point masses. (Pg-210,211)
13. State in the absence of any external force the velocity of the center of mass remains constant. (Pg-214,215)
14. Define Torque and derive its expression. (Pg-217)
15. Explain torque about an axis? (Pg-221)
16. Obtain the relation between torque and angular acceleration. (Pg-224)
17. Discuss the pure rolling and find the condition for rolling without slipping and sliding. (Pg-252)
18. Write an expression for the kinetic energy of a body in pure rolling. (Pg-255)

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PLUS ONE PHYSICS VOLUME-2 (QUESTION BANK)

IMPORTANT FIVE MARKS

UNIT-6 GRAVITATION

1. State and explain Kepler's law. (Pg-2,3)
2. Discuss the important features of the law of gravitation. (Pg-5,6)
3. Derive the expression for gravitational potential energy. (Pg-13)
4. Prove that at points near the surface of the Earth, the gravitational potential energy of the object is U = mgh (Pg-15)
5. Explain the variation of g with latitude, altitude, depth from the Earth's surface. (Pg-19-21)
6. Derive an expression for escape speed. (Pg-22)
7. Derive the time period of satellite orbiting the Earth. (Pg-24)
8. Derive an expression for energy of satellite. (Pg-25)
9. Discuss the apparent weight of man standing inside the elevators. (Pg-28)
10. Explain how geocentric theory is replaced by heliocentric theory using the idea of retrograde motion of planets. (Pg-31)
11. Describe the measurement of Earth's shadow (umbra) radius during total lunar eclipse. (Pg-35)

UNIT-7 PROPERTIES OF MATTER

1. State Hooke's law and verify it with the help of an experiment. (Pg-54)
2. Explain the different types of modulus of elasticity. (Pg-55,57)
3. Derive an expression for the elastic energy stored per unit volume of a wire. (Pg-59)
4. Derive the expression for the terminal velocity of a sphere moving in a high viscous fluid using stokes force. (Pg-69)
5. Derive Poiseuille's formula for the volume of a liquid flowing per second through a pipe under streamlined flow. (Pg-70)
6. What is capillarity? Obtain an expression for the surface tension of a liquid by capillary rise method. (Pg-80)
7. State and prove Bernoulli's theorem for a flow of incompressible, non-viscous, and streamlined flow of fluid. (Pg-83)

UNIT-8 HEAT AND THERMODYNAMICS

1. Explain in detail the thermal expansion. (Pg-102)
2. Explain Calorimetry and derive an expression for final temperature when two thermodynamic systems are mixed. (Pg-106)
3. Discuss various modes of heat transfer. (Pg-107)
4. Explain in detail Newton's law of cooling. (Pg-109)
5. Derive the work done in an isothermal process. (Pg-126)
6. Derive the work done in an adiabatic process. (Pg-130)
7. Explain in detail Carnot heat engine. (Pg-144)
8. Explain in detail the working of a refrigerator. (Pg-150)

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UNIT-9 KINETIC THEORY OF GASES

1. Derive the expression of pressure exerted by the gas on the walls of the container. (Pg-165)
2. Describe the total degrees of freedom for monoatomic molecule, diatomic molecule and triatomic molecule. (Pg-174)
3. Explain in detail the Maxwell Boltzmann distribution function. (Pg-172)
4. Derive the expression for mean free path of the gas. (Pg-177)

UNIT-10 OSCILLATIONS

1. Discuss the simple pendulum in detail. (Pg-207)
2. Describe the vertical oscillations of a spring. (Pg-201)
3. Discuss in detail the energy in simple harmonic motion. (Pg-210)

UNIT-11 WAVES

1. Show that the velocity of a travelling wave produced in a string is $v = \sqrt{\frac{T}{\mu}}$ (Pg-232)
2. Derive an expression for Velocity of longitudinal waves in an elastic medium. (Pg-233)
3. Discuss the Factors affecting speed of sound in gases.
   (a) Effect of pressure (b) Effect of temperature (c) Effect of density
   (d) Effect of moisture (humidity) (e) Effect of wind (Pg-237)
4. Obtain the equations for constructive and destructive interference for sound waves. (Pg-248)
5. Explain how overtones are produced in a (a) Closed organ pipe (b) Open organ pipe (Pg-261)
6. What is meant by Doppler effect? Discuss the following cases
   (1) Source in motion and Observer at rest
   (a) Source moves towards observer (b) Source moves away from the observer
   (2) Observer in motion and Source at rest.
   (a) Observer moves towards Source (b) Observer resides away from the Source
   (3) Both are in motion (a) Source and Observer approach each other (b) Source and Observer resides from each other (c) Source chases Observer (d) Observer chases Source (Pg-267)

