



CLASS XI - CBSE / PUC
Physics Study Material
K - CET and JEE (Main)

Name:

Chapter 1: Physical World

Overview

Physics is the fundamental science that studies the laws governing the universe. From the motion of planets to the behaviour of atoms, physics seeks to understand how nature works through observation, experimentation and logical reasoning.

In this introductory chapter, students are introduced to the scope, importance and beauty of physics. It highlights how physics helps us understand natural phenomena and how it plays a crucial role in the development of modern technology.

Subtopics Covered in This Chapter

- What is Physics?
- Scope and importance of physics
- Relationship between physics and other sciences
- Physics and technology
- Contributions of physicists to human civilisation
- Fundamental forces of nature
- Role of observation and experimentation

Important Concepts Students Will Learn

- Understanding physics as a systematic study of nature
- The four fundamental forces governing the universe
 - Gravitational force
 - Electromagnetic force
 - Strong nuclear force
 - Weak nuclear force
- Importance of experiments in discovering scientific laws
- The role of mathematical models in explaining physical phenomena
- The connection between physics and engineering innovations

KCET / NEET Examination Relevance

Direct questions from this chapter are rare. However, the ideas discussed here form the philosophical foundation of physics and help students understand the importance of studying physical laws.

In competitive examinations such as **KCET and NEET**, this chapter may contribute **0–1 question**, usually related to fundamental forces or the scope of physics.

Chapter 2: Units and Measurements

Subtopics Covered in This Chapter

- Physical Quantities
- Fundamental and Derived Units
- International System of Units (SI)
- Dimensional Analysis
- Errors in Measurement
- Significant Figures
- Order of Magnitude

Important Concepts Students Must Master

- Identification of fundamental physical quantities such as length, mass, time, electric current, temperature, amount of substance and luminous intensity.
- Understanding the SI system of units and standard symbols used for various physical quantities.
- Writing dimensional formulas of physical quantities such as velocity, acceleration, force, work and energy.
- Applying the principle of dimensional homogeneity to verify the correctness of physical equations.
- Using dimensional analysis to derive relationships between different physical quantities.
- Understanding the difference between systematic errors, random errors and instrumental errors.
- Calculating absolute error, relative error and percentage error in measurements.
- Correctly applying significant figure rules in addition, subtraction, multiplication and division.

Practical Importance of This Chapter

- All laboratory experiments rely on accurate measurements.
- Correct units are essential in engineering design and scientific research.
- Dimensional analysis helps physicists check the validity of complex formulas.
- Error analysis is important for improving experimental accuracy.
- Scientists often estimate values using order-of-magnitude calculations.

KCET / NEET Examination Relevance

In competitive examinations such as **KCET and NEET**, questions from this chapter usually test the student's understanding of dimensional analysis, significant figures and error calculations.

Typical exam questions may involve:

- Determining the dimensional formula of a physical quantity
- Checking whether a given equation is dimensionally correct
- Calculating percentage error
- Applying rules of significant figures

On average, this chapter contributes **about one question** in KCET and occasionally in NEET.

Physics PYQ Chapter-Wise Trend Analysis

K-CET & JEE (Main) | Last 10 Years

Target: K-CET 2028 & JEE Main 2028

*Note: Physical World (Chapter 0/1a) is **not asked** in either K-CET or JEE Main. Focus entirely on Units & Measurements.*

Overall 10-Year Weightage Summary

Exam	Total Physics Qs (per year)	Qs from this chapter (over 10 years)	Weightage (%)	Priority
K-CET	60	≈ 9 total ≈ 1 /year	$\approx 1.6\%$	Low-Moderate
JEE (Main)	30	1–2 per session	$\approx 3.3\text{--}5\%$	Moderate

K-CET Insight: Questions are almost always *direct, definition-based or formula-based* from NCERT. Expect 0–2 questions per year.

JEE Main Insight: Appears in *every session*. Questions test dimensional analysis, error propagation, and instruments (Vernier, Screw Gauge). Numerical-type questions are common here.

Approximate Year-Wise Question Count (K-CET)

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
No. of Qs	1	1	0	1	1	1	1	1	1	1

(Most years: 1 question; occasional year with 0. Total ≈ 9 in 10 years.)

Preparation Strategy

For K-CET: Expect **1 question** per year. It will almost always be a *dimensional formula* or *error analysis* question directly from NCERT examples or exercises. NCERT + previous year papers is sufficient.

For JEE Main: Expect **1–2 questions** per session. Give special attention to *Vernier/Screw Gauge readings* (numerical type), *error propagation in multi-variable formulas*, and *identifying non-meaningful dimensional combinations*. This is an **easy scoring chapter** — do not skip!

Time to allocate: Low (3–4 days of study; revisit before exam).

Chapter 3: Motion in a Straight Line

Subtopics Covered in This Chapter

- Frame of Reference
- Position and Displacement
- Distance and Speed
- Velocity and Acceleration
- Uniform Motion
- Uniformly Accelerated Motion
- Motion Under Gravity
- Graphs of Motion

Important Concepts Students Must Master

- Kinematic equations of motion
- Relationship between displacement, velocity and acceleration
- Interpretation of displacement–time graphs
- Interpretation of velocity–time graphs
- Area under velocity–time graph as displacement
- Free fall and acceleration due to gravity
- Solving motion problems using algebraic equations

Practical Importance

- Analysing the motion of vehicles
- Understanding motion of falling objects
- Predicting travel time and speed
- Studying motion in sports and athletics

KCET / NEET Examination Relevance

Kinematics is one of the most fundamental areas of physics and is frequently tested in competitive examinations.

