AP Physics C: Mechanics

Common Mistakes · 常见错误

Physics C is calculus-based, and most lost points are for setting up the wrong integral or for using a constant-acceleration formula where the acceleration is not constant. Write the relation before the number.
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Setting up

Using the suvat equations when acceleration is not constant. If a depends on time or position, integrate or use $a = v\,dv/dx$.

Writing an integral without its limits, or with limits in the wrong variable after a substitution.

Treating $F = ma$ as universal. Newton's second law is $F = dp/dt$, and mass is not always constant.

Answering with a number where a symbolic expression was asked for, or the reverse. The question always specifies.

Skipping the statement of the principle. 'By conservation of angular momentum…' is itself worth a point.

Energy and momentum

Computing work as Fd for a variable force. It is the integral of $F \cdot dx$, or the area under a force-position graph.

Assigning potential energy to one object rather than to the system, and then treating the system boundary inconsistently.

Forgetting that the force is the NEGATIVE gradient of the potential energy function.

Applying conservation of mechanical energy where a non-conservative force such as friction acts.

Confusing impulse with force, or momentum with kinetic energy – the second is not conserved in an inelastic collision while the first is.

Rotation and oscillation

Computing rotational inertia without stating the axis, or applying the parallel-axis theorem from an axis that is not through the centre of mass.

Forgetting the rolling constraint $v = \omega R$, which is what links the translational and rotational equations.

Treating torque as a scalar and losing the sign, or omitting the perpendicular distance.

Claiming a motion is simple harmonic without showing that the restoring force is proportional to displacement and opposite in direction.

Assuming the pendulum's period is independent of amplitude for large angles – the small-angle approximation must be stated.

Gravitation

Using mgh for gravitational potential energy far from a planet's surface, where $U = -GMm/r$ applies.

Forgetting that gravitational potential energy is negative and approaches zero at infinity, so escape corresponds to zero total energy.

Applying Kepler's third law with a radius where the semi-major axis is required.