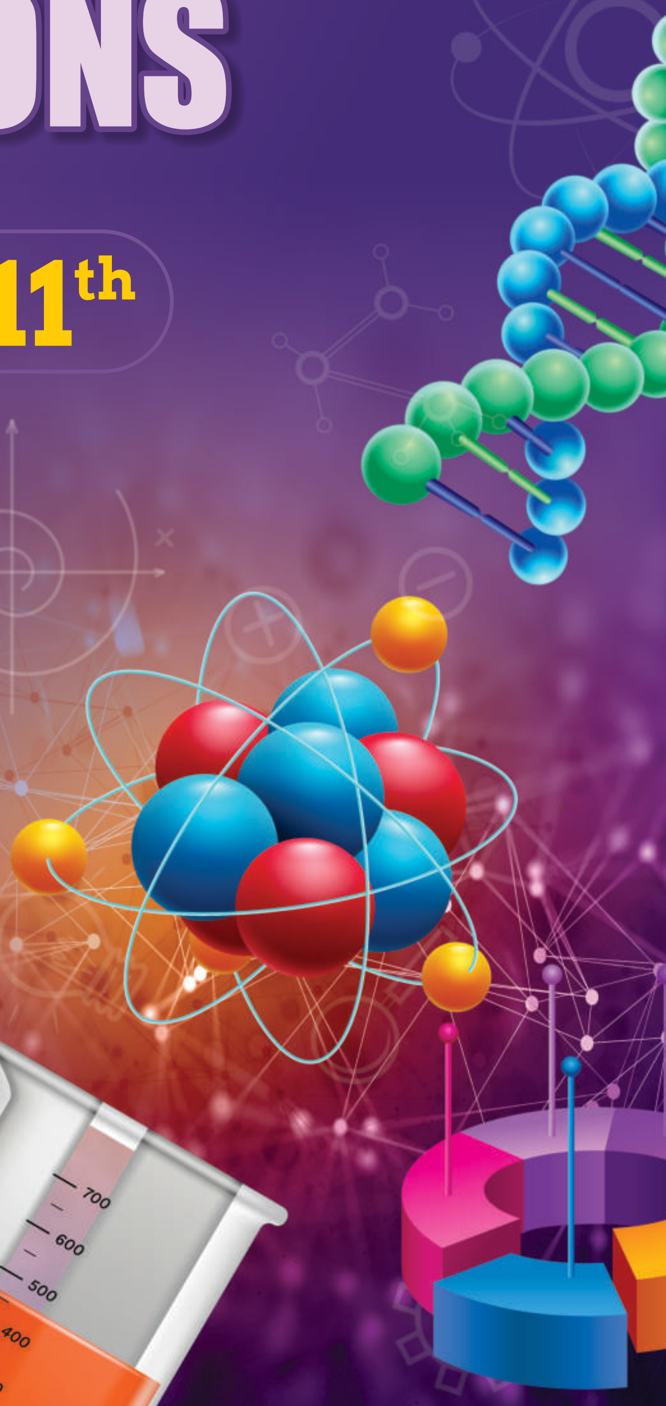
CBSE

CHAPTERWISE 20 MOST PROBABLE QUESTIONS

CLASS 11th

- Physics
- Chemistry
- Biology
- Mathematics



2026
EXAMINATION

Contents

20 Most Probable Questions for Board

PHYSICS

Units and Measurements

***MCQ* (1 to 4)**

(4×1=4) Marks

1. The sum of the numbers 436.32, 227.2 and 0.301 in appropriate significant figures is

(1) 663.821 (2) 664

(3) 663.8 (4) 663.82

2. A physical quantity of the dimensions of length that can be formed out of c, G and $\frac{e^2}{4\pi e_0}$ is [c is velocity of light, G is universal constant of gravitation and e is charge] :-

(1) $c^2\left[G\frac{e^2}{4\pi\varepsilon_0}\right]^{1/2}$ (2) $\frac{1}{c^2}\left[\frac{e^2}{G4\pi\varepsilon_0}\right]^{1/2}$

(3) $\frac{1}{c^2}\left[G\frac{e^2}{4\pi\varepsilon_0}\right]$ (4) $\frac{1}{c^2}\left[G\frac{e^2}{4\pi\varepsilon_0}\right]^{1/2}$

3. If frequency F, velocity V, and density D are considered fundamental units, the dimensional formula for momentum will be

(1) DVF^2 (2) DV^2F^{-1}

(3) $D^2V^2F^2$ (4) DV^4F^{-3}

4. **Assertion (A) :** A dimensionally wrong or inconsistent equation must be wrong.

