Muscle force and the pressure–volume cycle — review sheet

Use this after attempting the worked examples and practice. Explain each claim in words before calculating.

Key ideas

- Filaments slide; they do not need to shorten themselves.
- Force can be nonzero without shortening.
- Valve states and conservation explain the four loop phases.
- Stroke volume is a difference; ejection fraction is a ratio; output also includes rate.
- Loop area represents net pressure-volume work, not total metabolic energy.

Common errors and repairs

A vertical loop segment means no muscle activity. It means no chamber-volume change in this idealization; pressure and active force can change.

A larger ejection fraction is an energy-efficiency measurement. It is a volume fraction, not a ratio of mechanical to chemical energy.

Retrieve without your notes

- Which axis carries volume on a pressure-volume loop?
- What evidence would test a prescribed loop shape?

Readiness check

- Describe sliding filaments without saying the filaments themselves shrink.
- Identify filling, pressure-rise, ejection and pressure-fall phases from a loop.
- Calculate stroke volume, ejection fraction and output with units.
- Estimate the net work of a rectangular loop and distinguish it from total metabolic energy.