IMPORTANT THREE MARKS

UNIT-6 GRAVITATION

1. Explain how Newton arrived at his law of gravitation from Kepler's third law or Newton's inverse square law? (Pg-6)
2. Explain how Newton verified his law of gravitation. (Pg-*)
3. Explain in detail the idea of weightlessness using lift as an example. (Pg-29)
4. Explain the variation of g with latitude. (Pg-21)
5. Explain the variation of g with altitude. (Pg-19)
6. Explain the variation of g with depth from the Earth's surface. (Pg-20)
7. Derive an expression for orbital velocity of satellite. (Pg-24)
8. Derive the time period of satellite orbiting the Earth. (Pg-24)
9. Derive an expression for energy of satellite. (Pg-25)
10. Explain in detail the geostationary and polar satellites. (Pg-26)
11. Explain in detail the Eratosthenes method of finding the radius of Earth. (Pg-34)
12. Describe the measurement of Earth's shadow (umbra) radius during total lunar eclipse (Pg-35)

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UNIT-7 PROPERTIES OF MATTER

1. State Hooke's law and verify it with the help of an experiment. (Pg-54)
2. Derive an equation for the total pressure at a depth 'h' below the liquid surface. (Pg-61)
3. State and prove Pascal's law in fluids. (Pg-63)
4. State and prove Archimedes principle. (Pg-64)
5. Explain coefficient of viscosity. (Pg-66)
6. Write stoke's law and its applications. (Pg-70)
7. How is surface tension related to surface energy? (Pg-75)
8. Distinguish between cohesive and adhesive forces. (Pg-72)
9. Obtain an expression for the excess of pressure inside a i) liquid drop ii) liquid bubble iii) air bubble. (Pg-77)
10. Obtain an equation of continuity for a flow of fluid on the basis of conservation of mass.(Pg-82)
11. Explain the applications of Bernoulli's theorem. (Pg-84)
12. Describe the construction and working of venturimeter and obtain an equation for the volume of liquid flowing per second through a wider entry of the tube. (Pg-85)

UNIT-8 HEAT AND THERMODYNAMICS

1. Explain Joule's Experiment of the mechanical equivalent of heat. (Pg-117)
2. Derive the expression for the work done in a volume change in a thermodynamic system.(Pg-121)
3. Derive Mayer's relation for an ideal gas. (Pg-124)
4. Explain in detail the isothermal process. (Pg-124)
5. Explain in detail an adiabatic process. (Pg-128)
6. Explain the isobaric process and derive the work done in this process. (Pg-132)
7. Explain in detail the isochoric process. (Pg-134)
8. What are the limitations of the first law of thermodynamics? (Pg-140)
9. Explain the heat engine and obtain its efficiency. (Pg-143)
10. Derive the expression for Carnot engine efficiency. (Pg-148)
11. Explain the second law of thermodynamics in terms of entropy. (Pg-149)

UNIT-9 KINETIC THEORY OF GASES

1. Write down the postulates of kinetic theory of gases. (Pg-164)
2. Explain in detail the kinetic interpretation of temperature. (Pg-167)
3. Explain rms speed, average speed and most probable speed of a gas molecule. (Pg-169)
4. Derive an expression for the relation between the average kinetic energy and pressure? (Pg-168)
5. State and Explain the law of equipartition of energy. (Pg-175)
6. Deduce Charles' law based on kinetic theory. (Pg-169)
7. Deduce Boyle's law based on kinetic theory. (Pg-169)
8. Deduce Avogadro's law based on kinetic theory. (Pg-169)
9. Derive the ratio of two specific heat capacities of monoatomic, diatomic and triatomic molecules. (Pg-176)
10. Describe the Brownian motion. (Pg-179)

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UNIT-10 OSCILLATIONS

1. What is meant by angular harmonic oscillation?. Compute the time period of angular harmonic oscillation. (Pg-198)
2. Write down the difference between simple harmonic motion and angular simple harmonic motion. (Pg-199)
3. Explain the horizontal oscillations of a spring. (Pg-200)
4. Explain (i) Springs connected in series (ii) Springs connected in parallel (Pg-203,205)
5. Write short notes on the oscillations of liquid column in U-tube. (Pg-210)
6. Explain in detail the four different types of oscillations. (Pg-213)