Reason (R) : A dimensionally consistent equation is an exact or a correct equation.

(1) Both Assertion (A) and Reason (R) are correct and Reason (R) is the correct explanation of Assertion (A).

(2) Both Assertion (A) and Reason (R) are correct and Reason (R) is not the correct explanation of Assertion (A).

(3) Assertion (A) is correct, but Reason (R) is incorrect.

(4) Assertion (A) is incorrect, but Reason (R) is correct.

5. The statement "The terms 'fast' or 'slow' are meaningless without specifying a reference for comparison" emphasizes the need for a standard to define such terms. Without a reference, these terms lack context and clarity.

In light of this, reframe the following statements wherever necessary:

1. Neutrons are very heavy particles.

2. The Sun is extremely hot.

3. The Earth's magnetic field is very weak.

4. The wavelength of visible light is very short.

(2 Marks)

6. What are dimensional and dimensionless constants. Explain with example

(2 Marks)

7. "A more precise measurement has to be more accurate." Comment on this statement

(3 Marks)

8. How is one system of units converted to another with the help of dimensions?

(3 Marks)

9. An artificial satellite is revolving around a planet of mass M and radius R in a circular orbit of radius r. From Kepler's third law about the period of satellite around a common central body, square of period of revolution is proportional to cube of the radius of the orbit. Show using dimensional analysis, that

$$T=\frac{k}{R}\sqrt{\frac{r^3}{g}}$$

Where k is a dimensionless constant and g is acceleration due to gravity.

(3 Marks)

10. The volume of a liquid flowing out per second of a pipe of length l and radius r is written by a student as $v=\frac{\pi}{8}\frac{pr^4}{\eta l}$ where p is the pressure difference between the two ends of the pipe and η is coefficient of viscosity of the liquid having dimensional formula $ML^{-1}T^{-1}$. Check whether the equation is dimensionally correct.

(3 Marks)

11. What are Significant figures. Explain the rules for counting Significant figures with examples.

(4 Marks)

12. What do you mean by Dimensional Analysis. What are its applications.

(4 Marks)

13. Explain the limitations of dimensional analysis. Support your answer with suitable examples.

(4 Marks)

14. The pressure *P*, volume *V* and temperature *T* of a real gas are related through Van der Waals equation $\left(P+\frac{a}{V^2}\right)(V-b)=RT$

Find the dimensions of constants.

Also write the units of *a* and *b*, in SI system.

(4 Marks)

15. Read the following text carefully and answer the questions.

The dimensional analysis helps us in deducing the relations among different physical quantities and checking the accuracy derivation and dimensional consistency or its homogeneity of various numerical expressions.

The conversion of one system of units into another is an application of dimension. As we know numerical value is inversely proportional to the size of the unit but the magnitude of the physical quantity remains the same whatever be the system of its measurement.

i.e. $n_1u_1 = n_2u_2 \Rightarrow n_2 = \frac{n_1u_1}{u_2}$

Where, u_1 and u_2 are two units of measurement of the quantity and n_1 and n_2 are their respective numerical values.

The method of dimensions is used to deduce the relation among the physical quantities. We should know the dependence of the physical quantity on other quantities.

(i) How the numerical value of a physical quantity is related to its unit.

(ii) Which method is used to deduce the relation among the physical quantities.

(iii) Force $=\frac{\alpha}{\text{Density}+\beta^3}$, then what are the dimension of α,β ?

(iv) Find the value of 60 J per min on a system that has $100\,\text{g}, 100\,\text{cm}$ and 1 min as the base units.

(4 Marks)

16. If the velocity of light *c*, Planck's constant *h* and gravitational constant *G* are taken as fundamental quantities then express mass, length and time in terms of dimensions of these quantities.

