

# Class 11 Physics most important questions

prepared with love by Mandeep sir

## NOTE:

- Questions written in **red** colour are not in syllabus for session 2024. but if that topic is covered in your school, you have to prepare that question.
- Questions written in **bold** are extra important. if you have less time (very less time in fact), you should only focus on those questions.
- Questions written in **purple** are most important, so if you have very less time, do only those questions.
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## Units and measurements

1. **Write four advantages of SI system.**
2. What are three system of units commonly used?
3. **Indirect methods of measurements**
  - a. **Large distances**
    - i. Discuss LASER method\*
    - ii. Discuss RADAR method\*
    - iii. Discuss Echo method\*
    - iv. Discuss Kepler method\*
    - v. Discuss Copernicus method\*
    - vi. Discuss trigonometric method\*
    - vii. Discuss Parallax method
  - b. **Small distances**
    - i. **Size of molecule of oleic acid**
4. What are advantages of Method of dimensional analysis for deriving relationship between physics quantities.
5. **What are errors? How they are categorized?**
6. **Define the following with examples:**
  - a. **Absolute errors**
  - b. **Mean absolute error**
  - c. **Fractional error or relative error**
  - d. **Percentage error**
7. **Explain combination of errors and their propagation in**

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- a. **Sum**
- b. **Difference**
- c. **Product**
- d. **Division**
- e. **Exponent**

of physical quantities.

8. **What are significant figures? Discuss rules of counting significant figures.**
9. Discuss the rules to obtain number of significant figures in
  - a. Sum and difference
  - b. Multiplication and division of physical quantities.
10. **Differentiate between accuracy and precision.**

### Motion in a straight line

1. Define the following:
  - a. Speed
  - b. Velocity
  - c. Distance
  - d. Displacement
  - e. Uniform motion and uniform speed (non-uniform motion and non-uniform speed)
  - f. acceleration
2. Derive three equations of uniformly accelerated motion using algebraic method.
3. **Derive three equations of uniformly accelerated motion using calculus method.**
4. Derive three equations of uniformly accelerated motion using graphical method.
5. Speed time, velocity time, distance time, displacement time for all situations (given in NCERT).
6. **What is relative velocity? How relative velocity is calculated. Draw velocity time graph to show the motion of two bodies moving relative to each other.**

### Motion in a plane

1. What is a vector quantity? Define the following
  - a. Unit vector
  - b. Collinear vector or parallel vectors
  - c. Polar and axial vector
  - d. Coplanar vectors
2. **Define triangle law of vector addition by giving suitable examples.**
3. **Discuss parallelogram law of vector addition and derive a formula to find magnitude and resultant of two vectors A and B inclined at an angle  $\theta$ .**
4. Explain resolution of vector into its rectangular components.
5. Explain two examples from daily life using components of vectors.
6. Explain dot product and cross product of vectors.

7. What is a projectile. Derive a relation for following quantities when a projectile is fired with velocity  $u$  from a height  $h$  in the horizontal direction:
  - a. Equation of path
  - b. Time of flight
  - c. Velocity at any instant
  - d. Range
  - e. Angle with vertical.
8. Derive a relation for following quantities when a projectile is fired with velocity  $u$  with horizontal at an angle  $\theta$  .
  - a. Equation of path
  - b. Time of flight
  - c. Maximum height attained
  - d. Velocity at any instant
  - e. Range
  - f. Maximum range
  - g. Angle with vertical.
9. Show that range for two complimentary angles is same when the projectile is fired with same velocity at these two angles.
10. What is uniform circular motion and non-uniform circular motion?
11. Define centripetal acceleration and derive a relation for it.
12. Define angle velocity and angular acceleration.

