

Machines

Chapter 3: Machines · Topic 1

Key Concept

Mechanical advantage (MA) is the ratio of load to effort ($MA = \text{Load}/\text{Effort}$), showing how much a machine multiplies force.

Velocity ratio (VR) is the ratio of the effort's distance moved to the load's distance moved, showing the machine's geometry.

Efficiency of a machine is $(MA/VR) \times 100\%$, always less than 100% due to friction and other energy losses.

Common simple machines include levers (classified by fulcrum, load, effort positions), pulleys (fixed and movable), and inclined planes.

Quick Revision Notes

- Mechanical Advantage (MA) = Load/Effort.
- Velocity Ratio (VR) = effort distance/load distance.
- Efficiency = $(MA/VR) \times 100\%$.
- Efficiency is always less than 100%.
- This is due to friction and energy losses.
- Levers classified by fulcrum/load/effort positions.
- Pulleys can be fixed or movable.
- Inclined planes are also simple machines.

Practice Questions

- 1 Calculate MA for a machine with load 50N and effort 10N.
- 2 Calculate VR for a machine where effort moves 4m and load moves 1m.
- 3 Calculate efficiency given $MA=4$ and $VR=5$.
- 4 Discuss the classes of levers with examples.
- 5 Discuss the difference between fixed and movable pulleys.
- 6 Explain why efficiency is never 100%.