



PHYSICS

BOOKS - MODERN PUBLICATION

Friction

Exercise

1. A horizontal force of 490 n is required to slide a sledge weighing 600 kgf over a flat surface. Calculate the coefficient of friction.



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2. A mass of 4 kg rests on a horizontal plane. The plane is gradually inclined at an angle $\theta = 15^\circ$ with the horizontal, the mass just begins to slide. What is the coefficient of static friction between the block and the surface?



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3. A block of mass 25 kg is lying on a rough horizontal surface. When a force of 122.5 N is applied horizontally, the block just begins to move. Find the coefficient of friction between the surface and the block.



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4. A body moving on a the ground with a velocity of 15ms^{-1} comes to rest after covering a distance of 25 m. If the acceleration

due to gravity is 10ms^{-2} , find the coefficient of friction between the ground and the body.



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5. A block of mass 15 kg is placed on a long trolley. The coefficient of friction between the block and the trolley is 0.18. The trolley accelerates from rest with 0.5ms^{-2} for 20 s and then moves with uniform velocity. Discuss the motion of the block as viewed by an observer with the trolley.



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6. A box is lying on the floor of a moving train and the coefficient of friction between the floor and the box is 0.24. Find the maximum acceleration of the train for which the box will lie stationary on the floor. Given that $g = 9.8ms^{-2}$.



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7. A bullet of mass 0.01 kg is fired horizontally into a 4 kg wooden block at rest on a horizontal surface. The coefficient of the kinetic friction between the block and the surface is 0.25 . The bullet gets embedded in the block and the combination moves 20 m before coming to rest. With what speed did the bullet strike the block?



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8. A horizontal force of 12 kgf pushes a block weighing 5 kgf against a vertical wall. The coefficient of static friction between the wall and the block is 0.5 and the coefficient of kinetic friction is 0.4. Will the answer change, if the block was initially sliding ?



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9. A horizontal force of 12 kgf pushes a block weighing 5 kgf against a vertical wall. The

coefficient of static friction between the wall and the block is 0.5 and the coefficient of kinetic friction is 0.4. Will the answer change, if the block was initially sliding ?



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10. A chain of mass M and length L is placed on a table, such that only a part of it is on the table and the remaining part hangs in air. If the coefficient of friction between the chain and table is μ , find the maximum length of the

chain that can hang in air without the sliding of the part of the chain on the table.



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11. A force of 98 N is just able to move a body weighing 45 kgf on rough horizontal surface. Calculate the coefficient of friction and the angle of friction.



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12. A body placed on a rough inclined plane just begins to slide, when the slope of the plane is 1 in 4. Calculate the coefficient of friction.



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13. Calculate the force required to move a train of 2000 quintals up on incline of 1 in 50 with an acceleration of $2ms^{-2}$, the force of friction being 0.5 N per quintal.





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14. An aeroplane requires for take off a speed of 80kmh^{-1} , the run on the ground being 100m. The mass of the plane is 10000 kg and the coefficient of friction between the plane and the ground is 0.2. Assume that the plane accelerates uniformly during the take off. What is minimum force required by the engine of the plane for take off ?



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15. What is friction?



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16. Define limiting factor.



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17. Which of the following is a self adjusting force?



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18. What is the unit of coefficient of limiting friction?



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19. Why is it difficult to walk on sand?



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20. Is a large brake on a bicycle wheel more effective than small one ? Explain.



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21. It is difficult to move a cycle along a road with its brakes on. Why?



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22. Proper inflation of tyres saves fuel. this is because:



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23. Why are lubricants used in machines ?



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24. Which of the following is not used to reduce friction



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25. What are the methods of reducing friction?/



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26. Give old and modern views of the cause of friction.



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27. what do you mean by friction ? Explain the cause of sliding friction.



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28. Explain the term limiting friction



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29. Define the following : angle of repose.



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30. Define the following : coefficient of limiting friction.



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31. What is the difference between static friction and rolling friction ? Which of the two is smaller sliding friction or rolling friction.



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32. What is the difference between static friction and kinetic friction ?



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33. Explain the term limiting friction



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34. Draw a graph showing the variation of frictional force with the applied force. What is meant by limiting friction ?



