Unit 4

Electric Circuits, Magnetism, and Ampere Force

SOURCE LOCK

Built from SPH3U video-distilled notes. Teacher moves, examples, and practice prompts are pulled from the local distilled packets.

Big idea

- Circuit and magnetism questions reward a clean model: decide the path of current, the voltage/resistance relationship, and the direction rule before calculating.

Lesson map

- Circuits - 27 source lessons
- Magnetism basics - 8 source lessons
- Qualitative force on current - 6 source lessons

Core Notes

What to know

- Current describes charge flow through a circuit element or path.
- Voltage, current, and resistance are connected by Ohm's-law style reasoning in simple resistor contexts.
- Series and parallel circuits have different current and voltage patterns.
- Right-hand and left-hand rules are direction tools; the direction setup matters before any formula use.
- Ampere-force questions often require an equivalent length, equivalent plane view, or motion-analysis routine.

Problem-solving workflow

- Redraw or simplify the circuit before calculating.
- Label current direction and potential differences.
- Choose the series, parallel, or mixed-circuit rule that fits the structure.
- For magnetic direction questions, set the hand rule before deciding the result.
- Check the unit: ampere, volt, ohm, tesla, newton, or joule.

Common traps

- Do not treat a parallel circuit like a single series chain.
- Do not calculate before simplifying the circuit structure.
- For magnetic-field direction, do not swap the current direction and force direction.
- In Ampere-force contexts, make the effective geometry clear first.

Teacher Moves

HOW TO THINK

These notes preserve the teacher's problem-solving moves: how to decide the model before calculating.

Move 1

- Name current direction and the charge-flow model before calculating. | Source: L123 00:00:00, L124 00:02:39, L125 00:09:03.

Move 2

- Simplify the circuit structure before using formulas. | Source: L124 00:13:07, L125 00:00:40, L126 00:01:04.

Move 3

- Read the graph feature first: slope, area, intercept, or trend. | Source: L132 00:17:12, L138 00:04:57, L141 00:12:02.

Move 4

- Set the right-hand rule carefully before naming a magnetic direction. | Source: L151 00:00:05, L152 00:06:55, L153 00:00:53.

Move 5

- Set directions before assigning signs or writing equations. | Source: L152 00:07:47, L153 00:00:35, L155 00:01:36.

Move 6

Move 6

- Use parallel-circuit rules only after identifying shared endpoints. | Source: L126 00:03:52, L128 00:06:22, L129 00:02:15.

Move 7

- Keep power, force, and velocity relationships distinct in car-start problems. | Source: L132 00:12:29, L133 00:01:56, L138 00:00:53.

Move 8

- Set the left-hand rule carefully before naming force direction. | Source: L153 00:01:37, L154 00:01:12, L158 00:04:03.

Move 9

- Draw the free-body diagram before writing force equations. | Source: L125 00:05:25, L159 00:04:30, L163 00:03:38.

Move 10

- Use series-circuit rules only for elements on the same current path. | Source: L136 00:03:35, L137 00:05:17, L146 00:02:25.

Worked Examples

Distilled example patterns

One-resistor circuit (Unit 4 distilled pattern: identify current, voltage, and resistance before calculating)

Use the simple circuit relationship V = IR.

If V = 12 V and R = 4 Ω, solve for I.

I = V/R = 12/4.

Attach the unit ampere.

Answer pattern: I = 3 A.

Magnetic direction routine (Unit 4 distilled pattern: use the direction rule before solving motion)

Identify the current direction.

Identify the magnetic-field direction.

Use the hand rule named by the source lesson.

Practice prompts

- Use V = IR in a one-resistor context.
- Identify whether current or voltage is shared in series or parallel parts.
- Use a direction rule for a current-carrying wire in a magnetic field.

Source quality note

OCR review flags in this unit: 2 / 1752.

Printed slide text is usually reliable; dense handwritten equations should be verified against source frames.

This packet is polished for student reading, but it keeps the source trace instead of inventing missing formulas.