(5 Marks)

17. Read the following text carefully and answer the questions.

Dimensions of a physical quantity are the powers to which the fundamental units of mass (*M*), length (*L*) and time (T) must be raised to represent the unit of that physical quantity.

In mechanics, the dimensional formula is written in terms of the dimensions of mass, length and time (*M*, *L* and *T*). In heat and thermodynamics, in addition to M, L and *T*, we need to mention the dimension of temperature in kelvin (*K*). In electricity and magnetism, in addition to *M*, *L* and *T*, we need to mention the dimension of current or charge per unit time (*A* or QT^{-1}). There are various applications of dimensional analysis is such as principle of homogeneity, in deriving relationship among various physical quantities.

(i) Find the dimensional formula of the following physical quantities.
  (a) Surface energy
  (b) Force constant

(ii) State the principle of homogeneity of dimensions

(iii) Check the correctness of the relation $s = ut + at^2$, where the symbols have their usual meanings.

(iv) Deduce the dimensional formula for *R*, using ideal gas equation $PV = nRT$.

(5 Marks)

18. Einstein's mass energy relation emerging out of his famous theory of relativity relates mass (*m*) to energy (*E*) as $E = mc^2$, where *c* is speed of light in vacuum. At the nuclear level, the magnitudes of energy are very small. The energy at nuclear level is usually measured in MeV, where 1 $MeV = 1.6\times10^{-13}\,J$; the masses are measured in unified atomic mass unit (u) where $1u = 1.67 \times 10^{-27}$ kg.

(a) Show that the energy equivalent of $1u$ is 931.5 Mev.

(b) A student writes the relation as $1u = 931.5$ MeV. The teacher points out that the relation is dimensionally incorrect. Write the correct relation. **(5 Marks)**

19. A new system of units is proposed in which unit of mass is α kg, unit of length β m and unit of time γ s. How much will 5 J measure in this new system? **(5 Marks)**

20. Rule out on dimensional arguments, from the following, the wrong formulae for the kinetic energy E of a body of mass m :

(i) $E = m^2v^3$

(ii) $E = \frac{1}{2}mv^2$

(iii) $E = ma$

(iv) $E = \frac{3}{16}mv^2$

(v) $E = \frac{1}{2}mv^2 + ma$

Where v is velocity and a is acceleration of the body.

(5 Marks)

■■■

ANSWER KEY

1. **(3)**
2. **(4)**
3. **(4)**
4. **(3)**
5. **Refer to solution**
6. **Refer to solution**
7. **Refer to solution**
8. **Refer to solution**
9. **Refer to solution**
10. **Refer to solution**
11. **Refer to solution**
12. **Refer to solution**
13. **Refer to solution**
14. **Refer to solution**
15. **Refer to solution**
16. **Refer to solution**
17. **Refer to solution**
18. **Refer to solution**
19. **Refer to solution**
20. **Refer to solution**

1. **(3)**

When adding or subtracting, the result should have the same number of decimal places as the number with the least decimal places.

Calculation:

436.32 + 227.2 + 0.301 = 663.821

The number with the least decimal places is 227.2, which has 1 decimal place. Therefore, the result should be rounded to 1 decimal place.

Final Answer:

663.8

[NCERT (2024-25) Page No. 05]

2. **(4)**

Let $\frac{e^2}{4\pi\varepsilon_0} = A = ML^3T^{-2}$

$L = c^x G^y (A)^z$

$L = \left[LT^{-1}\right]^x \left[M^{-1}L^3T^{-2}\right]^y \left[ML^3T^{-2}\right]^z$

$-y + z = 0 \Rightarrow y = z \ldots$ (i)

$x + 3y + 3z = 1 \ldots$ (ii)

$-x - 4z = 0 \ldots$ (iii) $[\because y = z]$

From (i), (ii) & (iii)

$z = y = \frac{1}{2}, x = -2$

[NCERT (2024-25) Page No. 09]

3. **(4)**

Momentum,

$p = mv = MLT^{-1} = ML^{-3}L^4T^{-4}T^3 = DV^4F^{-3}$

[NCERT (2024-25) Page No. 09]

4. **(3)**

A dimensionally consistent equation need not be actually an exact or correct equation, but a dimensionally wrong or inconsistent equation must be wrong.