UNIT-11 WAVES

1. Discuss how ripples are formed in still water. (Pg-225)
2. Describe the formation of beats. (Pg-252)
3. What are stationary waves? Explain the formation of stationary waves and also write down the characteristics of stationary waves. (Pg-255)
4. Discuss the law of transverse vibrations in stretched strings. (Pg-259)
5. What is a sonometer ? Give its construction and working. Explain how to determine the frequency of tuning fork using sonometer. (Pg-256)
6. Explain intensity and loudness. (Pg-260)
7. Explain end correction in resonance air column apparatus? (Pg-265)
8. Briefly explain the difference between travelling waves and standing waves. (Pg-256)
9. Describe Newton's formula for velocity of sound waves in air and also discuss the Laplace's correction. (Pg-236)

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IMPORTANT TWO MARKS

UNIT-6 GRAVITATION

1. State Kepler's three laws. (Pg-2,3)
2. State Newton's Universal law of gravitation. (Pg-4)
3. Define the gravitational field. Give its unit. (Pg-10)
4. Define gravitational potential energy. (Pg-14)
5. Define gravitational potential. (Pg-16)
6. What is the difference between gravitational potential and gravitational potential energy? (Pg-14,16)
7. What is meant by escape speed in the case of the Earth? (Pg-22)
8. Why is the energy of a satellite (or any other planet) negative? (Pg-26)
9. What are geostationary and polar satellites? (Pg-26,27)
10. Define weight. (Pg-27)

Additional Questions:

11. Will the angular momentum of a planet be conserved? Justify your answer. (Pg-6)
12. What is meant by superposition of gravitational field? (Pg-12)
13. Is potential energy the property of a single object? Justify. (Pg-*)

Potential energy is a property of a system rational than of a single object due to its physical position. Because gravitational potential energy depends on relative position. So, a reference level at which to set the potential energy equal to zero.

14. Why is there no lunar eclipse and solar eclipse every month? (Pg-37)
15. How will you prove that Earth itself is spinning? (Pg-38)
16. What is acceleration due to gravity. (Pg-19)
17. What is called Geo-centric theory? (Pg-2)
18. What is Heliocentric theory? (Pg-2)
19. Define orbital velocity of a satellite. (Pg-24)
20. Define Time period of a satellite. (Pg-24)
21. Write a note on weightlessness? (Pg-29)
22. The astronauts in space ships experience weightlessness. Why? (Pg-29)
23. What is called "retrograde motion" of planets. (Pg-31)

UNIT-7 PROPERTIES OF MATTER

1. Define stress and strain. (Pg-52,53)
2. State Hooke's law of elasticity. (Pg-54)
3. Define Poisson's ratio. (Pg-58)
4. Which one of these is more elastic, steel or rubber? Why? (Pg-60)
5. State Pascal's law in fluids. (Pg-63)
6. State Archimedes principle. (Pg-64)
7. State the law of floatation. (Pg-64)
8. Define coefficient of viscosity of a liquid. (Pg-66)

The coefficient of viscosity is defined as the force of viscosity acting between two layers per unit area and unit velocity gradient of the liquid. Its unit is Nsm^{-2} and dimension is $[ML^{-1}T^{-1}]$.

9. Distinguish between streamlined flow and turbulent flow. (Pg-67)

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10. What is Reynold's number? Give its significance. (Pg-68)
11. Define terminal velocity. (Pg-69)
12. State Bernoulli's theorem. (Pg-83)
13. Two streamlines cannot cross each other. Why? (Pg-67)
14. Define surface tension of a liquid. Mention its S.I unit and dimension. (Pg-74)
15. Define viscosity. (Pg-65)
16. Define angle of contact for a given pair of solid and liquid. (Pg-76)
17. Distinguish between cohesive and adhesive forces. (Pg-72)
18. What are the factors affecting the surface tension of a liquid? (Pg-73,74)
19. What do you mean by capillarity or capillary action? (Pg-79)
20. What is called deforming force? (Pg-51)
21. Define elasticity. (Pg-51)
22. What is called restoring force? (Pg-52)
23. Define plasticity. (Pg-51)
24. Define elastic limit. (Pg-53)
25. Define modulus of elasticity. (Pg-55)
26. Define Young's modulus. (Pg-55)
27. Define Bulk modulus. (Pg-56)
28. Define Rigidity modulus. (Pg-57)
29. Define compressibility. (Pg-56)
30. Give the applications of elasticity. (Pg-59)
31. Define Relative density (specific gravity). (Pg-60)
32. Give the applications of viscosity. (Pg-71)
33. Give some examples for surface tension. (Pg-72,73)
34. Give the practical application of angle of contact. (Pg-76)
35. Give the practical applications of capillarity. (Pg-80)
36. Give the applications of surface tension. (Pg-81)

