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Centripetal Force Quiz Questions and Answers PDF

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Discuss the significance of centripetal force in maintaining satellite orbits and the role of gravity in this context.

> **Centripetal force is the net force that acts on a satellite, directed towards the center of its orbit, and is provided by the gravitational pull of the Earth. This gravitational force is essential for maintaining the satellite's orbit, preventing it from flying off into space.**

What is the direction of centripetal force in circular motion?

○ Outward from the center
○ Tangential to the path
○ **Inward towards the center ✓**
○ Perpendicular to the motion

> Centripetal force always acts towards the center of the circular path, keeping the object in circular motion. It is essential for maintaining the curved trajectory of the object.

What provides the centripetal force for a car turning on a curved road?

○ Gravity
○ Air resistance
○ **Friction ✓**
○ Engine power

> The centripetal force for a car turning on a curved road is primarily provided by the friction between the car's tires and the road surface. This frictional force allows the car to change direction while maintaining

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> its circular path.

Compare and contrast centripetal and centrifugal forces in terms of their origin and effects in circular motion.

> **Centripetal force originates from an external source and acts towards the center of the circular path, maintaining circular motion, while centrifugal force is a perceived force that acts outward on a mass in a rotating system, resulting from inertia.**

Which of the following is NOT a source of centripetal force?

○ Tension in a string
○ Friction between surfaces
○ **Air resistance ✓**
○ Gravitational pull

> Centripetal force is required for an object to move in a circular path, and it can arise from various sources such as tension, gravity, and friction. However, a source that does not provide centripetal force, such as inertia, would be the correct answer to the question.

Which of the following is the formula for centripetal force?

○ $F = ma$
○ **$F = \frac{mv^2}{r}$ ✓**
○ $F = mg$
○ $F = \frac{1}{2}mv^2$

> The formula for centripetal force is given by $F = (mv^2)/r$, where F is the centripetal force, m is the mass of the object, v is the velocity, and r is the radius of the circular path.

How does the concept of centripetal force apply to the design of amusement park rides like roller coasters?

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> **The concept of centripetal force applies to the design of amusement park rides like roller coasters by ensuring that the forces acting on the riders keep them safely on the track during high-speed turns and inversions.**

Which of the following forces acts as a centripetal force in planetary orbits?

◯ Tension
◯ Friction
◯ Magnetic force
◯ **Gravity ✓**

> The gravitational force between a planet and the sun acts as the centripetal force that keeps the planet in its orbit. This force is essential for maintaining the circular or elliptical paths of planetary motion.

What is the role of friction in providing centripetal force for a vehicle navigating a curve?

> **Friction acts as the centripetal force that keeps the vehicle on its curved path.**

What is the term for the perceived force that acts outward in a rotating frame?

◯ Centripetal force
◯ Gravitational force
◯ **Centrifugal force ✓**
◯ Electromagnetic force

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> The term for the perceived force that acts outward in a rotating frame is known as centrifugal force. This force is not a real force but rather a result of inertia in a rotating reference frame.

In the context of circular motion, which forces can be considered real forces? (Select all that apply)

- ☐ **Centripetal force ✓**
- ☐ Centrifugal force
- ☐ **Gravitational force ✓**
- ☐ **Frictional force ✓**

> In circular motion, real forces include centripetal force, gravitational force, and tension, as they are responsible for maintaining the circular path of an object. Other forces like friction can also play a role depending on the context of the motion.

Which of the following statements about centripetal acceleration are true? (Select all that apply)

- ☐ **It is directed towards the center of the circle ✓**
- ☐ **It depends on the square of the velocity ✓**
- ☐ It is independent of the radius
- ☐ It is zero in uniform circular motion

> Centripetal acceleration is always directed towards the center of the circular path and is responsible for changing the direction of an object's velocity in circular motion. It is calculated using the formula $a_c = v^2/r$, where v is the tangential speed and r is the radius of the circular path.

Explain why centripetal force is not considered a separate force but rather a result of other forces.

> **Centripetal force is not considered a separate force because it is the net result of other forces acting on an object in circular motion, such as gravitational force, tension, or friction, which all act towards the center of the circular path.**

In which unit is centripetal force measured?

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○ Joules

○ Pascals

○ **Newtons ✓**

○ Watts

> Centripetal force is measured in newtons (N), which is the standard unit of force in the International System of Units (SI). This force is essential for keeping an object moving in a circular path.

Centripetal force is necessary for which of the following scenarios? (Select all that apply)

☐ **A satellite orbitin Earth ✓**

☐ A car driving straight on a highway

☐ **A roller coaster looping a loop ✓**

☐ A pendulum at rest

> Centripetal force is necessary for any scenario involving circular motion, such as a car turning on a curved road or a satellite orbit. It acts towards the center of the circular path, keeping the object in motion along that path.

Which of the following can act as a centripetal force? (Select all that apply)

☐ **Tension ✓**

☐ **Friction ✓**

☐ **Gravity ✓**

☐ Magnetic force

> Centripetal force can be provided by various sources, including tension in a string, gravitational force, frictional force, and normal force, depending on the context of the motion. Each of these forces can act to keep an object moving in a circular path.

What is the relationship between centripetal force and velocity in circular motion?

○ **Directly proportional to the square of velocity ✓**

○ Inversely proportional to velocity

○ Independent of velocity

○ Directly proportional to velocity

> Centripetal force is directly proportional to the square of the velocity of an object in circular motion, meaning that as the velocity increases, the required centripetal force also increases to maintain the circular path.

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Describe a real-world scenario where tension acts as the centripetal force and explain the dynamics involved.

> **Consider a car attached to a pole by a rope while it moves in a circular path. The tension in the rope acts as the centripetal force, keeping the car in circular motion.**

In a rotating frame, which of the following forces are experienced? (Select all that apply)

☐ **Centripetal force ✓**
☐ **Centrifugal force ✓**
☐ Gravitational force
☐ Electromagnetic force

> In a rotating frame, the forces experienced include centrifugal force and Coriolis force, which arise due to the rotation of the reference frame. These fictitious forces are essential for analyzing motion in non-inertially rotating systems.

Which factors affect the magnitude of centripetal force? (Select all that apply)

☐ **Mass of the object ✓**
☐ **Radius of the circular path ✓**
☐ **Speed of the object ✓**
☐ Temperature of the environment

> The magnitude of centripetal force is affected by the mass of the object, the speed of the object, and the radius of the circular path. Specifically, it increases with greater mass and speed, and decreases with a larger radius.

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