Physics (New Book) - 9th Class Physics Chapter 4 Long Question Preparation

Q1. Q no:6(B) The steering of a has a radius 16 cm. Find the torque produced by a couple of 50 N.

Ans 1:
F = 50 N
r= 16 cm
d= AB = 32cm =0.32m
t=?
As we know that
t = Fx AB
t = 50 x 0.32
t = 16Nm

Q2. Define couple and explain it mathematically

Ans 1: Couple: a couple is formed by two unlike parallel forces of same magnitude but not along the same lineExample: two unlike forces act on a steering wheel and produce torque to turn the vehicle. Similarly, a double arm spanner is used to open a nut of the tyre . Two equal and unlike forces on a water tap produce torque hence , they act as a couple.

Ans 2: Couple arm: the perpendicular distance between two forces of couple armMathematically: Torque of couple = Force * couple armThe torque of couple is given by the product of one of the two forces and perpendicular distance between them

Ans 3: Quantity: it is a vector quantityUnit: its unit is Nm or J

Q3. How position of center of mass effects stability

Ans 1: center of mass helps in stability. T make the object stable, center of mass is kept as low as possibleExample: Racing cars are made heavy at the bottom and height is kept as low as possible.Circular artist such as tight rope walker use long poles to lower their center of mass.In above two examples low center of mass helps them to prevent from topple over

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Q4. What is center of gravity. also explain it

Ans 1: Centre of gravity: a point where the whole weight of the body appears to act vertically downward is called center of gravityExplanation: a body is made of large number of particles. Earth attracts all particles vertically downward. Ass the weight is a vector quantity, the resultant of all these parallel forces is a single force equal to the weight of the whole body. A point where this resultant force acts vertically towards the center of earth is called center of gravity

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Q5. A mechanic tightens the nut of a bicycle using a 15 cm long spannerby exerting a force of 200 N. Find the torque has tightened it.

Ans 1: Solutions:
F= 200N
L= 15cm = 0.15m
t= ?

t= F x L
t = 200 x 0.15
t =30Nm Ans

Q6. Discuss resolution of forces

Ans 1: To split up a force into its perpendicular components is called resolution of the force.

Ans 2: Component of vector; the part of a vector which is effective in a specific direction is called the component of vector of that force

Ans 3: perpendicular components : the components which are making an angle of 90 with each other are perpendicular components. They are of two typesHorizontal component, Vertical component

Ans 4: Horizontal component: the component which is in the direction of x-axis is called horizontal component

Ans 5: Vertical component: the component which is in the direction of y-axis is called vertical component

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Q7. state and explain second condition for equilibrium.

Ans 1: Second condition for equilibrium: if the sum of all the torques acting on a body is zero then the body is in state of equilibrium

Ans 2: Explanation: consider a body pulled by the forces F1 and F2. The two forces are equal but opposite to each other . Both are acting along the same line, hence their resultant will be zero. According to first condition the body will be in equilibrium

Ans 3: NoteClockwise rotation: clockwise rotation is taken as negativeAnticlockwise rotation: anticlockwise rotation is taken as positive

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Q8. Explain like parallel and unlike parallel forces

Ans 1: Parallel forces: such forces which are parallel to each other are called parallel forces.ORthe forces which can never cross 3each other a re called parallel forces.Example: we often come across objects on which many forces are acting in many cases, we find some or all forces acting on the body in the same direction e.g. many people push a bus to start it, all the people apply the forces in the same direction so thy are called parallel forces.

Ans 2: Like parallel force: like parallel forces are the forces that are parallel to each other and have same directionExample: consider a bag with apples in it. The weight of the bag is due to the weight of all apples in it. Since the weight of every apple in the bag is the force of gravity acting on it vertically down words, therefore weight of all apples are parallel forces

Ans 3: Unlike parallel forces: unlike parallel forces are the forces that are parallel but have directions opposite to each otherExample: an apple is suspended by a string: The string is stretched due to its weight. The forces acting on it are weight of the apple acting down words, and tension in the string pulling it vertically upwards . The two forces are parallel but opposite to each other . These force are called unlike parallel forces

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Q9. Write and explain the states of equilibrium

Ans 1: States of equilibrium: there are three states of equilibriumStable equilibrium ,Unstable equilibrium, Neutral equilibrium

Ans 2: Stable equilibrium: a body is said to be in stable equilibrium if after a slight tilt it returns to its previous positionExplanation: when a body is in stable equilibrium its center of gravity is at the lowest position. When it is tilted, its center of gravity rises. It returns to its state of sable equilibrium by lowering its center of gravity. Note that a body remains in state o stable equilibrium as long as the center of gravity acts through the base of the bodyExample: consider a block. when the block is tilt its entre of gravity G rises passes through its base in the tilt position. the block returns to its previous position. If the vertical line through G gets out of its base . the block does not return to its previous position. That is why a vehicle is made heavy at its bottom to keep its center of gravity as low as possible. A low center of gravity keep it stable. Moreover , the base of a vehicle is made wide so that the vertical line passing through its center of gravity should not get out of its base during a turn

Ans 3: Unstable equilibrium; if a body does not return to its previous position when et free after slightest till is said to b in unstable equilibriumExplanation: in state of unstable equilibrium C.G is at is highest position. Try to keep a pencil in vertical position on its top. whenever we leave it the pencil will topple over its top and hence fall down. Because of its center of gravity becomes lower and its weight acts out of its base. So the pencil is in the unstable equilibrium

Ans 4: Neutral equilibrium: if a body remains in its new position when disturbed from its previous position, it is said to be in state of neutral equilibriumExplanation: in neutral equilibrium C.G of the body remains at the same height . When a ball is placed on a horizontal surface and after displacing it the ball attains a new position and does not return but in both the positions its center of gravity remains at the same level . So a ball on a horizontal surface is in neutral equilibrium.

Q10. How we determine the center of gravity of an irregular shaped thin lamina

Ans 1: Center of gravity of an irregular shaped thin lamina: a simple method to find center of gravity of an object is by the use of a plumb linePlumb line: a plumb line consists of a small metal bob supported by a string. When the bob is suspended freely by the truing. Its weight acts vertically downward. In this state, center of gravity of the bob is exactly below its point of suspension

Ans 2: Experiment: take an irregular piece of card board. Make three holes on its edge. If a nail on the wall . Support the card board on the nail through hole A. So that it can swing freely about A. Vertical line from A can be located using a plumb line hung from the nail. Repeat it by supporting the cardboard from hole B and C. The line drawn from B and C and the line from A , all will pass through a single point G. Hence G is the center of gravity of card board

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