Questions usually involve:

- Solving numerical problems using equations of motion
- Interpreting motion graphs
- Analysing free fall motion

In KCET, this chapter typically contributes **3–4 questions**.

Physics PYQ Chapter-Wise Trend Analysis

K-CET & JEE (Main) | Last 10 Years

Target: K-CET 2028 & JEE Main 2028

Note: This is a foundational chapter. It is important for both exams, and also forms the base for Motion in a Plane (Chapter 3) and Laws of Motion (Chapter 4). Do NOT skip this.

Overall 10-Year Weightage Summary

Exam	Total Physics Qs (per year)	Qs from this chapter (over 10 years)	Weightage (%)	Priority
K-CET	60	≈ 9 total ≈ 1 /year	$\approx 1.67\%$	Moderate
JEE (Main)	30	1–2 per session	$\approx 3.3\text{--}6\%$	Moderate–High

K-CET Insight: Almost always **exactly 1 question per year**. The question is typically a numerical based on equations of motion or a graph-interpretation question. Very consistent and predictable.

JEE Main Insight: 1–2 questions per session, mostly numerical type. Graph-based questions (v - t , x - t , a - t) are a favourite. Relative motion and free fall combinations also appear regularly.

Year-Wise Question Count (K-CET): 2015–2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
No. of Qs	1	1	1	1	1	1	2	1	1	1

Total over 10 years: ≈ 10 questions. Virtually guaranteed 1 question every year.

Preparation Strategy

For K-CET: Expect **1 guaranteed question** per year. It will be either a straight equation-of-motion numerical or a graph-reading question. Cover all 3 equations of motion and practice reading v - t graphs. NCERT examples and exercises are sufficient.

For JEE Main: Expect **1–2 questions** per session. Focus heavily on *graph-based questions* (identifying incorrect graphs, finding area/slope), *two-body free fall* problems, and *relative motion*. Numerical-type (integer answer) questions from this chapter are common — practice without calculator.

Important Link: This chapter is the **backbone** of Motion in a Plane and Laws of Motion. A weak foundation here will hurt you in later chapters.

Time to allocate: Moderate (5–6 days; revisit graphs before exam).

Chapter 4: Motion in a Plane

Subtopics Covered in This Chapter

- **Scalars and Vectors**

Understanding quantities that have only magnitude and those that have both magnitude and direction.

- **Vector Addition**

Methods of adding vectors using graphical and analytical techniques.

- **Resolution of Vectors**

Breaking vectors into components along coordinate axes.

- **Projectile Motion**

Studying the motion of objects projected into the air under the influence of gravity.

- **Relative Velocity**

Understanding motion of one object with respect to another moving object.

Important Concepts Students Must Master

- Representation of vectors using components
- Vector addition using triangle and parallelogram laws
- Resolution of vectors along x and y directions
- Equations describing projectile motion
- Maximum height of a projectile
- Time of flight
- Horizontal range of a projectile
- Relative velocity in two dimensions

Practical Importance

- Predicting the trajectory of projectiles
- Understanding motion of aircraft and satellites
- Analysing motion in sports such as cricket, football and basketball
- Navigation and tracking moving objects

KCET / NEET Examination Relevance

This chapter is very important for solving problems involving projectile motion and vector analysis. Typical examination questions include:

- Calculating range, maximum height and time of flight
- Resolving vectors into components
- Analysing motion using relative velocity

In KCET, this chapter usually contributes **2–3 questions**.

Physics PYQ Chapter-Wise Trend Analysis

K-CET & JEE (Main) | Last 10 Years

Target: K-CET 2028 & JEE Main 2028

*Note: This chapter covers Vectors, Projectile Motion, Relative Motion (2D), and Uniform Circular Motion. It has the **highest weightage** among all 1st PUC chapters in K-CET. For JEE Main, Projectile Motion and Circular Motion are among the most frequently tested topics in all of Mechanics.*

Overall 10-Year Weightage Summary

Exam	Total Physics Qs (per year / session)	Total Physics Marks (per year / session)	Qs from this chapter (over 10 years)	Weightage (%)
K-CET	60	60	$\approx 13-16$ total; $\approx 1-2$ /year	$\approx 2.2-3.3\%$
JEE (Main)	25	100	1–2 per session	$\approx 4-8\%$

K-CET Insight: This is the *highest weightage 1st PUC chapter* in K-CET. In 2021, alone 4 questions came from this chapter. Projectile motion and relative velocity questions dominate.

JEE Main Insight: Projectile motion appears in virtually every session. Circular motion and 2D relative velocity are also tested regularly. Integer-type numerical questions on projectile motion are very common.

Year-Wise Question Count (K-CET): 2015–2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
No. of Qs	2	2	1	0	1	2	4	1	1	1

Total (2015–2024): ≈ 15 questions. This is the most asked 1st PUC chapter in K-CET. Note the spike of 4 questions in 2021.

Preparation Strategy

For K-CET: This is the **most important 1st PUC chapter** — expect **1–2 questions per year**, occasionally more. Focus on projectile motion formulas and horizontal projectile problems. Questions are mostly direct formula-based. NCERT examples + previous year K-CET papers are sufficient.

For JEE Main: This chapter is **high priority**. Projectile motion appears in almost every session, often as a numerical-type question. Circular motion (banking, conical pendulum) and river-boat problems are also regular. Practise a wide variety of projectile problems including projectile on inclined planes.

Key tip: Always resolve motion into horizontal (x) and vertical (y) components independently. Horizontal: uniform velocity. Vertical: uniform acceleration (g downward).

