SCERT Kerala · Class 10 · Physics

Physics Part 2

PADIKAM
PHYSICS
PART II
Complete Study Notes | Standard X | English Medium
SCERT Kerala 2025 syllabus coverage
Original explanations, revision tools, exam focus and practice

PADIKAM | CLASS 10 PHYSICS - PART II
Contents
Three applied chapters explain electrical energy, electromagnetic induction and the simple machines that multiply or redirect force.
Chapter 5 | Electric Energy: Consumption and Conservation
Chapter 6 | Electromagnetic Induction in Daily Life
Chapter 7 | Mechanical Advantage in Action
How to use this book
• Read the chapter mission first to understand the learning target.
• Study the core notes and pause at every table, formula or process map.
• Use the exam focus list for last-minute revision.
• Answer the practice questions without looking back, then revise weak areas.
Official textbook links
SCERT Kerala Class 10 PART II
SCERT Kerala Standard 10 textbook catalogue

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CHAPTER 5
Electric Energy: Consumption and
Conservation
Chapter mission: calculate electrical energy and cost, understand power ratings, and choose safe conservation practices.
Power and electrical energy
• Electrical power is the rate at which electrical energy is converted. Appliance ratings state the operating potential difference and power.
• Electrical energy equals power multiplied by time. Commercial energy is measured in kilowatt-hour.
$P = VI$

$P = I R$

$P = V /R$
$E = Pt$

1 kWh = 3.6 × 10 J
Symbols and SI units
Symbol Meaning SI unit
P electrical power watt (W)
V potential difference volt (V)
I electric current ampere (A)
R resistance ohm (Ω)
E electrical energy joule (J)

t time second (s)
Commercial unit energy billed kilowatt-hour (kWh)
Consumption and cost
• Convert watts to kilowatts and usage time to hours before finding kWh. Add the energy used by all appliances for the billing period.
• Cost depends on the tariff structure, so use the rates and fixed charges given in the problem or current bill.
Energy in kWh = power in kW × time in h

Cost = energy consumed × tariff rate
Conservation and safety
• Choose efficient appliances, avoid standby waste, use daylight and ventilation, and match device size to need.
• A fuse or miniature circuit breaker interrupts excessive current. Earthing provides a low-resistance safety path for leakage current.
• Do not handle switches with wet hands or overload sockets. Electrical repairs must be done by a qualified person.
Exam focus
• Keep power (kW) separate from energy (kWh).
• Show every unit conversion.
• Link conservation choices to both energy saved and safe use.
Practice
1. A 1.5 kW heater runs for 2 h. Find the energy used.
2. Calculate a bill from a given appliance table and tariff.
3. Explain the purposes of a fuse and earthing.

CHAPTER 6
Electromagnetic Induction in Daily Life
Chapter mission: explain induced current, generators, transformers and everyday induction applications.
Electromagnetic induction
• A changing magnetic flux linked with a conductor induces an electromotive force. A current flows when the circuit is closed.
• Faster change, a stronger field, more turns or a larger linked area can increase the induced emf.
• Lenz's law states that induced current opposes the change producing it, expressing conservation of energy.
$\Phi = BA\cos\theta$
$\varepsilon = -N\,\Delta\Phi/\Delta t$
Symbols and SI units
Symbol Meaning SI unit
Φ magnetic flux weber (Wb)
B magnetic flux density tesla (T)
A area of coil square metre (m^2)
θ angle between field and area normal radian or degree
ε induced emf volt (V)
N number of turns no unit
t time second (s)
Generator
• A generator converts mechanical energy into electrical energy by rotating a coil or magnetic field so that linked flux changes.
• Fleming's right-hand rule gives field, motion and induced-current directions.
• Slip rings are associated with alternating output; a split-ring arrangement can make the external current unidirectional.
Mechanical energy → electrical energy
Transformer
• A transformer uses mutual induction and works with changing current. A step-up transformer increases

voltage; a step-down transformer decreases it.
• For an ideal transformer, voltage ratio equals turns ratio and input power equals output power approximately.

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• High-voltage transmission reduces current for the same power and therefore reduces I R loss.
V/V = N/N
Ideal: VI = VI

Power loss = I R
Daily applications
• Induction cookers produce currents in suitable vessels. Dynamic microphones, bicycle dynamos, wireless charging and metal detectors use related induction principles.
• A transformer does not provide continuous voltage change from steady direct current because the magnetic flux must change.
Exam focus
• State what changes to produce induction.
• Use Fleming's right-hand rule for generation, not the left-hand motor rule.
• Identify primary and secondary symbols before using the turns ratio.
Practice
1. How can induced emf be increased?
2. A transformer has a stated turns ratio. Find secondary voltage.
3. Why is electrical power transmitted at high voltage?

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CHAPTER 7
Mechanical Advantage in Action
Chapter mission: analyse machines through effort, load, displacement, work, efficiency and velocity ratio.
Why machines help
• A machine may multiply force, change the direction of force, or trade force for distance or speed. It cannot create energy.
• Load is the resisting force overcome; effort is the applied force. Mechanical advantage compares them.
MA = load/effort
Work, velocity ratio and efficiency
• Input work is effort multiplied by effort distance. Output work is load multiplied by load distance.
• Velocity ratio compares the distances moved by effort and load. Efficiency compares useful output work with input work and is at most 100% for a real passive machine.
VR = distance moved by effort / distance moved by load
η = output work/input work × 100%
η = MA/VR × 100%
Symbols and SI units
Symbol Meaning SI unit
MA mechanical advantage no unit
VR velocity ratio no unit
η efficiency percentage (%)
L load force newton (N)
E effort force newton (N)
W work joule (J)
d distance metre (m)
Levers
• A lever turns about a fulcrum. The moment of a force equals force multiplied by perpendicular distance from the pivot.
• In equilibrium, clockwise and anticlockwise moments balance. Lever class depends on the relative positions of fulcrum, load and effort.

Moment = force × perpendicular distance

Effort × effort arm = load × load arm

Pulleys, inclined planes and gears

• A fixed pulley mainly changes force direction. Movable and compound pulleys can provide mechanical advantage.

• An ideal inclined plane has velocity ratio equal to slope length divided by vertical height.

• Meshing gears rotate in opposite directions. Speed is inversely related to the number of teeth, while torque changes oppositely.

VR(inclined plane) = slope length/height

N ω = N ω

1 1 2 2

Real machines

• Friction, deformation and sound reduce efficiency, so actual mechanical advantage is lower than the ideal prediction.

• Lubrication, bearings, correct alignment and suitable materials can reduce energy loss.

Exam focus

• MA and VR are ratios and have no SI unit.

• Use perpendicular distance when calculating moment.

• A machine can reduce effort only by increasing another quantity such as distance or time.

Practice

1. Find MA, VR and efficiency from given load, effort and distances.
2. Classify three everyday levers.
3. Explain why a real machine cannot reach 100% efficiency.

Final Revision Checklist

• I can distinguish power from electrical energy.

• I can calculate kWh consumption and cost.

• I can explain induction, generators and transformers with correct rules.

• I can calculate MA, VR and efficiency and state that their ratios have no SI unit.

Padikam Learning Content

Prepared as an independent learning companion using the SCERT textbook only as the syllabus and notation reference.