### Laws of motion

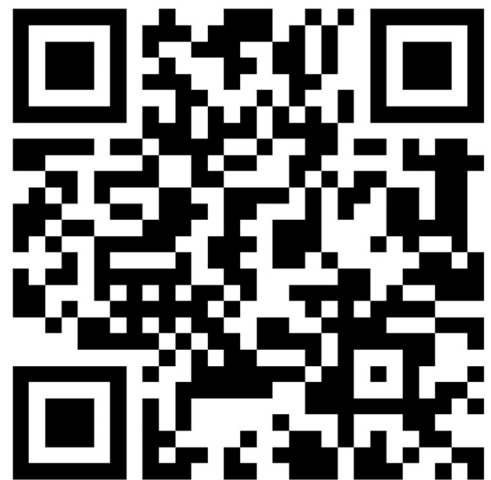
1. Define Newton's first law
2. What is inertia? Discuss three types of inertia with examples.
3. What is momentum? What is its SI unit?
4. State Newton's second law and derive  $F = ma$  from it.
5. Why is it easier to pull a lawn roller than to push it?
6. Discuss horse and cart problem.
7. Second law is the real law of motion. Explain why.
8. State newton's third law and discuss some applications from daily life.
9. Explain the concept of apparent weight of a man in an accelerating elevator.
10. Two masses  $m_1$  and  $m_2$  are connected to a string passing over a pulley. Derive an expression for acceleration of the masses and tension in the string.
11. What is friction. Explain the following by giving suitable examples.
  - a. Static friction
  - b. Limiting friction
  - c. Kinetic friction

12. Write laws of friction.
- 13. What is angle of friction? How is it related to coefficient of friction?**
- 14. What is angle of repose? Derive an expression for it.**
15. Derive an expression for acceleration of a body sliding down a rough inclined plane.
16. Derive an expression for work done to move a body up a rough inclined plane with constant velocity.
17. Derive an expression for work done to move a body on a rough horizontal surface with constant velocity.
18. Why friction is called necessary evil. Give some examples to support the statement.
19. Explain some methods to reduce friction.
- 20. Explain the motion of a car on an unbanked road while turning.**
- 21. Explain the banking of roads and railway tracks.**
- 22. Explain why a cyclist bends on turns.**

### Work energy power

1. A light body and a heavy body have same linear momentum. Which one has greater K.E?
2. A truck and a car moving with same K.E are stopped by applying some retarding force by means of breaks. Which one will stop at a smaller distance?
3. If stretch in a spring of force constant  $k$  is doubled, calculate:
  - a. Ratio of final to initial force in the spring
  - b. Ratio of elastic energies stored in the two cases.
  - c. Work done in changing to the state of double stretch.
4. What is meant by work? Obtain an expression for work done by constant force.
5. Explain using examples, what is meant by positive work, negative work and zero work?
- 6. What are conservative and non-conservative forces? Explain with examples.**
7. Obtain an expression for K.E of a body moving uniformly.
8. What do you mean by potential energy? Obtain an expression for gravitational potential energy.
9. What is mass energy equivalence?
- 10. State and explain work energy principle.**
- 11. Explain what is meant by potential energy of spring obtain an expression for it.**
- 12. State and establish principle of conservation of energy.**
- 13. Discuss elastic collision in one dimension. Obtain expressions for velocities of the two bodies after such a collision.**
14. What is inelastic collision?

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15. Define power. State and define its SI unit.
16. What is efficiency of a machine. Write its formula and SI unit.

### System of particles and rotational motion

1. **What is meant by centre of mass? Derive an expression for centre of mass of a system of  $n$  particles (or 2 particles)**
2. Derive three equations of rotational motion.
3. What is torque? Write its SI unit.
4. Derive an expression for Cartesian and polar coordinates of torque.
5. What is angular momentum? Write its SI unit.
6. Derive an expression for Cartesian and polar coordinates of Angular momentum.
7. **Derive a relationship between torque and angular momentum.**
8. **What is moment of inertia. Derive a formula for it for a system of  $n$  particles having masses  $m_1, m_2, m_3, \dots, m_n$  rotating about a given axis.**
9. **What is radius of gyration. Obtain an expression for it.**
10. **Derive a relation between moment of inertia and torque.**
11. **Derive a relation between moment of inertia and angular momentum.**
12. State and prove the law of conservation of angular momentum.
13. Explain why a dancer bends her hands inwards when she revolves around her body.
14. Explain why a helicopter has two propellers.
15. Explain why a diver bends his body during jump and stretches when he is about to touch water.
16. Explain why a cat can jump from a large height without getting injured.
17. Explain what would happen if all the ice on polar caps would melt.
18. **Derive an expression for acceleration of a body rolling down a rough inclined plane.**

