

AP PHYSICS 1 CHEAT SHEET

Unit 2 : Dynamics

- **Focus:** How forces affect motion using Newton's Laws.
- **Exam Lens:** The AP exam tests free body diagrams, force reasoning, and applying Newton's Laws logically, not just equation use.

Quick Overview

- Introduces the cause of motion
- Forces are vectors and must be summed
- Newton's Laws explain acceleration
- Free body diagrams are essential
- Most problems involve multiple forces acting together

Key Concepts and Definitions

- **Force (F):** A push or pull that can change motion
- **Net force (ΣF):** Vector sum of all forces on an object
- **Mass (m):** Resistance to acceleration
- **Weight (W):** Gravitational force, $W = mg$
- **Normal force (N):** Support force perpendicular to a surface
- **Tension (T):** Pull transmitted through a string or rope
- **Friction (f):** Force that opposes relative motion
- **Inertia:** Resistance to change in motion

Essential Formulas and Constants

- $\Sigma F = ma$
- $W = mg$
- $f_k = \mu_k N$
- $f_s \leq \mu_s N$
- $a = \Sigma F \div m$
- $g = 9.8 \text{ m/s}^2$

Mini Formula Boxes

Mini formula box

$$\Sigma F = ma$$

- Core relationship for all dynamics problems.

Mini formula box

$$W = mg$$

- Weight always acts downward.

Mini formula box

$$f_k = \mu_k N$$

- Used only when the object is sliding.

Newton's Laws of Motion

- **First Law:** Object remains at rest or constant velocity unless acted on by net force
- **Second Law:** Acceleration depends on net force and mass
- **Third Law:** Forces come in equal and opposite pairs acting on different objects

Free Body Diagrams

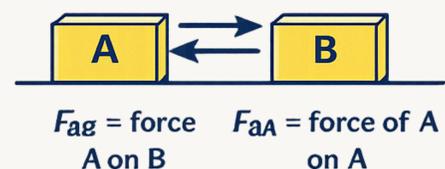
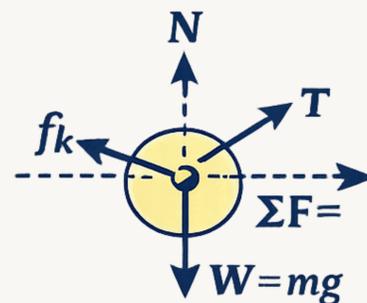
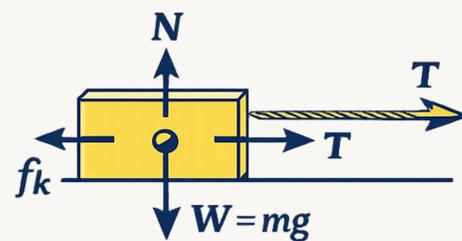
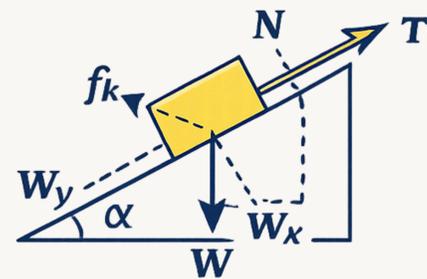
- Draw only forces acting on the object
- Represent forces as arrows from the object
- Do not include motion arrows
- Each force must have a physical source

Free body diagrams are required for full credit on FRQs.

Mnemonics

- "ΣF causes a"
- "No net force means no acceleration"
- "Forces act on objects, not motions"
- "Action-reaction forces act on different objects"

Visual Mnemonics



Common Pitfalls

- Confusing velocity with speed
- Forgetting direction signs
- Using g as positive when downward is negative
- Mixing up graph slopes and areas
- Assuming velocity is zero at the top of projectile motion in both directions
- Forgetting units

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