Unit 1

Kinematics, Motion Graphs, and Projectile Models

SOURCE LOCK

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

Big idea

- Motion questions become manageable when you name the variables, choose directions, and separate horizontal and vertical motion when needed.

Lesson map

- Motion description - 15 source lessons
- Uniform acceleration - 13 source lessons
- Projectile motion - 4 source lessons
- Curved motion and vectors - 5 source lessons

Core Notes

What to know

- Treat position, displacement, velocity, and acceleration as signed quantities when direction matters.
- Use slope as the key graph idea: position-time slope gives velocity, and velocity-time slope gives acceleration.
- Use area under a velocity-time graph to reason about displacement.
- For uniformly accelerated motion, choose a positive direction before substituting values.
- For projectile motion, split the motion into horizontal and vertical parts, then connect them with time.

Problem-solving workflow

- Draw or imagine the motion diagram.
- Choose a positive direction and label known values with signs.
- Decide whether the model is constant velocity, constant acceleration, graph reading, or projectile motion.
- Use the formula or graph relationship that matches the model.
- Check the sign and unit of the final answer.

Common traps

- Do not mix distance and displacement when direction is part of the question.
- Do not use speed when the question needs velocity with direction.
- For braking questions, check whether the object stops before the stated time.
- For projectile questions, do not combine horizontal and vertical acceleration into one shortcut.

Teacher Moves

HOW TO THINK

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

Move 1

- Separate displacement, velocity, and speed before calculating. | Source: L007 00:06:16, L008 00:09:03, L013 00:23:06.

Move 2

- Read the graph feature first: slope, area, intercept, or trend. | Source: L010 00:07:09, L013 00:15:25, L014 00:05:18.

Move 3

- Choose a positive direction and keep every vector sign consistent. | Source: L013 00:02:14, L014 00:07:26, L015 00:05:40.

Move 4

- Use slope as the meaning-maker on motion graphs. | Source: L013 00:24:54, L015 00:07:17.

Move 5

- Draw the free-body diagram before writing force equations. | Source: L021 00:03:54, L032 00:00:59.

Move 6

- Split projectile motion into horizontal and vertical parts. | Source: L029 00:08:25, L030 00:00:24.

Move 7

Move 7

- Decide the model from the situation instead of forcing one formula. | Source: L001 00:05:56.

Move 8

- Simplify the circuit structure before using formulas. | Source: L001 00:05:08.

Move 9

- Name current direction and the charge-flow model before calculating. | Source: L005 00:04:50.

Move 10

- Set directions before assigning signs or writing equations. | Source: L037 00:03:29.

Worked Examples

Distilled example patterns

Constant-acceleration setup (Unit 1 distilled pattern: uniform-acceleration formula and sign choice)

Choose forward as positive.

If a cart starts from rest with $a = 2.0\ m/s^2$ for 3.0 s, use $v = v_0 + at$.

$v = 0 + (2.0)(3.0) = 6.0\ m/s$.

For displacement, use $\Delta x = v_0t + 1/2\ at^2 = 0 + 1/2(2.0)(3.0^2)$.

Answer pattern: $v = 6.0\ m/s$ and $\Delta x = 9.0\ m$.

Projectile split (Unit 1 distilled pattern: horizontal and vertical motion are solved separately)

Horizontal velocity stays constant if air resistance is ignored in the model.

Vertical motion uses acceleration g downward.

Use vertical motion to find time, then use horizontal motion to find range.

Practice prompts

- Read slope and area from x-t and v-t graphs.
- Solve a constant-acceleration problem after choosing signs.
- Break a projectile problem into horizontal and vertical components.

Source quality note

OCR review flags in this unit: 54 / 2090.

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.