Time to allocate: High (7–10 days). This chapter has the best return on investment for K-CET from 1st PUC.

Chapter 5: Laws of Motion

Overview

Newton's laws form the backbone of classical mechanics and explain how forces influence motion.

Subtopics

- Force and inertia
- Newton's First Law
- Newton's Second Law
- Newton's Third Law
- Linear momentum
- Impulse
- Friction
- Circular motion

Important Concepts

- Free body diagrams
- Static and kinetic friction
- Conservation of momentum
- Centripetal force

KCET Weightage

Typically **3–4 questions** appear from Newton's laws and friction.

Physics PYQ Chapter-Wise Trend Analysis

K-CET & JEE (Main) | Last 10 Years

Target: K-CET 2028 & JEE Main 2028

*Note: This chapter covers Newton's three laws, friction, free body diagrams, Atwood machine, pulley systems, and motion on inclined planes. It is a **foundational chapter** – concepts here are used in every mechanics chapter that follows.*

Overall 10-Year Weightage Summary

Exam	Qs from this chapter (over 10 yrs)	Avg. per year / session	Weightage (%)
K-CET	≈ 9–11 total	≈ 1 per year	≈ 1.67%
JEE (Main)	≈ 2–3 per session (across sessions)	1–2 per session	≈ 4–8%

K-CET Insight: Extremely consistent — **exactly 1 question per year** in 8 out of 10 years (2 questions in 2018, 0 in rare years). Questions are direct: Newton's 2nd law numericals, friction on surfaces, tension in

strings. NCERT level is sufficient.

JEE Main Insight: 1–2 questions per session, almost always present. About 40% are conceptual (Newton's laws, action-reaction, inertia) and 60% are numericals (FBD, friction, pulley, inclined plane). Integer-type numerical questions from friction are very common.

Year-Wise Question Count (K-CET): 2015–2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
No. of Qs	1	1	1	2	1	1	1	1	1	1

Total (2015–2024): ≈ 11 questions. Virtually guaranteed 1 question every year.

Golden Rule: Always Draw a Free Body Diagram (FBD)

For every problem in this chapter, follow this sequence:

Step 1: Isolate each body in the system.

Step 2: Draw **all forces** acting on it: weight (mg), normal (N), friction (f), tension (T), applied force (F).

Step 3: Choose a convenient coordinate axis (along the incline for incline problems).

Step 4: Apply $F_{\text{net}} = ma$ along each axis.

Step 5: Solve the equations simultaneously.

Preparation Strategy

For K-CET: Expect **1 question per year** – almost always a direct numerical using Newton's 2nd Law or friction on a flat/inclined surface. The question style is straightforward. Master FBD, $F = ma$, and friction formulae. NCERT examples and exercises are fully sufficient.

For JEE Main: Expect **1–2 questions per session**. Friction (especially on inclined planes and conveyor belt problems) and pulley systems are the most tested. Integer-type numerical questions frequently come from this chapter. Practice wedge + block systems, and block-on-block (two-body friction) problems from HC Verma and DC Pandey.

Key tip: Do **not** mix up μ_s and μ_k . Remember: $\mu_k < \mu_s$ always. Static friction is self-adjusting up to its maximum value.

Time to allocate: High (7–10 days). This chapter is directly tested and also underpins Work-Energy, Rotational Motion, and Fluid Mechanics.

Chapter 6: Work, Energy and Power

Topics Covered in This Chapter

- Work Done by a Force
- Work Done by Variable Forces
- Kinetic Energy
- Potential Energy
- Work–Energy Theorem
- Conservation of Mechanical Energy
- Power

Important Concepts Students Must Master

- Work done by constant and variable forces
- Mathematical expression for kinetic energy
- Gravitational potential energy near Earth's surface
- Work–energy theorem
- Conservative and non-conservative forces
- Conservation of mechanical energy
- Power and efficiency of machines

Practical Importance

- Understanding how engines and machines perform work
- Analysing motion using energy conservation
- Studying energy transfer in mechanical systems
- Understanding efficiency in machines and power plants
- Explaining everyday phenomena such as roller-coaster motion and falling objects

KCET / NEET Examination Relevance

The concepts of work and energy are extremely important for competitive examinations because they are used in many other chapters of mechanics.

Typical questions include:

- Calculating work done by forces
- Applying the work–energy theorem
- Solving problems using conservation of mechanical energy
- Determining power and efficiency of systems

In KCET, this chapter usually contributes approximately **2–3 questions**. The concepts learned here also appear frequently in later chapters such as rotational motion and gravitation.

Chapter 7: System of Particles and Rotational Motion

*Note: This chapter is one of the **most important mechanics chapters** for JEE Main and a **highly scoring chapter** for K-CET. Rotational Motion is frequently tested in JEE Main, while K-CET usually asks direct formula-based questions. Do NOT treat this chapter lightly — it has strong conceptual weight and consistently appears in exams.*

Overall 10-Year Weightage Summary

Exam	Qs from this chapter (over 10 yrs)	Avg. per year / session	Weightage (%)
K-CET	≈ 10–14 total	≈ 1–1.5 per year	≈ 2–3%
JEE (Main)	2–3 per session	2–3 per session	≈ 7–8%

K-CET Insight: This chapter generally gives **1 direct question every year**, and in some years up to **2 questions**. Most questions are straightforward and formula-based, especially from centre of mass, torque, and rolling motion. A very scoring chapter if formulas are clear.