[NCERT (2024-25) Page No. 08]

5.

1. Neutrons are very heavy particles compared to electrons but are slightly lighter than protons.
2. The Sun is extremely hot compared to the surface temperature of Earth, with a surface temperature of about 6000 K and a core temperature of approximately 15 million K.
3. The Earth's magnetic field is very weak compared to the magnetic field produced by a typical bar magnet, as it is about 10^{-4} Tesla.
4. The wavelength of visible light is very short compared to the wavelengths of radio waves.

[NCERT (2024-25) Page No. 01]

6. **Dimensional Constants**

Dimensional constants are physical constants that have dimensions and are expressed in terms of fundamental units like mass (*M*), length (*L*), and time (*T*). For Example:

Gravitational constant (G)

Dimensions: $\left[M^{-1}L^3T^{-2}\right]$

Units: $\text{Nm}^2\,\text{kg}^{-2}$

Dimensionless Constants

Dimensionless constants are constants that do not have dimensions or units. They are pure numbers and often arise in ratios or factors in physics.

π(Pi):

Ratio of the circumference of a circle to its diameter.

Dimensions: None (dimensionless)

[NCERT (2024-25) Page No. 08]

7. A more precise measurement does not necessarily imply greater accuracy. Precision reflects the consistency of measurements, while accuracy reflects how close a measurement is to the true value. Precision and accuracy are independent, and achieving one does not guarantee the other.

Consider measuring the length of a table that is exactly 2.00 meters using two different instruments:

1. **Instrument A:** A faulty steel tape measure that is stretched and always underestimates by 0.05 meters.
   - Measurements: 1.95,1.95,1.95,1.95 meters.
   - Precision: High (all measurements are consistent).
   - Accuracy: Low (all measurements deviate by 0.05 meters from the true value).
2. **Instrument B:** A rough wooden scale with worn-out markings.

- Measurements: 1.96,2.02,2.04,1.98 meters.
- Precision: Low (measurements vary significantly).
- Accuracy: Moderate (average is closer to the true value).

[NCERT (2024-25) Page No. 02]

8. Let a physical quantity be given by

$$A = n_1 u_1 = n_2 u_2$$

where n_1 is numerical value with u_1 as unit in one system and similarly n_2 is numerical value with u_2 as unit in another system.

If dimensional formula of A is $\left[M^a L^b T^c\right]$

then, $n_1\left[M_1^a L_1^b T_1^c\right] = n_2\left[M_2^a L_2^b T_2^c\right]$

i.e.,

$$n_2 = n_1 \frac{\left[M_1^a L_1^b T_1^c\right]}{\left[M_2^a L_2^b T_2^c\right]}$$

$$= n_1 \left[\frac{M_1}{M_2}\right]^a \left[\frac{L_1}{L_2}\right]^b \left[\frac{T_1}{T_2}\right]^c$$

[NCERT (2024-25) Page No. 07]

9. Given $T^2 \propto r^3 \Rightarrow T \propto r^{3/2}$ …(i)

T is also the function of R and g

$\therefore$ We may write $T \propto g^x R^y$ …(ii)

Combining (i) and (ii) $T \propto g^x R^y r^{3/2}$ …(iii)

Equating dimensions of both sides

$$\left[M^0 L^0 T^1\right] = \left[M^0 L T^{-2}\right]^x \left[L^y\right]\left[L^{3/2}\right]$$

$$= \left[M^0 L^{x+y+3/2} T^{-2x}\right]$$

Comparing dimensions of L and T

$$0 = x + y + \frac{3}{2} \quad \text{…(iv)}$$

and $-2x = 1$ or $x = -\frac{1}{2}$ …(v)

Substituting value of x in (iv)

$$0 = -\frac{1}{2} + y + \frac{3}{2} \Rightarrow y = -1 \quad \text{…(vi)}$$

Thus, equation (iii) gives

$$T \propto g^{-1/2} R^{-1} r^{3/2} \text{ or } T \propto \frac{1}{R}\frac{r^{3/2}}{g^{1/2}}$$

or $T = \frac{k}{R}\sqrt{\frac{r^3}{g}}$ where k is dimensionless constant.

