Physics (New Book) - 9th Class Physics Chapter 2 Long Question Preparation

Q1. Differentiate between distance and displacement.

Ans 1: Distance: Length of a path between two points is called the distance between those points. Explanation: Let S be the Length of the curved path between two points A and B on it. Then S is the distance between points A and B. Displacement: "Displacement is the shortest distance between two points which has magnitude and direction." Explanation: Consider a body that moves from Point A to point B along the curved path. Joint points A and B by a straight line. The straight line AB gives the distance which is the shortest between A and B. This shortest distanced in a particular direction is called displacement. It is a vector quantity and is represented by d.

Q2. Prove That S= Vit +1/2 at²

Ans 1: Second Equation of Motion: The total distance S travelled by the body is equal to the total area OABD under the graph. That is Total OACD+ triangle ABC) Area of OACD = OA x OD = Vi xt Area of ABC = 1/2 (ACxBC) =1/2 (tx at) Since Total area = Area of rectangle OACD + OABD area of triangle ABC putting values in the above equation , we get S = Vit + 1/2 t x at S= Vit +1/2 at²

Q3. Explain the type of motion

Ans 1: There are three types of motion
translatory motion, rotatory motion, vibratory motion

Ans 2: Translatory motion: in translatory motion, a body moves along a line without any rotation. The line may be straight or curved.
Example: Falling of a moving body and translatory motion of riders in ferris wheel
Types of translatory motion: linear motion, circular motion, random motion

Ans 3: Linear motion: straight line motion of a body is known as its linear motion
Example: Aero plane flying straight in air, car moving on a straight and level road, freely falling bodies
Circular motion: The motion of a n object in a circular path is known as circular motion.
Example: A stone tied at the end of string moves in a circular motion
A toy train moving in a circular path
motion of earth around the sun Note : in circular motion, the point about which body goes around, is outside the body.

Ans 4: Random motion: The disordered or irregular motion of an object is called random motion
Example; motion of insects and birds
motion of dust and smoke particles
brownian motion of a gas or a liquid molecules

Ans 5: Rotatory motion: spinning motion of a body about its axis is called its rotatory motion.
Axis: An axis is a line around which a body rotates
Example: motion of a wheel about its axis
motion of a top about its axis
motion of a steering wheel
Note: in rotatory motion the line, around which a body moves about, is passing through the body itself
Vibratory motion: to and fro motion of a body about its mean position is known as vibratory motion
Example: to and fro motion of a pendulum clock about its mean position
children playing see-saw

Q4. What are scalars and vectors. How vectors are represented

Ans 1: Scalers: physical quantities that can be described completely by its magnitude only are called as scaler quantity
Example: work, energy, mass, length, time and temperature etc

Ans 2: Vector; physical quantities that required both magnitude and direction for their representation are called vector quantities
Example: velocity, displacement , force , torque and momentum etc

Ans 3: Representation of vectors: Vectors can be represented by two way:
Symbolic representation, Graphical representation

Ans 4: Symbolic Representation: symbolically a Vectors can be represented in the following way
To differentiate a vector from scalar quantity we generally use bold letters to represent vector quantities such as F, a, d etc.

Ans 5: Graphical representation: Graphically a vector can be represented by a line segment with an arrow head.
length of line segment gives the magnitude of vector on selected scale
while the arrow head shows the direction of vector

Q5. Explain the motion of freely falling bodies

Ans 1: Motion of freely falling bodies: Galileo was the first scientist to notice that all the freely falling objects have the same acceleration independent of their masses

Ans 2: Experiment: Galileo dropped various objects of different masses from the leaning tower of Pisa

Ans 3: Result: he found that all of them reach the ground at the same time

Ans 4: Gravitational Acceleration: The acceleration of freely falling bodies is called gravitational acceleration; It is denoted by g.
Value: on the surface of the earth, its value is approximately 10 ms-2

Ans 5: Sign significant: its value is positive when object move vertically downward. its value is negative when object move vertically upward

Q6. Derive first equation of motion. or prove that vf = vi+at

Ans 1: consider a body moving with initial velocity vi in a straight line with uniform acceleration . Its velocity becomes vf after time t. The motion of body is described by speed time graph as shown in figure by line AB. The slope of line AB is acceleration a. speed time graph from the motion of a body is shown in figure
slope of line AB gives the acceleration of body

Q7. Derive third equation of motion

Ans 1: Consider a body moving with initial velocity vi in a straight line with uniform acceleration a . Its velocity becomes vf after time t. The motion of body described by speed time graph by line AB. The slope of line AB is acceleration a. The total distance covere by the body is shown by the shaded area under the line AB. Third equation of motion can be obtained easily from the graph. In speed time graph the total distance S travelled by the body is equal to the total area OABD under the graph. That is
Total distance covered by the object = Area of trapezium OABD

=1/2(sum of parallel sides)* Height
S= 1/2(OA+BD) * OD

Q8. Derive second equation of motion

Ans 1: Consider a body moving with initial velocity vi in a straight line with uniform acceleration a . Its velocity becomes vf after time t. The motion of body is described by speed time graph by line AB. The slope of line Ab is acceleration a. The total distance covered by the body is shown by the shaded area under the line AB. Equations of motion can be obtained easily from this graph.
In speed time graph the total distance S travelled by the body is equal to the total area OABD under the graph. That is
Area of OABD= S
Total distance S= area of rectangle OACD+ triangle ABC
Area of rectangle OACD= OA*OD=(length)* (width)

Q9. Define and explain acceleration. also define uniform acceleration

Ans 1: Acceleration: acceleration is defined as the rate of change of velocity of a body. it is represent by a
Formula: Acceleration=change in velocity/time taken
acceleration= final velocity- initial velocity/time taken
a=vf-vi/t
Unit: its S.I unit is meter per second square. it is a vector quantity

Ans 2: Positive acceleration: Acceleration of body is positive if its velocity increase with time. The direction of positive acceleration is same in which body is moving without change in its direction

Ans 3: Negative acceleration: Acceleration of body is negative if its velocity decrease with time. The direction of negative acceleration is opposite to the direction in which body is moving. It is also known as deceleration or retardation.

Q10. what is graph. Explain the motion graphically

Ans 1: Graph: graph is a pictorial way or presenting information about the relation between various quantities. The quantities between which a graph is plotted are called variables
There are two types of variables
Independent variables, Dependent variable
independent variables: The quantity which vary independently called as independent variables e.g. Time
Dependent variables: The quantity which varies with independent quantity is called dependent variables e.g. Velocity

Ans 2: Distance time graph: in distance time graphs, time is taken at x axis and distance is taken on y axis

Object at rest: when distance covered by an object with time is zero with respect to observer and time is going on. Horizontal lines parallel to time axis on a distance time graph shows that object is at rest

Object moving with constant speed: speed of object is said to be constant if it covers equal distances in equal interval of time

Ans 3: Object moving with variable speed: when an object does not cover equal distance in equal intervals of time . In this case distance time graph is not a straight line.
Speed is higher when slope is greater. Speed is zero when slope is horizontal

Ans 4: Speed time graph: in speed time graph, time is taken along x axis and speed is taken along y axis

Object moving with constant speed: a straight line parallel to time axis represents constant speed of object
Object moving with uniform acceleration: straight line means that object is moving with uniform acceleration. Slope of line gives magnitude of its acceleration

Ans 5: Distance travelled by a moving object: area under speed time graph represents the distance travelled by object. If motion is uniform then area can b e calculated using appropriate formula for geometrical shapes represented by graph