JEE Main Insight: This is a **high-weightage chapter** in Mechanics. JEE Main regularly asks questions from: centre of mass, moment of inertia, rolling motion, and angular momentum conservation. Many rotational motion questions are direct applications of standard formulas. This chapter offers **easy marks** if concepts are strong.

Year-Wise Question Count (K-CET): 2015–2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
No. of Qs	1	1	1	2	1	1	1	1	2	1

Total (2015–2024): approximately 12 questions. This chapter is highly reliable for K-CET preparation.

Sample Actual K-CET Questions (Representative PYQs)

Year	Question Summary	Topic
2024	Solid sphere rolling down incline; compare translational and rotational KE	Rolling motion
2023	Two particles connected by rod; find centre of mass position	Centre of mass
2021	Disc rotating about axis; calculate torque needed	Torque / angular acceleration
2019	Ring and disc rolling from same height; compare speeds	Rolling motion / MOI

Common Mistakes to Avoid

Mistake	Correct Approach
Using force instead of torque	Use $\tau = rF \sin \theta$ for rotational motion
Forgetting axis while using MOI	Always check about which axis MOI is calculated
Ignoring rolling condition	Use $v = r\omega$ for rolling without slipping
Confusing angular momentum with torque	Torque changes angular momentum; they are different
Using wrong standard MOI formulas	Memorise rod, disc, ring, sphere formulas
Ignoring energy conservation in rolling	Use translational + rotational KE together

Preparation Strategy

For K-CET: Expect **1 direct formula-based question every year**. Focus mainly on: (i) centre of mass formula, (ii) torque, (iii) standard moment of inertia values, (iv) rolling motion relation $v = r\omega$. NCERT examples and solved exercises are sufficient for K-CET.

For JEE Main: Expect **2–3 questions per session**. This chapter is one of the highest scoring in Mechanics. Focus on: rolling motion on incline, angular momentum conservation, torque and angular acceleration, radius of gyration, and mixed translational-rotational systems.

Key resource tip: Complete all NCERT examples first. Then solve:

- Previous Year JEE Main questions (2019–2025)
- DC Pandey rotational motion chapter
- K-CET PYQs

Time to allocate: High importance chapter. Recommended: **7–9 days** of focused preparation.

Chapter 8: Gravitation

Subtopics Covered in This Chapter

- **Universal Law of Gravitation**

Newton's law describing the gravitational force between two masses in the universe.

- **Gravitational Field**

Understanding the region around a mass where gravitational forces act.

- **Acceleration Due to Gravity**

Study of gravitational acceleration near the Earth's surface and its variation with height and depth.

- **Gravitational Potential Energy**

Energy possessed by a body due to its position in a gravitational field.

- **Escape Velocity**

The minimum velocity required for an object to escape the gravitational field of a planet without further propulsion.

- **Orbital Motion**

Understanding how planets and satellites move in stable orbits under gravitational forces.

- **Artificial Satellites**

Motion of satellites around the Earth and the concept of orbital velocity.

Important Concepts Students Must Master

- Newton's universal law of gravitation
- Gravitational field strength
- Variation of acceleration due to gravity with height and depth
- Gravitational potential and potential energy
- Escape velocity of planets
- Orbital velocity of satellites
- Energy of satellites in orbit

KCET / NEET Examination Relevance

Gravitation is an important chapter in mechanics and frequently appears in competitive examinations. Typical questions involve:

- Applying Newton's law of gravitation
- Calculating variation of gravitational acceleration
- Determining escape velocity
- Calculating orbital velocity of satellites
- Energy of satellites in circular orbit

In KCET, this chapter generally contributes about **3–4 questions**. Some problems may also combine concepts from circular motion and work–energy principles.

Chapter 8: Gravitation

*Note: This chapter is a **highly scoring and formula-rich** chapter in both K-CET and JEE Main. Questions are generally direct, repetitive, and heavily based on standard formulas. Do NOT skip this chapter — it consistently gives easy marks every year if concepts are clear.*

Overall 10-Year Weightage Summary

Exam	Qs from this chapter (over 10 yrs)	Avg. per year / session	Weightage (%)
K-CET	≈ 10–13 total	≈ 1 per year	≈ 1.7–2.5%
JEE (Main)	1–2 per session	≈ 1.5 per session	≈ 5–7%

K-CET Insight: Gravitation is one of the most reliable Class 11 chapters in K-CET. Students can expect **1 question almost every year**, usually from: variation of g , satellite motion, escape velocity, or gravitational

potential. Most questions are direct substitutions in standard formulas.

JEE Main Insight: Gravitation contributes **1–2 questions in most sessions**, with recent trend analyses placing its weightage at roughly **5–7%**. Frequently tested areas include: satellite motion, escape velocity, variation of g , Kepler's laws, and gravitational potential energy. This is a **must-master easy marks chapter** in Mechanics.

Year-Wise Question Count (K-CET): 2015–2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
No. of Qs	1	1	1	1	2	1	1	1	1	1

Total (2015–2024): approximately 11 questions. This chapter is extremely dependable for K-CET scoring.

Common Mistakes to Avoid

Mistake	Correct Approach
Using g constant everywhere	Remember: g decreases with height and depth
Confusing escape and orbital velocity	$v_e = \sqrt{2}v_o$ near Earth
Using surface formulas at altitude	Use total distance from centre of Earth
Ignoring negative sign in potential energy	Gravitational PE is always negative
Wrong use of Kepler's law	Use $T^2 \propto r^3$ carefully
Forgetting unit consistency	Convert km to m before substitution

Preparation Strategy

For K-CET: Expect **1 direct question every year**. Focus mainly on: (i) variation of g , (ii) escape velocity, (iii) orbital velocity, (iv) satellite time period. This chapter is very easy to score if formulas are memorised.

