



PHYSICS

BOOKS - VGS BRILLIANT PHYSICS (TELUGU ENGLISH)

LAWS OF MOTION

Additional Problems

1. An aircraft executes a horizontal loop at a speed of 720 km/h with its wings banked at

15° . What is the radius of the loop ?



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2. A train runs along an unbanked circular track of radius 30 m at a speed of 54 km /h . The mass of the train is 10^6 kg . What provides the centripetal force required for this purpose - The engine or the rails ? What is the angle of banking required to prevent wearing out of the rail ?



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3. A block of mass 25 kg is raised by a 50 kg man in two different ways as shown in Fig. What is the action on the floor by the man in the two cases ? If the floor yields to a normal force of 700 N , which mode should the man adopt to lift the block without the floor yielding ?



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4. A monkey of mass 40 kg climbs on a rope (Fig) which can stand a maximum tension of 600 N. In which of the following cases will the rope break : the monkey



climbs up with acceleration of $m s^{-2}$



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5. A monkey of mass 40 kg climbs on a rope (Fig) which can stand a maximum tension of 600 N. In which of the following cases will the

rope break : the monkey



climbs down with an acceleration of 4 m s^{-2}



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6. A monkey of mass 40 kg climbs on a rope (Fig) which can stand a maximum tension of 600 N. In which of the following cases will the rope break : the monkey



climbs up with a uniform speed of 5 m s^{-1}



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7. A monkey of mass 40 kg climbs on a rope (Fig) which can stand a maximum tension of 600 N. In which of the following cases will the rope break : the monkey



falls down the rope nearly freely under gravity ? (Ignore the mass of the rope) .



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8. A 70 kg man stands in contact against the inner wall of a hollow cylindrical drum of radius 3 m rotating about its vertical axis with 200 rev/min . The coefficient of friction between the wall and his clothing is 0.15. What is the minimum rotational speed of the cylinder to enable the man to remain stuck to the wall (without falling) when the floor is suddenly removed ?



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9. A thin circular loop of radius R rotates about its vertical diameter with an angular frequency ω . Show that a small bead on the wire loop remains at its lowermost point for $\omega \leq \sqrt{g/R}$. What is the angle made by the radius vector joining the centre to bead with the vertical downward direction for $\omega = \sqrt{2g/R}$? Neglect friction.



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Very Short Answer Questions

1. Why are spokes provided in a bicycle wheel ?



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2. What is inertia ? What gives the measure of inertia ?



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3. According to Newton's third law , every force is accompanied by an equal and opposite force. How can a movement ever take place ?



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4. When a bullet is fired from a gun , the gun gives a kick in the backwark direction Explain .



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5. Why does a heavy rifle not recoil as strongly as a light rifle using the same catridges ?



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6. If a bomb at rest explodes into two pieces, the pieces must travel in opposite directions . Explain .



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7. Define force . What are the basic forces in nature ?



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8. Can the coefficient of friction be greater than one ?



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9. Why does the car with a flattened tyre stop sooner than the one with inflated tyres ?



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10. A horse has to pull harder during the start of the motion than later . Explain .



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11. What happens to the coefficient of friction if the weight of the body is doubled ?



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Short Answer Questions

1. A stone of mass 0.1 kg is thrown vertically upwards . Given the magnitude and direction of the net force on the stone (a) during its upward motion (b) during its downward motion (c)at the highest point , where it momentarily comes to rest .



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2. Define the terms momentum and impulse . State and explain the law of conservation of linear momentum . Give examples .



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3. Why are shock absorbers used in motor cycles and cars ?



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4. Explain the terms limiting friction , dynamic friction and rolling friction .



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5. Explain the advantages and disadvantages of friction .



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6. Explain Friction . Mention the methods used to decrease friction .



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7. State the laws of rolling friction .





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8. Why is pulling the lawn roller preferred to pushing it ?



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Long Answer Questions

1. State Newton's second law of motion .

Hence , derive the equation of motion $F = ma$ from it .



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2. A body is moving along a circular path such that its speed always remains constant. Should there be a force acting on the body?



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3. Define Angle of friction and Angle of repose. Show that angle of friction is equal to angle of repose for a rough inclined plane.

A block of mass 4 kg resting on a rough horizontal force of 30 N is applied on .If $g = 10m / s^2$. Find the total contact force exerted by the plane on the block .



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