Additional Questions:

37. Define longitudinal stress. (Pg-52)
38. Define shearing stress. (Pg-52)
39. Define bulk stress or volume stress. (Pg-53)
40. Define longitudinal strain. Give its types. (Pg-53)
41. Define shearing strain. (Pg-53)
42. Define bulk strain or volume strain. (Pg-53)
43. What is the importance of Young's modulus. (Pg-56)
44. What is the importance of Bulk modulus. (Pg-56)
45. What is the importance of Rigidity modulus. (Pg-57)
46. What is called fluids. (Pg-60)
47. Define pressure of fluids. (Pg-60)
48. Define atmospheric pressure. (Pg-60)
49. Define density of fluids. (Pg-60)
50. Define sphere of influence. (Pg-72)

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51. Define capillarity. (Pg-79)
52. Why the roof of hut or house is blown off during wind storm? (Pg-84)
53. What is the principle involved in the Aerofoil lift. (Pg-85)
54. Write a note on Bunsen burner. (Pg-85)
55. What is called Venturimeter? (Pg-85)
56. Explain elasticity using intermolecular forces. (Pg-51)
57. A spring balance shows wrong readings after using for a long time. Why? (Pg-*)
    When the spring balances have been used for a long time they develop elastic fatigue in n them and therefore the reading shown by such balances will be wrong.
58. What is the effect of temperature on elasticity? (Pg-*)
    If the temperature of the substance increases, its elasticity decreases.
59. Write down the expression for the elastic potential energy of a stretched wire. (Pg-59)
60. What do you mean by upthrust or buoyancy? (Pg-64)
61. Write down the expression for the Stoke's force and explain the symbols involved in it. (Pg-70)
62. What are the energies possessed by a liquid? Write down their equations. (Pg-82)
63. What happens to the pressure inside a soap bubble when air is blown into it? (Pg-*)
    When air is blown in to the soap bubble, the radius of the bubble is increased. So that the excess pressure inside it decreases.
64. A drop of oil placed on the surface of water spreads out. But a drop of water place on oil contracts to a spherical shape. Why? (Pg-*)
    - A drop of oil placed on the surface of water spreads because the force of adhesion between water and oil molecules dominates the cohesive force of oil molecules.
    - On the other hand, cohesive force of water molecules dominates the adhesive force between water and oil molecules. So drop of water on oil contracts to a spherical shape.
65. State the principle and usage of Venturimeter. (Pg-85)

UNIT-8 HEAT AND THERMODYNAMICS

1. 'An object contains more heat'- is it a right statement? If not why? (Pg-96)
2. Obtain an ideal gas law from Boyle's and Charles' law. (Pg-97)
3. Define one mole. (Pg-98)
4. Define specific heat capacity and give its unit. (Pg-100)
5. Define molar specific heat capacity. (Pg-101)
6. What is a thermal expansion? (Pg-102)
7. Give the expressions for linear, area and volume thermal expansions. (Pg-103)
8. Define latent heat capacity. Give its unit. (Pg-105)
9. State Stefan-Boltzmann law. (Pg-111)
10. What is Wien's law? (Pg-111)
11. Define thermal conductivity. Give its unit. (Pg-107)
12. What is a black body? (Pg-*) A surface that absorbs all radiant energy falling on it.
    The term arises because incident visible light will be absorbed rather than reflected, and therefore the surface will appear black. The concept of such a perfect absorber of energy is extremely useful in the study of radiation phenomena.
13. What is a thermodynamic system? Give examples. (Pg-113)
14. What are the different types of thermodynamic systems? (Pg-113,114)
15. What is meant by 'thermal equilibrium'? (Pg-113)

