NCERT Physics Questions
Chapter 7: Motion
Solutions

Theory questions

Short theory questions

1. Define displacement.
   Ans: The shortest distance measured from the initial to the final position of an object is known as the displacement.

2. Define uniform motion.
   Ans: When object covers equal distances in equal intervals of time, it is said to be in uniform motion.

3. Define speed. Also define average speed.
   Ans: (Best to also mention SI unit and formula in definitions.)

   - *Speed is distance travelled by the object in unit time.*
   - *SI unit: metre per second, m/s or m s^{-1}.*
   - *(Explain the symbols in the formula) If an object travels a distance s in time t then its speed $v = \frac{s}{t}$.*
   - *Average speed is the total distance travelled by the object divided by the total time taken.*

4. Does speed have direction?
   Ans: No.

5. Define velocity. Does it have direction?
   Ans:

   - *Velocity is the speed of an object moving in a definite direction.*
   - *Yes, velocity has direction.*

6. Give two definitions of average velocity.
   Ans:

   - *Definition 1: Arithmetic mean of initial velocity and final velocity for a given period of time.*
   - $v_{av} = \frac{u+v}{2}$
   - *Definition 2: Total displacement divided by the total time taken.*
   - $v_{av} = \frac{total\ displacement}{total\ time}$
   - *It has same unit of speed, m/s.*

7. State differences between speed and velocity.
   Ans:

   - *Speed has no direction, velocity has direction.*
   - *Avg speed is distance by time, avg velocity is displacement by time.*

8. Define acceleration.
   Ans:

   - *Change in the velocity of an object per unit time.*
   - *If the velocity of an object changes from an initial value u to the final value v in time t, the acceleration a is* $a = \frac{v-u}{t}$.
   - *SI unit:* $m\ s^{-2}$.

9. Define uniform acceleration.
   Ans: An object is in uniform acceleration if

   - *The object is moving in a straight line,*
   - *its velocity increases or decreases by equal amounts in equal intervals of time.*

10. Give examples of uniform and non uniform acceleration.
    Ans: Uniform acceleration:

- *Object falling freely under gravity.*

Non-uniform acceleration:

- *A car travelling along a straight road increases its speed by unequal amounts in equal intervals of time.*

11. Describe the values of speed, velocity and acceleration for uniform motion. *Ans:*

    - *Speed is constant.*
    - *Velocity is constant.*
    - *Magnitude of velocity is equal to speed.*
    - *Acceleration is zero.*

12. Describe the shape of the distance-time graph for an object in a) uniform motion, b) uniform acceleration, c) zero speed.
    Ans:

    (a) Straight line with no-zero slope.

    (b) Curved line.

    (c) Straight horizontal line parallel to time axis.

13. Describe the shape of the velocity-time graph foran object in a) uniform motion, b) uniform acceleration, c) zero speed.
    Ans:

    (a) Straight horizontal line parallel to time axis.

    (b) Straight line with non-zero slope.

    (c) Straight horizontal line exactly on the time axis.

14. How to get value of a) acceleration, b) displacement from velocity-time graph?
    Ans:

    (a) Slope of the graph.

    (b) Area under the graph.

15. How to get value of speed from distance-time graph?
Ans: Slope of the graph.

16. Give the 3 equations of motion. In which situations of motion do they work?
Ans:

(a) $v = u + at$

(b) $s = ut + \frac{1}{2}at^2$

(c) $2as = v^2 - u^2$

where s is displacement, u is initial velocity, v is final velocity, a is uniform acceleration, and t is time. (Don't forget to define the meanings of the symbols while answering.)
These formulas work only for uniform acceleration along a straight line.

17. Define uniform circular motion.
Ans: An object is said to be in uniform circular motion if

- *it moves in a circular path with constant speed,*
- *the only change in velocity is the direction and the magnitude is constant.*

Formula of speed: $v = \frac{2\pi r}{T}$, where r is radius of the circle, and T is time period.

18. Give 3 properties of uniform circular motion.
Ans:

- *Speed is constant,*
- *Direction of velocity at any moment is tangential to the circle.*
- *Rate of change of velocity is constant, in direction only (magnitude is constant),*