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35. State the laws of friction.



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36. State the laws of friction.



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37. State and explain the law of limiting factors.



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38. Show that $\tan \theta = \mu$, where θ is angle of friction and μ is coefficient of friction.



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39. Define angle of friction.



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40. What do you mean by angle of repose ?



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41. Define angle of friction and angle of repose. Find the relationship between them.



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42. Define coefficient of static friction.



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43. Define coefficient of friction.



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44. Define angle of friction.



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45. what do you mean by friction ? Explain the cause of sliding friction.



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46. Friction is a necessary evil. Explain.



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47. Friction is a necessary evil. Explain.



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48. Friction is a necessary evil. Explain.



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49. Discuss the advantage and disadvantage of friction.



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50. Friction is a necessary evil. Explain.



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51. What are factors on which the force of friction depends ? How does lubrication help in reducing friction ?



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52. What are the methods of reducing friction?/



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53. Give old and modern views of the cause of friction.



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54. What is friction?



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55. Rolling friction is:





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56. What is friction?



[Watch Video Solution](#)

57. State the laws of friction.



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58. What do you mean by ball bearings ? How sliding friction is converted into rolling friction ?



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59. A ball rolled on ice with a velocity of 14ms^{-1} comes to rest after travelling 40m. Find the coefficient of friction. Given $g = 9.8\text{ms}^{-2}$.



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60. The coefficient of friction between a horizontal surface and a moving body is μ . With what speed must a body of mass m be projected parallel to the surface to travel a distance S before stopping ?



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61. An automobile is moving on a horizontal road with a speed v . If the coefficient of friction between the tyres and the road is μ ,

show that the shortest distance in which the automobile can be stopped is $v^2 / 2\mu g$.



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62. A suitcase is gently dropped on a conveyor belt moving at 3 m/s . If the coefficient of friction between the belt and the surface is 0.5 , how far will the suitcase move on the belt before coming to rest?



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63. If the coefficient of friction is 0.6, calculate the angle of friction.



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64. A force of 5 kgfis just sufficient to pull a block of weight 8 kgf over a horizontal surface. Find the angle of friction.



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65. A cubical block rests on an inclined plane with four edges horizontal. If $\mu = \frac{1}{\sqrt{3}}$ determine the angle when the block just slides down the plane.



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66. A mass of 4 kg rests on a horizontal plane. The plane is gradually inclined at an angle $\theta = 15^\circ$ with the horizontal, the mass just

begins to slide. What is the coefficient of static friction between the block and the surface?



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67. A mass of 100 kg is resting on a rough inclined plane of angle 30° . If the coefficient of friction is $1/\sqrt{3}$, find the greatest and the least forces that acting parallel to the plane in both cases, just maintain the mass in equilibrium.



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68. A block of mass 2 kg rests on a plane inclined at 30° with the horizontal. The coefficient of friction between the block and the surface is 0.7. Calculate the frictional force acting on the block.



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69. A horizontal force of 1.2 kgf is applied to a 1.5 kgf block, which rests on a horizontal surface. If the coefficient of friction is 0.3, find

the acceleration produced. Given,

$$g = 9.8ms^{-2}.$$



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70. A body is in limiting equilibrium on a rough inclined plane inclined at an angle of 30° with the horizontal. Calculate acceleration with which the body will slide down, when inclination of the plane is changed to 45° .

Given $g = 9.8ms^{-2}$.



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71. A metal block is placed on a metal plane inclined at an angle of 30° . If the mass of the block is 0.5 kg and coefficient of friction is 0.2, what force must be applied to keep the body from sliding down the plane.



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72. A metal block is placed on a metal plane inclined at an angle of 30° . If the mass of the block is 0.5 kg and coefficient of friction is 0.2,

what force must be applied to move it up the plane.



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73. A body of mass 10 kg is sliding down a rough inclined plane which makes an angle of 30° with the horizontal. If the coefficient of friction is 0.25, what is the acceleration of the body ?



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74. A block is gently placed at the top of an inclined plane 640 cm long. Find the time taken by the block to slide down to the bottom of the plane, which makes an angle of 30° with the horizontal. Coefficient of friction = 0.2 and $g = 1000\text{cm s}^{-2}$.



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