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16. What is mean by state variable? Give example. (Pg-114)
17. What are intensive and extensive variables? Give examples. (Pg-114)
18. What is an equation of state? Give an example. (Pg-114)
19. State Zeroth law of thermodynamics. (Pg-115)
20. Define the internal energy of the system. (Pg-116)
21. Are internal energy and heat energy the same? Explain. (Pg-117) Note
22. Define one calorie. (Pg-118)
23. Did joule converted mechanical energy to heat energy? Explain. (Pg-118)
24. State the first law of thermodynamics. (Pg-119)
25. Can we measure the temperature of the object by touching it? (Pg-116) Activity
26. Give the sign convention for Q and W. (Pg-119)
27. Define the quasi-static process. (Pg-120)
28. Give the expression for work done by the gas. (Pg-121)
29. What is PV diagram? (Pg-122)
30. Explain why the specific heat capacity at constant pressure is greater than the specific heat capacity at constant volume. (Pg-123)
31. Give the equation of state for an isothermal process. (Pg-125)
32. Give an expression for work done in an isothermal process. (Pg-126)
33. Express the change in internal energy in terms of molar specific heat capacity. (Pg-124)
34. Apply first law for (a) an isothermal (b) adiabatic (c) isobaric processes. (Pg-125,128,135)
35. Give the equation of state for an adiabatic process. (Pg-129)
36. Give an equation state for an isochoric process. (Pg-135)
37. If the piston of a container is pushed fast inward. Will the ideal gas equation be valid in the intermediate stage? If not, why? (Pg-120*)
38. Draw the PV diagram for a) Isothermal process (Pg-125) b) Adiabatic process(Pg-129) c) isobaric process (Pg-132) d) Isochoric process (Pg-135)
39. What is a cyclic process? (Pg-138)
40. What is meant by a reversible and irreversible processes? (Pg-141)
41. State Clausius form of the second law of thermodynamics. (Pg-141)
42. State Kelvin-Planck statement of second law of thermodynamics. (Pg-144)
43. Define heat engine. (Pg-142)
44. What are processes involves in a Carnot engine? (Pg-145)
45. Can the given heat energy be completely converted to work in a cyclic process? If not, when can the heat can completely converted to work? (Pg-144) Note
46. State the second law of thermodynamics in terms of entropy. (Pg-150)
47. Why does heat flow from a hot object to a cold object? (Pg-150)
48. Define the coefficient of performance. (Pg-151)

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Additional Questions:

49. What is Thermodynamics. (Pg-95)
50. What is meant by heating. (Pg-95)
51. What is meant by work? Explain with example. (Pg-96)
52. What is meant by Temperature. Give its unit. (Pg-96)
53. Define Avogadro's number. (Pg-98)
54. Define heat capacity. (Pg-100)
55. What is anomalous expansion of water. (Pg-104)
56. Define Latent heat of fusion. (Pg-105)
57. Define Latent heat of vaporization. (Pg-105)
58. Define Latent heat of sublimation. (Pg-105)
59. Define triple point substance. (Pg-105)
60. What is Steady state? (Pg-108)
61. State Prevost theory of heat exchange. (Pg-111)
62. Define emissivity of surface. (Pg-111)

UNIT-9 KINETIC THEORY OF GASES

1. What is the microscopic origin of pressure? (Pg-165)
2. What is the microscopic origin of temperature? (Pg-168)
3. Why moon has no atmosphere? (Pg-170)
4. Write the expression for rms speed, average speed and most probable speed of a gas molecule. (Pg-169,171)
5. What is the relation between the average kinetic energy and pressure? (Pg-168)
6. Define the term degrees of freedom. (Pg-173)
7. State the law of equipartition of energy. (Pg-175)
8. Define mean free path and write down its expression. (Pg-177,178)
9. Deduce Charles' law based on kinetic theory. (Pg-169)
10. Deduce Boyle's law based on kinetic theory. (Pg-169)
11. Deduce Avogadro's law based on kinetic theory. (Pg-169)
12. List the factors affecting the mean free path. (Pg-178)
13. What is the reason for Brownian motion? (Pg-179)

Additional Questions:

14. Define root mean square speed. (Pg-169)
15. Define mean or average speed. (Pg-171)
16. Define most probable speed. (Pg-171)
17. Why there is no hydrogen in Earth's atmosphere? (Pg-170)
18. Define Brownian motion. (Pg-179)
19. List the factors affecting the Brownian motion? (Pg-179)

UNIT-10 OSCILLATIONS

1. What is meant by periodic and non-periodic motion? Give two examples,for each motion.(Pg-189)
2. What is meant by force constant of a spring? (Pg-190)
3. Define time period of simple harmonic motion. (Pg-196)
4. Define frequency of simple harmonic motion. (Pg-196)

