

Rigid body mechanics · supported focus

Supported focus · HL

Supported scope

- Supported HL focus. First assessment 2025; full Physics guide acquired (84 PDF pages). Remaining guide, assessment and practical requirements retain their recorded holds.
- State model conditions and distinguish fictional data from measurements.

Rotations · 1.1

Reasoning

A door is easier to open when pushed near its outer edge. Force size alone does not determine the turning effect. Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.

Rotations · 2.1

Reasoning

Torque depends on force and perpendicular distance from the axis. Moment of inertia describes resistance to angular acceleration and depends on mass distribution about a stated axis. torque: Turning effect about an axis; moment of inertia: Resistance to angular acceleration about a specified axis.

Rotations · 3.1

Reasoning

For a rigid body about a fixed axis, net torque equals moment of inertia multiplied by angular acceleration. Rotational kinetic energy depends on angular speed squared. Angular momentum is conserved when net external torque is zero. Draw the pivot, force direction and perpendicular lever arm. Do not use the sloping distance from pivot to force point unless it is perpendicular to the force. For experiments, keep rotating parts guarded and loads secure.

Rotations · 4.1

Reasoning

State the known values and their units. Choose the relation because its assumptions fit this case, then rearrange before substitution. Known: a 10 N perpendicular force acts 0.30 m from an axis. Torque = force $\times$ perpendicular distance = $10 \times 0.30 = 3.0$ N m. If moment of inertia is 0.60 kg square metres, angular acceleration = torque/inertia = $3.0/0.60 = 5.0$ radians per second squared.

Rotations · 4.2

Reasoning

A 12 N force acts perpendicularly 0.25 m from the pivot. Find torque. Use the same sequence: known quantities $\rightarrow$ model $\rightarrow$ relation $\rightarrow$ substitution $\rightarrow$ unit and interpretation.

Rotations · 5.1

Reasoning

Torque has unit N m but is a turning effect, not an energy store. Moment of inertia changes if the same mass moves farther from the axis. Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

Rotations · 5.2

Reasoning

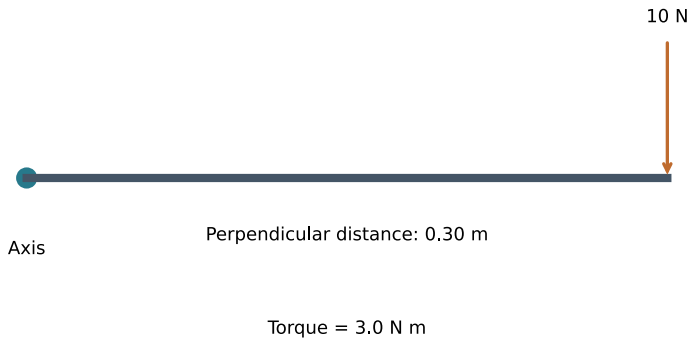
Moment of inertia depends only on total mass, never its distribution. This claim is false: Torque has unit N m but is a turning effect, not an energy store. Moment of inertia changes if the same mass moves farther from the axis.

Rotations · 5.3

Reasoning

Rigid bodies and rotational dynamics: For a rigid body about a fixed axis, net torque equals moment of inertia multiplied by angular acceleration. Rotational kinetic energy depends on angular speed squared. Angular momentum is conserved when net external torque is zero.

Rotations · diagram



- Original teaching diagram: Rigid bodies and rotational dynamics
- Use the labels and the stated model together.

Rotations · original transfer

Your turn

A 12 N force acts 0.50 m from a pivot at 30° to the lever. Find torque and compare a perpendicular force at the same radius.

Rotations · transfer reasoning

Method and interpretation

Torque = $rF \sin 30^\circ = 3.0 \text{ N m}$; perpendicular torque = 6.0 N m . Use the perpendicular moment arm and state the rotation sign convention.

Check yourself

- Explain torque using the stated model.
- Explain moment of inertia using the stated model.
- Change one value in the original transfer; explain which assumption still matters.