For JEE Main: Expect **1–2 questions per session**. Most repeated areas: satellite motion, escape velocity, Kepler's laws, gravitational potential, and variation of g with height/depth. Many PYQs are direct formula applications.

Key resource tip: Complete all NCERT examples first. Then solve:

- JEE Main Gravitation PYQs (2019–2025)
- K-CET chapter-wise PYQs
- Standard satellite and escape velocity numericals

Time to allocate: Moderate importance chapter. Recommended: **5–7 days** of focused preparation.

Chapter 9: Mechanical Properties of Solids

Subtopics Covered in This Chapter

- **Elastic Behaviour of Solids**

Understanding how solid bodies deform when external forces are applied and how they return to their original shape when the force is removed.

- **Stress and Strain**

Study of internal forces within materials and the resulting deformation.

- **Hooke's Law**

The relationship between stress and strain for elastic materials.

- **Elastic Moduli**

Different measures of elasticity including Young's modulus, Bulk modulus and Shear modulus.

- **Elastic Energy**

Energy stored in a body when it undergoes elastic deformation.

Important Concepts Students Must Master

- Difference between elastic and plastic deformation
- Types of stress: longitudinal, shear and bulk stress
- Types of strain: longitudinal, shear and volumetric strain
- Hooke's law and proportionality between stress and strain
- Young's modulus, Bulk modulus and Shear modulus
- Stress-strain curve for materials
- Elastic potential energy stored in deformed bodies

KCET / NEET Examination Relevance

This chapter focuses on the mechanical behaviour of materials and is important for understanding the strength and flexibility of structures and materials.

Typical examination questions include:

- Calculating stress and strain
- Applying Hooke's law
- Determining elastic moduli
- Interpreting stress-strain graphs

In KCET, this chapter generally contributes about **1–2 questions**. The numerical problems are usually straightforward and formula based.

Chapter 9: Mechanical Properties of Solids

*Note: This chapter is a **short, highly scoring, and formula-based** chapter in both K-CET and JEE Main. Most questions are straightforward and based on stress, strain, and elastic moduli. Do NOT ignore this chapter — it is one of the easiest chapters to secure quick marks with minimal preparation.*

Overall 10-Year Weightage Summary

Exam	Qs from this chapter (over 10 yrs)	Avg. per year / session	Weightage (%)
K-CET	$\approx 8-10$ total	≈ 1 per year	$\approx 1.5-2.5\%$
JEE (Main)	≈ 1 question in many sessions	$\approx 0.5-1$ per session	$\approx 2\%$

K-CET Insight: Mechanical Properties of Solids is a reliable **formula-based chapter** in K-CET. Recent chapter-wise analyses place it at roughly **4 marks worth of importance** in the syllabus, and students can expect **1 direct question in most years**. Typical questions come from: stress, strain, Young's modulus, and thermal stress.

JEE Main Insight: JEE Main asks fewer but very direct questions from this chapter. Past 5-year trend analyses place its chapter contribution at roughly **2.08%**. Questions are generally easy if formulas and stress-strain graph concepts are clear. This chapter is a **low effort, good return** topic.

Year-Wise Question Count (K-CET): 2015–2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
No. of Qs	1	1	1	1	0	1	1	1	1	1

Total (2015–2024): approximately 9 questions. This is one of the easiest low-time investment chapters in Class 11 Physics.

Common Mistakes to Avoid

Mistake	Correct Approach
Confusing stress with strain	Stress = force/area; strain is dimensionless
Using wrong area in stress	Use cross-sectional area only
Ignoring original length in strain	Strain = $\Delta L/L$
Wrong unit of Young's modulus	Use SI unit: Pa or N/m ²
Applying Hooke's law beyond elastic limit	Valid only within elastic limit
Forgetting thermal expansion effect	Include $\alpha\Delta T$ when needed

Preparation Strategy

For K-CET: Expect **1 direct question in most years**. Focus on: (i) stress and strain definitions, (ii) Young's modulus formula, (iii) thermal stress, (iv) stress-strain graph basics. This chapter is very easy and highly scoring.

For JEE Main: Expect **0–1 question per session**. Questions are generally direct and formula-based. Focus on: Young's modulus applications, wire extension, elastic energy, and stress-strain graph interpretation.

Key resource tip: Complete all NCERT examples first. Then solve:

- JEE Main PYQs (2019–2025)
- K-CET chapter-wise PYQs
- basic wire-extension numericals

Time to allocate: Low-to-moderate. Recommended: **3–4 days** of focused preparation.

Chapter 10: Mechanical Properties of Fluids

Subtopics Covered in This Chapter

- **Pressure**
Understanding pressure in fluids and how it varies with depth.
- **Pascal's Law**
Transmission of pressure in confined fluids and its applications in hydraulic machines.
- **Archimedes' Principle**
Buoyant force experienced by objects immersed in fluids.
- **Viscosity**
Resistance offered by fluids to flow and factors affecting viscosity.
- **Streamline and Turbulent Flow**
Different types of fluid motion and conditions for smooth fluid flow.
- **Bernoulli's Principle**
Relationship between pressure, velocity and height in fluid flow.
- **Surface Tension**
Phenomenon that causes the surface of a liquid to behave like a stretched elastic membrane.