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5. What is an epoch? (Pg-196)
6. Write short notes on two springs connected in series. (Pg-203)
7. Write short notes on two springs connected in parallel. (Pg-205)
8. Write down the time period of simple pendulum. (Pg-208)
9. State the laws of simple pendulum? (Pg-208)
10. Write down the equation of time period for linear harmonic oscillator. (Pg-201)
11. What is meant by free oscillation? (Pg-213)
12. Explain damped oscillation. Give an example. (Pg-213)
13. Define forced oscillation. Give an example. (Pg-214)
14. What is meant by maintained oscillation? Give an example. (Pg-214)
15. Explain resonance. Give an example. (Pg-214)

Additional Questions:

16. Define oscillatory motion. (Pg-188)
17. All the oscillatory motions are periodic, whereas all periodic motions need not be oscillatory. Explain. (Pg-189)
18. Define simple harmonic motion (SHM). (Pg-190)
19. Define displacement of the vibrating particle. (Pg-193)
20. Define amplitude of the vibrating particle. (Pg-194)
21. Define velocity. (Pg-194)
22. Define acceleration. (Pg-194)
23. Define angular frequency. Give its unit. (Pg-196)
24. Define phase. Give its unit. (Pg-196)
25. What is phase difference? (Pg-196)
26. If the spring is cut in to two pieces, what is the spring constant of that two species? (Pg-206)
27. Soldiers are not allowed to march on a hanging bridge. Why? (Pg-215)
28. Derive an expression for Pendulum length due to effect of temperature. (Pg-209)

UNIT-11 WAVES

1. What is meant by waves? (Pg-224)
2. Write down the types of waves. (Pg-227)
3. What are transverse waves?. Give one example. (Pg-227)
4. What are longitudinal waves?. Give one example. (Pg-227)
5. Define wavelength. (Pg-228)
6. Write down the relation between frequency, wavelength and velocity of a wave. (Pg-230)
7. What is meant by interference of waves? (Pg-249)
8. What is meant by the beats and beat frequency?. (Pg-252)
9. Define intensity of sound and loudness of sound. (Pg-260)
10. Define Doppler Effect. (Pg-267)
11. What is red shift and blue shift in Doppler Effect. (Pg-271)
12. What is meant by end correction in resonance air column apparatus? (Pg-265)
13. Sketch the function $y = x + a$. Explain your sketch. (Pg-244*) line shifts towards left side

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14. Write down the factors affecting velocity of sound in gases. (Pg-237,238)
15. What is meant by an echo? Explain. (Pg-242)

Additional Questions:

16. What are the properties of wave motion. (Pg-226)
17. Define time period. (Pg-229)
18. Define frequency. (Pg-229)
19. Define angular frequency. (Pg-230)
20. Define wave number. (Pg-230)
21. Define wave velocity. (Pg-230)
22. Define wave vector. (Pg-230)
23. Give the relation between velocity (v), angular velocity (ω) and wave number (k). (Pg-230)
24. Give the velocity of transverse waves in stretched string. (Pg-233)
25. Give the velocity of longitudinal waves in an elastic medium. (Pg-234)
26. How does the pressure affect the velocity of sound in air? (Pg-237)
27. How does the temperature affect the velocity of sound in air? (Pg-237)
28. How does the density affect the velocity of sound in air? (Pg-238)
29. How does the humidity affect the velocity of sound in air? (Pg-238)
30. How does the wind affect the velocity of sound? (Pg-238)
31. What is progressive wave (or) travelling wave? (Pg-243)
32. Define linear waves and non-linear waves. (Pg-248)
33. Define interference. (Pg-249)
34. What is called constructive interference? (Pg-249)
35. What is called destructive interference? (Pg-250)
36. Give the relation between phase difference and path difference. (Pg-251)
37. What are called stationary waves? (Pg-254)
38. Give the properties of stationary waves. (Pg-225)
39. Define intensity of sound. (Pg-259)
40. Define loudness of sound. (Pg-260)
41. Give the applications of Doppler Effect. (Pg-270)
42. Define harmonics and overtones. (Pg-258)
43. Define reverberation and reverberation time. (Pg-242)
44. Define Supersonic speed. (Pg-243)
45. Define Mach number. (Pg-243)
46. Define principle of superposition. (Pg-248)
47. Define inverse square law of sound intensity. (Pg-260)
48. Write a note on SONAR. (Pg-242)
49. Give the classification of sound waves. (Pg-242)
50. State Weber-Fechner's law. (Pg-261)
51. Define wave number. (Pg-230)
52. What is reflection of sound? State the laws of reflection of sound waves. (Pg-240)
53. Define specular reflection. (Pg-240)

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