### Gravitation

1. What is Newton's law of gravitation? Write its mathematical expression giving the meaning of each symbol used.
2. Write the value, units and dimensions of universal gravitational constant.
3. **What is acceleration due to gravity? Derive a formula for it in terms of mass and radius of a given planet.**
4. **Discuss the variation of acceleration due to gravity with height. Hence, derive a formula for percentage change in acceleration due to gravity for small heights.**
5. **Discuss the variation of acceleration due to gravity with depth. Hence, derive a formula for percentage change in acceleration due to gravity for a depth  $d$  below the surface of earth.**
6. **What is gravitational field intensity. Derive an expression for it and write its SI units.**
7. **Define gravitational potential at a point. Derive an expression for gravitational potential at a distance  $r$  due to a mass  $M$ .**

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8. **What do you mean by gravitational potential energy of a system? Derive an expression for gravitational potential energy of two bodies of masses  $M$  and  $m$  with their centres separated by a distance  $r$ .**
9. What is a satellite. What is the principle for launching a satellite?
10. **Derive an expression for the following for a satellite**
  - a. **Orbital velocity.**
  - b. **Time period.**
  - c. **Height.**
  - d. **Total energy.**
11. What is binding energy of a satellite. Write an expression for it.
12. What are geostationary satellites. What are the essential conditions for a satellite to be geostationary? Write some uses of geostationary satellites.
13. What are polar satellites. Write some uses of polar satellites.
14. **What do you mean by escape velocity? Derive an expression for escape velocity in terms of parameters of a given planet.**
15. **State three laws of Kepler's planetary motion.**
16. **Prove Kepler's law of time periods.**
17. **Derive Newton's law of gravitation from Kepler's third law.**
18. What is weightlessness? In which situation body becomes weightless?

### Mechanical properties of solids

1. **Define stress and strain and give their SI units**
2. **Discuss three types of stress and strain.**
3. **State Hooke's law and define modulus of elasticity.**
4. **Discuss three types of moduli of elasticity and state their SI units.**
5. **Explain and draw stress strain curve for a stretched wire.**
6. What is compressibility. Write its SI unit.
7. **Discuss how elasticity helps in**
  - a. **Deciding the radius of rope of cranes.**
  - b. **To decide shape of pillars of flyovers and bridges.**
  - c. **Find the height of mountain.**
8. **What is elastic potential energy in stretched wire, derive an expression for it.**
9. **What is Poisson ratio, what is its SI unit?**

### Mechanical properties of fluids

1. What is thrust? Write its SI unit.
2. **Derive an expression for pressure at a depth  $h$  in a fluid.**
3. Define surface tension. Write its SI unit

4. What are cohesive and adhesive forces? Explain giving examples.
5. What is angle of contact?
6. **Derive an expression for excess pressure inside a liquid drop.**
7. **Derive an expression for excess pressure inside a soap bubble.**
8. **What is capillarity? Derive Ascent formula.**
9. How does surface tension vary with temperature? Explain giving examples.
10. What is viscosity?
11. What is coefficient of viscosity? Write its SI units and dimensions.
12. **What is Stokes's law? Prove using method of dimensions.**
13. **What is terminal velocity? Derive an expression for terminal velocity acquired by a body while falling freely in a viscous medium.**
14. **What is Reynold's number? Write its value of the various types of flows.**
15. **Derive equation of continuity.**
16. **What are three types of flow, name and explain them.**
17. **State and prove Bernoulli's theorem.**
18. Explain magnus effect.
19. Explain why roofs of houses blow off during storm?
20. Why deep water runs slow?
21. Explain why we should not stand close to a moving train?
22. **Explain the working on venturi meter.**
23. **State and prove Torricelli's theorem.**
24. **What is surface energy? Derive an expression for it.**

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### Thermal properties of matter

1. **Derive relation between coefficient of linear expansion, areal expansion.**
2. **Derive relation between coefficient of linear expansion and volume expansion.**
3. Discuss three units of temperature and write relation between any two.
4. Discuss three practical application of linear thermal expansion.
5. **Define specific heat capacity and write it's SI unit**
6. **Define molar heat capacity and write it's SI unit**
7. **Define two principle specific heats of gas and discuss which is greater and why.**
8. **Define conduction and coefficient of thermal conductivity and write it's SI unit**
9. **Define convection and discuss the role of convection in sea breeze and land breeze**
10. Discuss three important practical applications of thermal conductivity.