Important Concepts Students Must Master

- Pressure in liquids and variation of pressure with depth
- Applications of Pascal's law in hydraulic systems
- Buoyant force and floating conditions
- Density and relative density of materials

- Viscous force and Stokes' law
- Streamline flow and Reynolds number
- Bernoulli's equation and its applications
- Surface tension and capillary action

KCET / NEET Examination Relevance

This chapter explains the behaviour of liquids and gases and has many important real-life applications. Typical examination questions include:

- Calculating pressure at different depths
- Applying Archimedes' principle
- Solving problems based on viscosity and Stokes' law
- Applying Bernoulli's equation in fluid flow
- Understanding surface tension phenomena

In KCET, this chapter generally contributes about **1–2 questions**. Many problems are concept-based and require understanding of fluid behaviour.

Chapter 10: Mechanical Properties of Fluids

*Note: This is a **high-weightage and consistently scoring** chapter for both K-CET and JEE Main. It is more conceptual than Gravitation but still heavily formula-based. Questions on Bernoulli's theorem, surface tension, and viscosity appear **almost every year**. Do NOT underestimate this chapter — it rewards students who master applications.*

Overall 10-Year Weightage Summary

Exam	Qs from this chapter (over 10 yrs)	Avg. per year / session	Weightage (%)
K-CET	≈ 15–20 total	≈ 1–2 per year	≈ 2.5–4%
JEE (Main)	2–3 per session	≈ 2–3 per session	≈ 7–10%

K-CET Insight: Mechanical Properties of Fluids is one of the **more reliable** Class 11 chapters in K-CET. Students can expect **1–2 questions every year**, usually from: pressure in fluids, Archimedes' principle, surface tension, or capillarity. Most questions are direct formula substitutions.

JEE Main Insight: This chapter contributes **2–3 questions in most sessions**, making it one of the highest-yielding Class 11 chapters in Physics. Frequently tested areas: Bernoulli's theorem (with applications like venturimeter and aerofoil), viscosity and terminal velocity, surface tension (excess pressure, capillary rise), and pressure in fluids. **This is a must-master chapter for JEE scoring.**

Year-Wise Question Count (K-CET): 2015–2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
No. of Qs	1	2	1	2	1	2	1	2	1	2

Total (2015–2024): approximately 15–20 questions. Questions alternate between fluid statics and fluid dynamics topics year to year.

Common Mistakes to Avoid

Mistake	Correct Approach
Using $\Delta P = \frac{2T}{R}$ for soap bubble	Soap bubble has two surfaces: use $\Delta P = \frac{4T}{R}$
Forgetting atmospheric pressure in depth problems	Total pressure = $P_0 + \rho gh$; never ignore P_0
Applying Bernoulli without checking flow type	Bernoulli valid only for ideal, steady, incompressible fluid
Wrong fraction submerged formula	Fraction submerged = $\frac{\rho_{\text{body}}}{\rho_{\text{fluid}}}$
Terminal velocity proportional to r	$v_t \propto r^2$, not r — very common error
Ignoring contact angle in capillarity	$h = \frac{2T \cos \theta}{\rho g r}$; use $\theta = 0$ only for water-glass
Confusing efflux velocity and flow rate	Speed $v = \sqrt{2gh}$; flow rate $Q = Av$
Unit errors (CGS vs SI)	Always convert to SI: Pa, m, kg, m/s

Preparation Strategy

For K-CET: Expect **1–2 questions every year**. Focus mainly on: (i) pressure at depth and Pascal's law, (ii) Archimedes' principle and floating conditions, (iii) surface tension — excess pressure and capillary rise, (iv) terminal velocity. Questions are almost always direct formula applications. Memorise formulas and units carefully.

For JEE Main: Expect **2–3 questions per session** — this is one of the **highest-scoring** Class 11 chapters. Most repeated areas: Bernoulli's theorem (venturimeter, aerofoil, Torricelli), surface tension (bubble, drop, capillarity), viscosity and terminal velocity, and pressure variation problems. Integer-type and numerical questions frequently come from this chapter. Many PYQ patterns repeat — do not skip.

Key resource tip: Complete all NCERT examples and exercises first. Then solve:

- JEE Main Fluids PYQs (2019–2025)
- K-CET chapter-wise PYQs
- H.C. Verma Chapter 13 (Fluid Mechanics) exercises

Time to allocate: High importance chapter. Recommended: **7–10 days** of focused preparation.

Chapter 11: Thermal Properties of Matter

Subtopics Covered in This Chapter

- **Temperature and Heat**

Understanding temperature as a measure of hotness and the concept of heat as energy transfer between bodies.

- **Thermal Expansion**

Expansion of solids, liquids and gases when temperature changes.

- **Expansion of Solids**

Linear expansion, superficial expansion and volumetric expansion of solids due to temperature change.

- **Expansion of Liquids**

Real and apparent expansion of liquids and anomalous expansion of water.

- **Specific Heat Capacity**

Amount of heat required to raise the temperature of a substance.

- **Calorimetry**

Measurement of heat exchange between bodies.

- **Heat Transfer**

Modes of heat transfer including conduction, convection and radiation.

Important Concepts Students Must Master

- Temperature scales and conversion between them
- Coefficient of linear, superficial and volume expansion
- Anomalous expansion of water
- Heat capacity and specific heat capacity
- Principle of calorimetry
- Thermal equilibrium and heat exchange
- Laws governing conduction of heat
- Convection currents in fluids
- Heat transfer by thermal radiation

KCET / NEET Examination Relevance

This chapter explains how heat affects matter and how energy is transferred between bodies.

