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Torque Quiz Questions and Answers PDF

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What is the standard unit of torque in the International System of Units (SI)?

◯ Joule
◯ Newton
◯ **Newton-meter** ✓
◯ Watt

> The standard unit of torque in the International System of Units (SI) is the newton meter (Nm). This unit measures the rotational force applied at a distance from a pivot point.

Discuss the importance of torque in mechanical systems, such as engines or gears.

◯ Torque is irrelevant in mechanical systems
◯ Torque is only important in linear systems
◯ **Torque is crucial for rotational motion** ✓
◯ Torque only affects speed, not power

> Torque is a critical factor in mechanical systems as it determines the rotational force that can be applied to components like engines and gears, influencing their efficiency and performance.

Which of the following best describes torque?

◯ A measure of linear force
◯ **A measure of rotational force** ✓
◯ A measure of gravitational force
◯ A measure of magnetic force

> Torque is a measure of the rotational force applied to an object, which causes it to rotate around an axis. It is calculated as the product of the force applied and the distance from the axis of rotation to the point where the force is applied.

What is the rotational equivalent of mass in torque calculations?

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○ Force
○ **Moment of inertia** ✓
○ Velocity
○ Acceleration

> In torque calculations, the rotational equivalent of mass is the moment of inertia, which quantifies how much an object resists rotational acceleration about an axis.

Which of the following are examples of torque in everyday life?

☐ **Opening a door** ✓
☐ **Using a wrench** ✓
☐ Pushing a car
☐ **Operating a seesaw** ✓

> Torque is a measure of the rotational force applied to an object, and it can be observed in various everyday activities such as using a wrench to tighten a bolt or opening a door by pushing on the handle. These examples illustrate how torque is essential in mechanics and daily tasks.

Which rule helps determine the direction of the torque vector?

○ Left-hand rule
○ **Right-hand rule** ✓
○ Torque rule
○ Vector rule

> The right-hand rule is used to determine the direction of the torque vector, where the fingers of the right hand curl in the direction of rotation and the thumb points in the direction of the torque vector.

Describe a real-world scenario where dynamic torque is observed and explain the forces involved.

○ A spinning wheel
○ **A car engine** ✓
○ A rotating fan
○ A pendulum swinging

> Dynamic torque is commonly observed in the operation of a car engine, where the rotational force generated by the engine's crankshaft is transmitted to the wheels, allowing the vehicle to accelerate. This involves forces such as the engine's output torque, frictional forces in the drivetrain, and the inertia of the vehicle.

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What happens when an object is in rotational equilibrium?

◯ It accelerates linearly

◯ It rotates faster

◯ **The sum of all torques is zero ✓**

◯ It stops rotating

> When an object is in rotational equilibrium, the net torque acting on it is zero, meaning it is either at rest or rotating at a constant angular velocity. This condition ensures that there is no angular acceleration.

How does the moment of inertia affect the torque required to rotate an object?

◯ It decreases torque required

◯ **It increases torque required ✓**

◯ It has no effect on torque

◯ It only affects linear motion

> The moment of inertia is a measure of an object's resistance to rotational motion, and a higher moment of inertia means that more torque is required to achieve the same angular acceleration.

What is the formula for calculating torque?

◯ $\tau = m \times a$

◯ **$\tau = r \times F$ ✓**

◯ $\tau = F \times d$

◯ $\tau = p \times v$

> Torque is calculated by multiplying the force applied to an object by the distance from the pivot point to the point where the force is applied, taking into account the angle of application.

Which of the following statements about torque are true?

☐ Torque is a scalar quantity

☐ **Torque can cause an object to rotate ✓**

☐ **Torque is measured in Newton-meters ✓**

☐ Torque is independent of the force applied

> Torque is a measure of the rotational force applied to an object, and it depends on both the magnitude of the force and the distance from the pivot point. It is a vector quantity, meaning it has both magnitude and direction, and is crucial in understanding rotational motion.

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In a balanced seesaw, which of the following must be true?

☑ **The seesaw is in rotational equilibrium ✓**
☑ **The net torque is zero ✓**
☐ The weights on both sides are equal
☐ The lever arms are equal

> In a balanced seesaw, the torques on both sides must be equal, which means that the product of the weight and the distance from the pivot point must be the same for both sides.

What are the components of torque?

☐ Mass
☑ **Lever arm ✓**
☑ **Force ✓**
☐ Temperature

> Torque is a measure of the rotational force applied to an object and is determined by the product of the force applied and the distance from the pivot point to the line of action of the force.

Explain how the right-hand rule is used to determine the direction of torque.

○ Curl fingers in the direction of force
○ **Curl fingers in the direction of rotation ✓**
○ Point thumb in the direction of force
○ Use left hand for torque direction

> The right-hand rule is a method used to determine the direction of torque by aligning the fingers of the right hand in the direction of the force applied and curling them towards the pivot point, with the thumb pointing in the direction of the torque vector.

What is the relationship between torque and angular acceleration in rotational motion?

○ Torque is inversely proportional to angular acceleration
○ **Torque is directly proportional to angular acceleration ✓**
○ Torque has no relationship with angular acceleration
○ Torque only affects linear acceleration

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Torque is directly proportional to angular acceleration, as described by Newton's second law for rotation, which states that the net torque acting on an object equals the moment of inertia multiplied by the angular acceleration.

Which component is essential for calculating torque?

○ Mass
○ Velocity
○ **Lever arm** ✓
○ Temperature

Torque is calculated using the product of force and the distance from the pivot point, known as the lever arm. Therefore, both the force applied and the distance from the pivot are essential components for calculating torque.

Which devices are used to measure torque?

☐ **Torque wrench** ✓
☐ Spring scale
☐ **Torque sensor** ✓
☐ Thermometer

Torque is commonly measured using devices such as torque wrenches, torque transducers, and dynamometers. These instruments help quantify the rotational force applied to an object.

Provide an example of a system in rotational equilibrium and explain how the torques are balanced.

○ **A balanced seesaw** ✓
○ A spinning top
○ A rotating carousel
○ A pendulum at rest

A seesaw with two children of equal weight sitting at equal distances from the pivot point is an example of a system in rotational equilibrium, as the torques produced by their weights are balanced.

In which scenario is static torque present?

○ A spinning top
○ **A stationary door with a force applied** ✓
○ A rolling ball
○ A moving car

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> Static torque is present when an object is at rest and experiencing forces that create a rotational effect without any movement. This typically occurs in scenarios where forces are applied but the object remains stationary, such as a door being pushed but not opening.

What factors affect the magnitude of torque?

☐ **Force applied** ✓
☐ **Distance from the pivot** ✓
☐ **Angle of force application** ✓
☐ Color of the object

> The magnitude of torque is influenced by the force applied, the distance from the pivot point (lever arm), and the angle at which the force is applied.

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