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11. What is principal of calorimetry.
12. State and explain Newton's law of cooling.

## Thermodynamics

1. State zeroth's law of thermodynamics.
2. Name four types of thermodynamical processes.
3. **What is an indicator diagram?**
4. **Derive an expression for work done by an ideal gas during isothermal reversible expansion.**
5. **Derive an expression for work done by an ideal gas during adiabatic expansion.**
6. What is the equation of state for:
  - a. Isothermal process
  - b. Adiabatic process
7. **Explain why an adiabatic curve is steeper than an isothermal curve?**
8. **What is first law of thermodynamics. State in mathematical also.**
9. **State and prove Mayer's formula or derive a relation between two principle specific heats of a gas.**
10. **What are limitations of first law of thermodynamics?**
11. **Write various statements of second law of thermodynamics.**
12. **What are heat engines? Derive an expression for efficiency of a heat engine.**
13. **Explain the working of refrigerator.**
14. **What is coefficient of performance of refrigerator?**
15. **Explain the working of Carnot engine.**
16. **State Carnot theorem.**

## Kinetic theory of gases

1. **State these gas laws and write their mathematical statements:**
  - a. Boyle's law
  - b. Charle's law
  - c. Gay lussac's law
  - d. Ideal gas equation
  - e. Avogadro's law
  - f. Graham's law of diffusion
2. **Derive an expression for pressure exerted by an ideal gas.**
3. Explain these various speeds of gas molecules:
  - a. Root mean square speed

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- b. Average speed.
- c. Most probable speed
- 4. **What is degree of freedom? How does it depend on atomicity of a gas?**
- 5. **What is law of equipartition of energy?**
- 6. **Derive the values of  $C_p$  and  $C_v$  of a polyatomic gas.**
- 7. **What is mean free path? Derive an expression for it.**
- 8. Explain Brownian motion.

## Oscillations

1. **For an oscillating body, derive an expression for its**
  - a. Displacement
  - b. Velocity
  - c. Acceleration
  - d. Force acting on it
  - e. Time period
  - f. Potential energy
  - g. Kinetic energy
  - h. Total energy

2. **Derive an expression for time period of a simple pendulum.**
3. Derive an expression for time period of a liquid oscillating in a U tube.
4. Derive an expression for time period of a floating cylinder.
5. Derive an expression for the time period of a body dropped inside earth in a tunnel which connects two diametrically opposite points.
6. **Derive an expression for time period of a block connected to spring**
7. **Derive equivalent spring constant for a combination of springs connected in**
  - a. Series
  - b. Parallel

8. **Discuss damped simple harmonic motion. Write differential equation of such a motion and displacement equation representing it.**
9. **Explain free, forced and resonant oscillations with the help of suitable examples.**

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## Waves

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1. What are mechanical and electromagnetic waves? Explain giving examples.
2. Derive an expression for velocity of transverse wave on a stretched string using method of dimensions.
3. Derive an expression for velocity of longitudinal wave in a gaseous medium using method of dimensions.
4. Derive equation of a plane progressive wave.
5. Derive a relation between wave velocity and particle velocity.
6. Derive Newton's formula for velocity of sound in gases. Why the value of velocity derived by Newton was wrong? What corrections did Laplace make to it? Derive Laplace's formula for velocity of sound in gases.
7. What are standing or stationary waves?
8. Discuss the formation of fundamental tones and overtones in the following:
  - a. Strings
  - b. Open organ pipes
  - c. Closed organ pipes
9. State the laws of vibration of strings.
10. What are beats. Give their analytical treatment. Derive an expression for beat frequency and beat interval.
11. What is Doppler's effects. Derive an expression for apparent frequency heard by observer when observer is moving relative to source.

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