Typical examination questions include:

- Calculating thermal expansion of solids
- Problems based on calorimetry
- Heat transfer mechanisms
- Temperature conversions
- Specific heat capacity calculations

In KCET, this chapter usually contributes about **1–2 questions**. The problems are generally formula-based and conceptual.

Chapter 11: Thermal Properties of Matter

*Note: This is a **high-scoring and conceptually important** chapter for both K-CET and JEE Main. Questions are commonly asked from thermal expansion, calorimetry, latent heat, and heat transfer. This chapter is easy to score if formulas, concepts, and applications are mastered properly.*

Overall 10-Year Weightage Summary

Exam	Qs from this chapter (over 10 yrs)	Avg. per year / session	Weightage (%)
K-CET	≈ 12–18 total	≈ 1–2 per year	≈ 2–4%
JEE (Main)	2–3 per session	≈ 2 per session	≈ 6–8%

K-CET Insight: Thermal Properties of Matter is a **reliable scoring chapter** in K-CET. Students can expect **1–2 direct questions every year**, mainly from: thermal expansion, calorimetry, latent heat, and heat transfer.

JEE Main Insight: This chapter contributes **2–3 questions in many sessions**, especially from: specific heat, calorimetry, Newton's law of cooling, and thermal expansion. Most questions are formula-based but may involve concept application.

Year-Wise Question Count (K-CET): 2015–2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
No. of Qs	1	1	2	1	2	1	2	1	2	1

Thermal Properties questions are consistently asked in K-CET, mostly as direct formula substitutions.

Common Mistakes to Avoid

Mistake	Correct Approach
Using Celsius directly everywhere	Convert to Kelvin when needed
Ignoring SI units	Always use SI units in numericals
Confusing heat and temperature	Heat is energy transfer; temperature is measure
Skipping anomalous expansion of water	Density maximum at 4°C
Wrong sign in calorimetry	Assign heat lost and gained carefully

Preparation Strategy

For K-CET: Expect **1–2 questions every year**. Focus on: (i) thermal expansion, (ii) calorimetry, (iii) latent heat, (iv) heat transfer. Questions are generally direct formula substitutions.

For JEE Main: Focus on: specific heat and heat capacity, calorimetry mixing problems, thermal expansion in solids, Newton's law of cooling. Numericals are very scoring.

Key Resource Tip: Complete:

- NCERT examples and exercises
- JEE Main PYQs (2019–2025)
- K-CET chapter-wise PYQs
- H.C. Verma thermal physics exercises

Time to Allocate: Recommended: **5–7 days** for full mastery.

Chapter 12: Thermodynamics

Subtopics Covered in This Chapter

- **Thermodynamic System**

Understanding the concepts of system, surroundings and thermodynamic equilibrium.

- **Thermodynamic Variables**

State variables such as pressure, volume and temperature that describe the state of a system.

- **Thermodynamic Processes**

Different processes such as isothermal, adiabatic, isobaric and isochoric processes.

- **First Law of Thermodynamics**

Relationship between heat, work and internal energy of a system.

- **Heat Engines**

Working principle of heat engines and energy conversion.

- **Second Law of Thermodynamics**

Limitations on the conversion of heat into work and the direction of natural processes.

- **Carnot Engine**

Ideal heat engine and concept of maximum efficiency.

- **Refrigerators and Heat Pumps**

Devices that transfer heat from lower temperature regions to higher temperature regions.

Important Concepts Students Must Master

- Internal energy of a thermodynamic system
- Work done during thermodynamic processes
- First law of thermodynamics
- Heat engine efficiency
- Reversible and irreversible processes
- Second law of thermodynamics
- Carnot cycle and Carnot efficiency
- Applications of thermodynamics in engines and refrigerators

KCET / NEET Examination Relevance

Thermodynamics is an important chapter because it explains how energy transforms between heat and mechanical work.

Typical examination questions include:

- Applying the first law of thermodynamics
- Calculating work done in thermodynamic processes
- Efficiency of heat engines
- Carnot engine calculations
- Conceptual questions on the second law of thermodynamics

In KCET, this chapter usually contributes about **2–3 questions**. The concepts learned here are also useful for understanding topics in chemistry and engineering.

“latex

Chapter 12: Thermodynamics

*Note: This is a **high-weightage and conceptually important** chapter for both K-CET and JEE Main. Questions are commonly asked from laws of thermodynamics, heat engines, Carnot cycle, and thermodynamic processes. This chapter is very scoring if concepts, sign conventions, and formulas are mastered properly.*

Overall 10-Year Weightage Summary

Exam	Qs from this chapter (over 10 yrs)	Avg. per year / session	Weightage (%)
K-CET	≈ 15–20 total	≈ 1–2 per year	≈ 3–5%
JEE (Main)	2–4 per session	≈ 2–3 per session	≈ 8–10%

Year-Wise Question Count (K-CET): 2015–2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
No. of Qs	1	2	1	1	2	1	1	2	1	1

Thermodynamics has remained one of the most consistently tested chapters in K-CET. Students can safely expect at least 1 direct question every year, usually from the first law, heat engines, or thermodynamic processes.

Common Mistakes to Avoid

Mistake	Correct Approach
Wrong sign convention	Work by system is positive
Confusing heat and internal energy	They are different quantities
Ignoring Kelvin scale in efficiency	Always use absolute temperature
Mixing process equations	Apply correct process relation

For K-CET: Expect **1–2 questions every year**. Focus mainly on: (i) first law of thermodynamics, (ii) sign convention in heat and work, (iii) specific heat relations, (iv) thermodynamic processes (isothermal, adiabatic), (v) heat engines and efficiency. Most K-CET questions are direct formula substitutions or simple concept checks.

