

Physics

Original practice in 11 topic units, with explanations, worked examples and answer guidance. Use alongside the prescribed texts and syllabus.



11 practice units

66 tasks with answer guidance

Name / नाम: _____

Original selected-topic practice. Use alongside school lessons and the prescribed textbook. The contents define this book's scope.

CBSE course 042 · 2026–27 · Selected practice, not a complete syllabus or official examination paper.

UNIT 01 / 11 · LEARN & TRY

Charge field: force, potential and capacitance

Name: _____ Date: _____

Goal: Calculate point-charge fields and forces and interpret superposition and closed-surface flux.

Learn

Electric field describes force per unit positive test charge; electric potential describes potential energy per unit charge. Field is a vector, while potential is a scalar. For an isolated point charge, $E = kq/r^2$ in magnitude and $V = kq/r$, using zero potential at infinity. Field direction is outward from a positive charge and inward towards a negative one. Superposition adds fields vectorially but potentials algebraically. A capacitor stores separated charge and energy. Capacitance $C = Q/V$ describes charge stored per potential difference. An ideal parallel-plate capacitor has $C = \epsilon_0 A/d$ in vacuum, neglecting edge effects. Increasing plate area increases capacitance; increasing separation decreases it. Energy stored can be written $\frac{1}{2}CV^2$. Identify whether a supply remains connected before reasoning about a changed capacitor: constant voltage and constant charge lead to different predictions. Keep distances in metres and charge units converted before calculating.

Worked example

Two positive charges, $2\ \mu\text{C}$ and $3\ \mu\text{C}$, are $0.30\ \text{m}$ apart in air treated as vacuum. With $k = 9.0 \times 10^9\ \text{N m}^2\ \text{C}^{-2}$, $F = kq_1q_2/r^2 = (9.0 \times 10^9)(2 \times 10^{-6})(3 \times 10^{-6})/0.30^2 = 0.60\ \text{N}$. The force is repulsive. At $0.30\ \text{m}$ from the $2\ \mu\text{C}$ charge alone, potential is $V = kq/r = 6.0 \times 10^4\ \text{V}$. In a separate symmetric model of two equal positive charges, their midpoint fields cancel but their positive potentials add; zero field there does not mean zero potential.

- 1.** Charges $+1\ \mu\text{C}$ and $-2\ \mu\text{C}$ are $0.10\ \text{m}$ apart in vacuum. Using $k = 9 \times 10^9$, find force magnitude and type. [3 marks]

UNIT 01 · PRACTISE · 5–6

Charge field: force, potential and capacitance

5. Find energy stored in a $4\ \mu\text{F}$ capacitor at $10\ \text{V}$. [2 marks]

6. An isolated charged ideal parallel-plate capacitor has its plate separation doubled. Describe changes in C , Q , V and U . [4 marks]

Explain one answer. Choose a question to revisit after a few days.

UNIT 01 · ANSWER GUIDANCE

Charge field: force, potential and capacitance

1. $F = k|q_1q_2|/r^2 = 1.8 \text{ N}$. Unlike charges attract.
2. $F = qE = -6 \times 10^{-4} \text{ N}$ in the right-positive convention: magnitude $6 \times 10^{-4} \text{ N}$ leftward.
3. The equal and opposite fields cancel, giving zero field. Both potentials are positive and add, so the potential is positive and nonzero.
4. $C = Q/V = 12/6 = 2 \text{ } \mu\text{F}$.
5. $U = \frac{1}{2}CV^2 = \frac{1}{2} \times 4 \times 10^{-6} \times 100 = 2.0 \times 10^{-4} \text{ J}$.
6. C halves because $C \propto 1/d$; Q stays fixed because it is isolated. $V = Q/C$ doubles and $U = Q^2/(2C)$ doubles, with mechanical work supplied to separate the plates.

Teaching note

Add electric fields with directions; add potentials as signed scalars.

Curriculum reference: https://cbseacademic.nic.in/web_material/CurriculumMain27/SecPart2/Physics_SecP2_2026-27.pdf

Selected practice; outcomes are publisher-defined. School practicals, projects and prescribed readings require separate preparation.