[NCERT (2024-25) Page No. 09]

10. If the dimensions of LHS of an equation are equal to the dimensions of RHS, then the equation is said to be dimensionally correct.

According to the problem, the volume of a liquid flowing out per second of a pipe is given by

$$V = \frac{\pi}{8}\frac{pr^4}{\eta l}$$

(where V = rate of volume of liquid per unit time)

Dimension of given physical quantities,

$$[V] = \frac{\text{Dimension of Volume}}{\text{Dimension of time}} = \frac{\left[L^3\right]}{[T]}$$

$$= \left[L^3 T^{-1}\right], [p] = \left[ML^{-1}T^{-2}\right]$$

$$[\eta] = \left[ML^{-1}T^{-1}\right], [l] = [L], [r] = [L]$$

$$\text{LHS } = [V] = \frac{\left[L^3\right]}{[T]} = \left[L^3 T^{-1}\right]$$

$$\text{RHS } = \frac{\left[ML^{-1}T^{-2}\right]\times\left[L^4\right]}{\left[ML^{-1}T^{-1}\right]\times[L]} = \left[L^3 T^{-1}\right]$$

Dimensionally, L.H.S = R.H.S.

Therefore, the equation is correct dimensionally.

[NCERT (2024-25) Page No. 08]

11. Significant figures are the digits in a number that carry meaningful information about its precision. This includes all certain digits and the first uncertain digit in a measurement.

Rules:

(i) All the non-zero digits are significant.
Example: 132.73 contains five significant figures.

(ii) All the zeros between the non-zero digits are significant.
Example: 207.009 contains six significant figures.

20 Most Probable Questions for Board

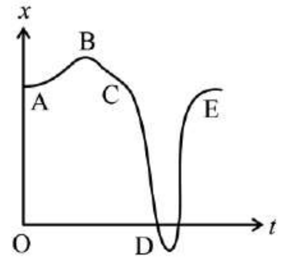
PHYSICS

Motion in A Straight Line

***MCQ* (1 to 4)**

(4×1=4) Marks

1. A graph of displacement (x) versus time (t) is shown in figure.



(a) The particle was released from rest at $t = 0$
(b) At B, the acceleration $a < 0$
(c) At C, the velocity and acceleration do not vanish.
(d) Average velocity for motion between A and D is negative

Choose the **correct** option
(1) a and c
(2) a and d
(3) a, b and c
(4) All are correct

2. A lift is coming from 8th floor and is just about to reach 4th floor. Taking ground floor as origin and positive direction upwards for all quantities, which one of the following is correct?
(1) $x < 0, v < 0, a > 0$
(2) $x > 0, v < 0, a < 0$
(3) $x > 0, v < 0, a > 0$
(4) $x > 0, v > 0, a < 0$

3. **Assertion (A):** For an observer looking out through the window of a fast-moving train, the nearby objects appear to move in the opposite direction to the train, while the distant objects appear to be stationary.
Reason (R): If the observer and the object are moving at velocity $\vec{v_1}$ and $\vec{v_2}$ respectively with reference to the laboratory frame, the velocity of the object with respect to the observer is $\vec{v_2} - \vec{v_1}$.
(1) Both Assertion (A) and Reason (R) are correct and Reason (R) is the correct explanation of Assertion (A).
(2) Both Assertion (A) and Reason (R) are correct and Reason (R) is not the correct explanation of Assertion (A).
(3) Assertion (A) is correct, but Reason (R) is incorrect.
(4) Assertion (A) is incorrect, but Reason (R) is correct.

4. **Assertion (A):** The speedometer of an automobile measures the average speed of the automobile.
Reason (R): Average velocity is equal to total distance divided by total time taken.
(1) Both Assertion (A) and Reason (R) are correct and Reason (R) is the correct explanation of Assertion (A).
(2) Both Assertion (A) and Reason (R) are correct and-Reason (R) is not the correct explanation of Assertion (A).
(3) Assertion (A) is correct, but Reason (R) is incorrect.
(4) Assertion (A) is incorrect, but Reason (R) is correct.

