FBISE 9th Class Physics New Book Notes Chapter 4

SHORT RESPONSE QUESTIONS

Q1. Why long spanner is used to open or tight nuts of vehicle's tire? While tightening a small nut, extra-long wrench is not suitable. Why?

Ans: For opening a vehicle tyre, long spanner is used in order to produce larger torque. For opening a small nut, extra-long wrench is not suitable because larger torque may break the nut.

From the relation of torque:

$$\mathbf{T = r \times F \Rightarrow r \propto r}$$

When force is constant, the torque is directly proportional to moment arm. So, greater the moment arm, greater will be the torque and vice versa.

Q2. Why door knobs are fixed at the edge of door? What will happen it the door knob is at the middle of the door?

Ans: From the relation of torque: $\mathbf{x = r \times F \Rightarrow}$
The handle of the door is provided at the free end because larger the distance from the hinge, lesser will be the force required to open the door. Maximum the distance smaller is the force to be applied Herve maximum is the torque

When force is constant, the torque is directly proportional to moment arm. So, greater the moment arm, greater will be the torque and vice versa. That's why door knobs (handles) are fixed at the edge of door to increase the moment arm. In this way even a small force is sufficient to produce the required torque, which helps in the opening or closing of the door.

If the door knob is at the middle of the door, the moment arm will become hall and you will need a double force to open / close the door as compared to the edge knob.

Q3. If you drop a feather and a bowling ball from the same height, which one will reach the terminal velocity first? Which one of them will hit the ground first?

Ans: In a vacuum, both the feather and the bowling ball would reach terminal velocity $\left(v_T = \frac{mg}{6\pi\eta r}\right)$ at the same time because they would experience the same gravitational acceleration.

However, in the presence of air resistance, the feather will take longer to reach terminal velocity due to its larger surface area-to-mass ratio, experiencing more air resistance. Once both objects reach terminal velocity, they will fall at the same constant speed.

Q4. Why do ice skates effortlessly slide on ice, while your shoes cause skidding?

Ans: Ice skates glide effortlessly on ice because their blades are designed to minimize friction. The blades are thin and have a smooth, flat surface, which reduces resistance when they come into contact with the ice. This allows skaters to move smoothly and efficiently across the ice without skidding

On the other hand, shoes have soles that are not designed for ice. They typically have treads or patterns that provide grip on surfaces like pavement or flooring but can cause skidding on ice because they have more surface area in contact with the ice, creating friction and reducing the ability to glide smoothly

Q5. Explain why it's easier to push a car on flat tyres than inflated ones. What happens to the frictional force between the tyres and the road?

Ans: Pushing a car with flat tires is easier than with inflated ones because flat tires have a larger contact area with the ground, increasing friction.

When tires are properly inflated, there's less contact area, so there's less friction to overcome when pushing. This means that when the tires are flat, more of the force applied to push the car is directed into overcoming static friction between the tires and the road, making it easier to get the car moving.

Q6. When standing on a crowded school bus, which stance would provide better stability and prevent you from being pushed over: legs joined or legs spread apart?

Ans: When standing on a crowded school bus, spreading your legs apart provides better stability and helps prevent you from being pushed over. This wider stance lowers your center of gravity and increases your base area of support, making it harder for external forces. like sudden movements of the bus or the crowd, to unbalance you

Q7. Why a moving bicycle is easier to balance? Relate this to the principles of rotational motion.

Ans: A moving bicycle is easier to balance due to the principles of rotational motion and angular momentum. When a bicycle is in motion, the wheels act as rotating gyroscopes, which provide stability

As the wheels spin, their angular momentum helps to stabilize the bike by resisting changes in orientation. This gyroscopic effect, along with other factors like forward momentum and the rider's input, contributes to the bike's stability and makes it easier to balance compared to when it's stationary.

Q8. Why is a pencil standing on its tip unstable, and what factors affect the stability of an object balanced on a point?

Ans: A pencil standing on its tip is unstable due to its small base of support compared to its height, making it prone to tipping over with even slight disturbances. Factors affecting stability of an object balanced on a point include the size and shape of the base, the height of the object, and the distribution of mass.

A wider base, lower center of gravity, and evenly distributed mass increase stability, while a narrow base, higher center of gravity, and uneven mass distribution decrease stability.

Q9. While driving what happens if the driver take the curve too fast? How does centripetal force play a role in keeping the car from skidding off the road?

Ans: If a driver takes a curve too fast while driving, the car may skid off the road due to insufficient centripetal force $\left(F_c = \frac{mv^2}{r}\right)$ to counteract the car's inertia.

Centripetal force is necessary to keep the car moving in a curved path, and I's provided by friction between the tires and the road surface. When the driver takes the curve too fast, the centripetal force required to keep the car on the road exceeds the available frictional force, causing the tires to lose traction and the car to skid off the road.

Q10. Consider a situation where you swing a ball connected to a string In a circle. How does the tension in the string vary as the ball moves across different points in its circular path, and what forces are involved?

Ans: As the ball connected to a string moves in a circular path, the tension in the string varies. At the top of the circle, the tension is highest because it needs to support the weight of the ball and provide the centripetal force $\left(F_c = \frac{mv^2}{r}\right)$ required to keep it moving in a circle.

At the bottom of the circle, the tension is lower because it only needs to provide the centripetal force.

The forces involved include:

i. Tension in the string:

Provides the centripetal force required to keep the ball moving in a circle.

L. Gravity: the ball

Acts downward, contributing to the tension needed to support the weight of

iii. Centripetal force:

Directed toward the center of the circular path, provided by the tension in the string, which keeps the ball moving in its circular trajectory.

Q11. Why is it important for communication satellites in geostationary orbit to maintain a specific speed?

Ans: Communication satellites in geostationary orbit must maintain a specific

- speed to remain synchronized with the Earth's rotation. This allows them to appear stationary relative to a fixed point on the Earth's surface, faciliating continuous communication with ground-based receivers.

If the satellite's speed deviates from the required velocity, a will dritt out of its designated position relative to the Earth, disrupting communication coverage.