For JEE Main: This is a **high-scoring chapter** with frequent questions. Focus on:

- Work done in different processes
- PV diagrams and area interpretation
- Internal energy change
- Carnot engine and refrigerator
- Cyclic processes and efficiency

Numericals are very common, so concept clarity is essential.

Chapter 13: Kinetic Theory of Gases

Subtopics Covered in This Chapter

- Molecular Nature of Matter
- Behaviour of Gases
- Gas Laws
- Kinetic Theory of Gases
- Pressure of an Ideal Gas
- Kinetic Interpretation of Temperature
- Degrees of Freedom
- Law of Equipartition of Energy
- Mean Free Path

Important Concepts Students Must Master

- Postulates of kinetic theory of gases
- Ideal gas equation
- Relationship between pressure and molecular motion
- Root mean square (RMS) speed of gas molecules
- Average kinetic energy of molecules
- Degrees of freedom of molecules
- Equipartition of energy principle
- Mean free path of molecules

KCET / NEET Examination Relevance

This chapter provides the microscopic explanation of gas behaviour and connects thermodynamics with molecular physics.

Typical examination questions include:

- Calculating RMS speed of gas molecules
- Applying the ideal gas equation
- Determining average kinetic energy
- Conceptual questions on degrees of freedom
- Problems involving gas laws

Chapter 13: Kinetic Theory of Gases

*Note: This is a **high-scoring bridge chapter** between Thermal Physics and Thermodynamics. Though relatively short, it is extremely important for both K-CET and JEE Main because it forms the base for gas laws, molecular motion, and thermodynamic interpretation. Questions are often direct, formula-based, and*

conceptually simple if fundamentals are clear. :contentReference[oaicite:0]index=0

Overall 10-Year Weightage Summary

Exam	Qs from this chapter (over 10 yrs)	Avg. per year / session	Weightage (%)
K-CET	$\approx 10-15$ total	≈ 1 per year	$\approx 2-3\%$
JEE (Main)	1–2 per session	≈ 1 per session	$\approx 2.5-4\%$

K-CET Insight: Kinetic Theory is one of the easiest scoring Class 11 chapters. Questions are usually asked from: ideal gas equation, rms speed, kinetic interpretation of temperature, and degrees of freedom. Most are direct substitutions.

JEE Main Insight: This chapter contributes about **2.88%** weightage on average in recent analyses. It is often linked with Thermodynamics and gas laws. Important areas include: pressure due to molecular motion, rms speed, mean free path, and equipartition of energy. :contentReference[oaicite:1]index=1

Year-Wise Question Count (K-CET): 2015–2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
No. of Qs	1	1	2	1	1	2	1	1	2	1

This chapter has shown a steady presence in K-CET, usually as a straightforward numerical or conceptual question.

Preparation Strategy

For K-CET: This is a **must-do easy chapter**. Focus on: (i) ideal gas equation, (ii) rms speed, (iii) pressure relation, (iv) kinetic energy of molecules. Questions are direct and highly scoring.

For JEE Main: This chapter is short but frequently linked with thermodynamics. Master:

- derivation of pressure expression
- rms / average / most probable speeds
- equipartition theorem
- mean free path basics

Solve PYQs to recognise repeating patterns.

Time to Allocate: Recommended: **3–5 days** for complete mastery.

Chapter 14: Oscillations

Subtopics Covered in This Chapter

- Periodic Motion
- Oscillatory Motion
- Simple Harmonic Motion (SHM)
- Mathematical Description of SHM
- Time Period and Frequency
- Energy in Simple Harmonic Motion
- Oscillations of Springs and Pendulums
- Damped Oscillations
- Forced Oscillations and Resonance

Important Concepts Students Must Master

- Characteristics of periodic and oscillatory motion
- Conditions for simple harmonic motion
- Displacement, velocity and acceleration relations in SHM
- Time period of spring–mass systems
- Time period of a simple pendulum
- Energy transformations in SHM
- Damping and forced oscillations
- Resonance and its applications

KCET / NEET Examination Relevance

Oscillations is an important topic because it forms the basis for the study of wave motion and many physical systems.

Typical examination questions include:

- Calculating time period of a simple pendulum
- Time period of spring–mass systems
- Energy relations in SHM
- Conceptual questions on resonance
- Graphs of displacement, velocity and acceleration in SHM

In KCET, this chapter generally contributes about **1–2 questions**. The concepts are also important for understanding wave motion in the next chapter.

Chapter 15: Waves

Subtopics Covered in This Chapter

- Wave Motion
- Types of Waves
- Wave Characteristics
- Mathematical Description of Waves
- Superposition of Waves
- Reflection of Waves
- Standing Waves
- Sound Waves
- Doppler Effect
- Beats

Important Concepts Students Must Master

- Wave equation relating speed, frequency and wavelength
- Difference between transverse and longitudinal waves
- Principle of superposition of waves
- Formation of standing waves
- Speed of sound in different media
- Doppler effect and frequency change
- Formation of beats and beat frequency

KCET / NEET Examination Relevance

This chapter explains the physics of wave motion and sound propagation, which are important in many scientific and technological applications.

Typical examination questions include:

- Applying the wave equation
- Problems involving standing waves
- Doppler effect calculations
- Beat frequency problems
- Conceptual questions on sound waves

In KCET, this chapter generally contributes about **2–3 questions**. The concepts of waves also form the foundation for advanced topics such as optics and modern physics in Class 12.