5. The displacement x of a particle varies with time t as $x = ae^{-\alpha t} + be^{\beta t}$
where a, b, α, β are positive constants. What is the condition that the velocity of body is zero at time $t = 0$?

(2 Marks)

6. A bird is tossing (flying to and fro) between two cars moving towards each other on a straight road. One car has a speed of 18 km/h while the other has the speed of 27 km/h. The bird starts moving from first car towards the other and is moving with the speed of 36 km/h and when the two cars were separted by 36 km. What is the total distance covered by the bird?

(2 Marks)

7. The distance x of a particle moving in one dimension under the action of a constant force is related to time t by the relation $t = \sqrt{x} + 3$, where x is in metres and time t in seconds. Find the displacement of the particle when its velocity is zero.

(3 Marks)

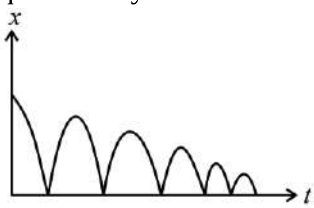
8. A ball is thrown vertically upwards with a velocity of 20 ms^{-1} from the top of a high building. The height of point of projection from the ground is 25.0 m. Calculate (*a*) maximum height upto which the ball rises, (b) time taken by the ball to hit the ground. (Take g = 10 ms^{-2}).

(3 Marks)

9. A ball is dropped and its displacement vs time graph is as shown figure (displacement x is from ground and all quantities are +ve upwards).

(a) Plot qualitatively velocity vs time graph.

(b) Plot qualitatively acceleration vs time graph.



(3 Marks)

10. Read each statement below carefully and state with reasons and examples, if it is correct or wrong. A particle in one-dimensional motion

(a) with zero speed at an instant may have non-zero acceleration at that instant.

(b) with zero speed may have non-zero velocity.

(c) with constant speed must have zero acceleration.

(d) with positive value of acceleration must be speeding up.

(3 Marks)

11. Drops of water fall at regular intervals from the roof of a building of height 16 m. The first drop strikes the ground at the same moment as the fifth drop leaves the roof. Find the distance between successive drops?

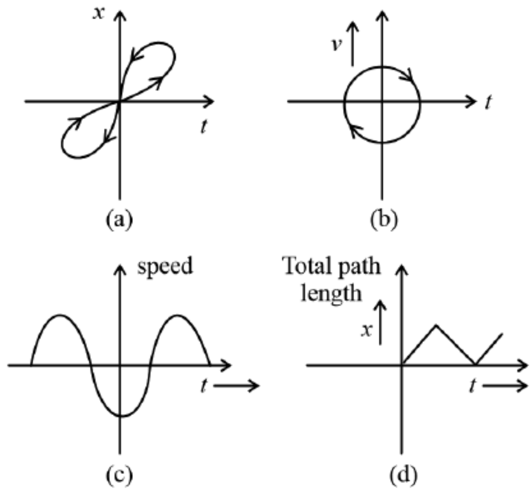
(4 Marks)

12. A motor car moving at a speed of 72 km/h can not come to a stop in less than 3.0 s while for a truck this time interval is 5.0 s. On a higway the car is behind the truck both moving at 72 km/h. The truck gives a signal that it is going to stop at emergency. At what distance the car should be from the truck so that it does not bump onto (collide with) the truck. Human response time is 0.5s.

(Comment: This is to illustrate why vehicles carry the message on the rear side. "Keep safe Distance")

(4 Marks)

13. Look at the graphs (a) to (d) carefully and state with reasons which of the following cannot possibly represent one dimensional motion of a particle.



(4 Marks)

14. An elevator without a ceiling is ascending up with an acceleration of 5 ms^{-2}. A boy on the elevator shoots a ball in vertical upward direction from a height of 2 m above the floor of elevator. At this instant the elevator is moving up with a velocity of 10 ms^{-1} and floor of the elevator is at a height of 50 m from the ground. The initial speed of the ball is 15 ms^{-1} with respect to the elevator.

Consider the duration for which the ball strikes the floor of elevator in answering following questions. (g = 10 ms^{-2})

(i) The time in which the ball strikes the floor of elevator is given by

(1) 2.13 s (2) 2.0 s

(3) 1.0 s (4) 3.12 s

(ii) The maximum height reached by ball, as measured from the ground would be

(1) 73.65 m (2) 116.25 m

(3) 82.56 m (4) 63.25 m

(iii) Displacement of ball with respect to ground during its flight would be

(1) 16.25 m (2) 8.76 m

(3) 20.24 m (4) 30.56 m

(iv) The maximum separation between the floor of elevator and the ball during its flight would be

(1) 12 m (2) 15 m

(3) 9.5 m (4) 7.5 m

(5 Marks)

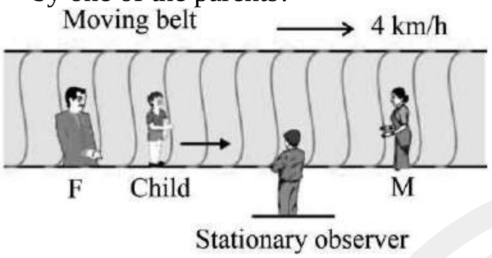
15. On a long horizontally moving belt (Figure), a child runs to and fro with speed 9 km/h (with respect to the belt) between his father and mother located 50 m apart on the moving belt. The belt moves with a speed of 4 km/h. For an observer on a stationary platform outside, what is the

a. Speed of the child while running from father to his mother.

b. Speed of child while running from mother to his father.

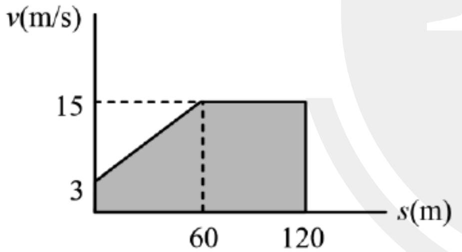
c. Time taken by the child while going father to mother and vice-versa.

d. Which of the answers alter if motion is viewed by one of the parents?



(5 Marks)

16. The *v-s* graph describing the motion of a motorcycle is shown in figure. Construct the a-s graph of the motion and determine the time needed for the motorcycle to reach the position s = 120 m. Given ln 5 = 1.6.



(5 Marks)

17. Draw and discuss the position-time graphs of two objects moving along a straight line, when the relative velocity is (i) zero (ii) positive and (iii) negative.

(5 Marks)

18. In a car race, car A takes a time of t sec. less than car B at the finish and passes the finishing point with a velocity v more than the car B. Assuming that the cars start from rest and travel with constant accelerations a_1 and a_2 respectively, show that $v = \sqrt{a_1 a_2} t$.

(5 Marks)

19. A ball is dropped from a height of 90 m on a floor. At each collision with the floor, the ball loses one-tenth of its speed. Plot the speed-time graph of its motion from t = 0 to t = 12s.

(5 Marks)

20. A man is standing on top of a building 100 m high. He throws two balls vertically, one at t = 0 and other after a time interval (less than 2 seconds). The later ball is thrown at a velocity of half the first. The vertical gap between first and second ball is +15 m at t = 2s. The gap is found to remain constant. Calculate the velocity with which the balls were thrown and the exact time interval between their throw.

(5 Marks)

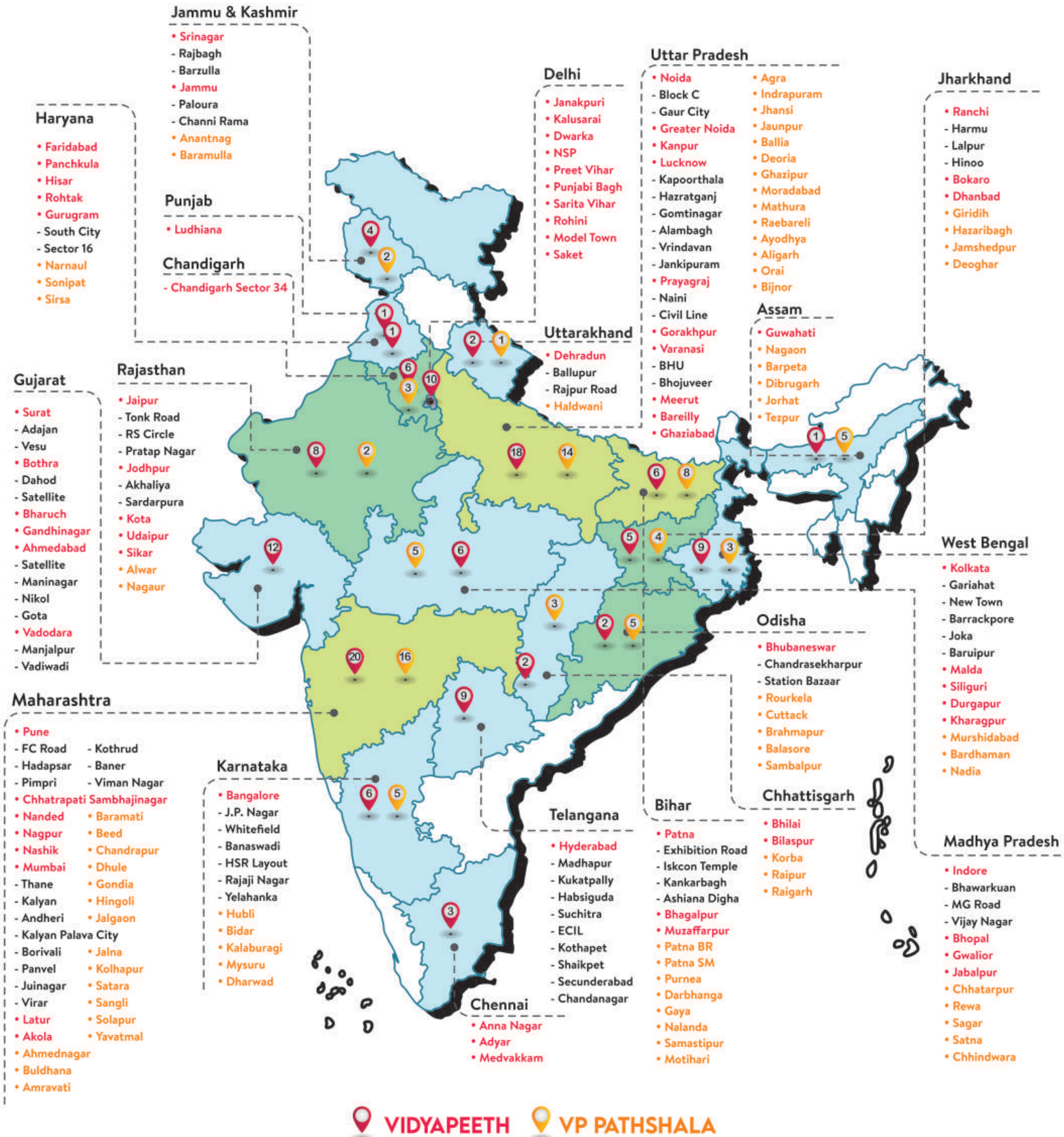
■■■

ANSWER KEY

1. **(4)**
2. **(1)**
3. **(2)**
4. **(4)**
5. **Refer to solution**
6. **Refer to solution**
7. **Refer to solution**
8. **Refer to solution**
9. **Refer to solution**
10. **Refer to solution**
11. **Refer to solution**
12. **Refer to solution**
13. **Refer to solution**
14. **Refer to solution**
15. **Refer to solution**
16. **Refer to solution**
17. **Refer to solution**
18. **Refer to solution**
19. **Refer to solution**
20. **Refer to solution**

VIDYAPEETH Is Now Present In 140+ Cities Across India

IIT-JEE | NEET | FOUNDATION



PHYSICS WALLAH PUBLICATION

Visit Your Vidyapeeth
SCAN ME!

To share Feedback
SCAN ME!

₹ 459/-

ISBN 978-93-6897-972-2

653d5951-e1f5-40e9-b8e4-306c6366abc3