1. What type of friction is involved when an axle rotates in a sleeve?
2. Is static friction a self-adjusting force?
3. What is the weight felt by a person in a lift when it has free fall?
4. How many newtons make one kg wt?
5. Sudden motion on a blanket removes dust. How?
6. Name the quantity that remains conserved in rocket propulsion.
7. What is the angle between frictional force and instantaneous velocity of the body moving on a rough road?
8. Which is greater: Nuclear force or electrostatic force?
9. Name the fundamental forces of nature.
10. If a string of a rotating stone breaks, in which direction will the stone move?
11. What happens to coefficient of friction, when weight of body is doubled?
12. A ball of mass 0.1kg is thrown against a wall. It strikes the wall normally with a velocity of 30 m/s and rebounds with a velocity of 20 m/s. Calculate the impulse of the force exerted by the ball on the wall. **(5 Ns)**
13. A golf ball of mass 60 g at rest is hit with a striker. Find the impulse of the hit if the ball stops after travelling a horizontal distance of 50m with a uniform retardation of $4m/s^2$. **(1.2 Ns)**
14. A block of metal weighting 2kg is resting on a frictionless plane. It is struck by a jet releasing water at a rate of 1kg/s and at a speed of 5m/s. Calculate the initial acceleration of the block. **($2.5\ m/s^2$)**
15. A 10 gram bullet is shot from a 5kg gun with a velocity of 400m/s. what is the speed of recoil of the gun?
16. Two blocks of masses m_1, m_2 are connected by light spring on a smooth horizontal surface. The two masses are pulled apart and then released. Prove that the ratio of their acceleration is inversely proportional to their masses.
17. A force is being applied on a body but it causes no acceleration. What possibilities may be considered to explain the observation?
18. Forces of 16N and 12N are acting on a mass 200kg in mutually perpendicular directions. Find the magnitude of the acceleration produced? **($0.1 m/s^2$)**

19. An elevator weighs 3000kg. What is its acceleration when the tension supporting cable is 33000N? **($1.2 m/s^2$)**

20. Two billiard balls each of mass 0.05kg moving in opposite directions with speed 6m/s collide and rebound with the same speed. What is the impulse imparted to each due to other.

21. A nucleus is at rest in the laboratory frame of reference. Show that if it disintegrates into two smaller nuclei, the products must be emitted in opposite directions.

22. A truck starts from rest and accelerates uniformly at 2 m/s^2. At t=10s, a stone is dropped by a person standing on the top of the truck (6m high from the ground). What are the a) velocity, and b) acceleration of the stone at t=11s? (Neglect air resistance.) **$\tan^{-1}(0.5)$**

23. Two bodies of masses 10kg and 20kg respectively kept on a smooth, horizontal surface are tied to the ends of a light string. A horizontal force F= 600N is applied to 1) A 2) B along the direction of string. What is the tension in the string in each case?

24. A cricket ball of mass 500g is moving with speed of 36 km/h. It is reflected back with the same speed, what is the impulse applied on it? **(10 kg m/s)**

25. A force of 72 dyne is inclined in the horizontal at an angle of 60^0, Find the acceleration in a mass of 9g. Which moves in horizontal direction? **($4cm/s^2$)**

26. A force of 5N gives a mass m_1 an acceleration of $8m/s^2$ and a mass m_2 an acceleration of $24m/s^2$. What acceleration would it give if both the masses are tied together? **($6m/s^2$)**

27. A hunter has a machine gun that can fire 50g bullets with a velocity of 150 m/s. A 120kg tiger springs at him with a velocity of 10 m/s. How many bullets mush the hunter fire to the tiger, in order to stop him in his track? **(160)**

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

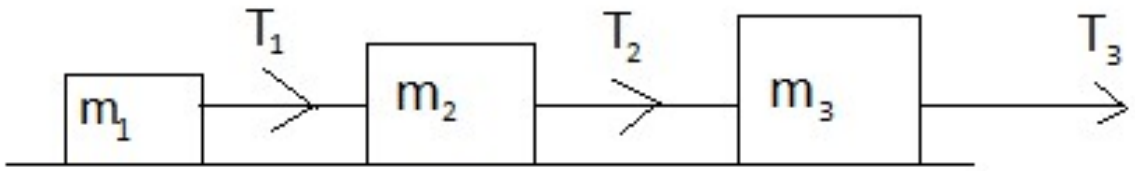
29. Weight of 50g and 40g are connected by a string passing over a smooth pulley. If system travels 2.18m in the first 2 seconds, find the value of g.

30. A ball moving with a momentum of 5kgm/s strikes against a wall at an angle of 45^0 and is reflected the same angle and with same speed. Find the change in momentum of the ball. **($5\sqrt{2}$ kg m/s)**

31. Two blocks 3kg and 2kg are suspended from a rigid support by two inextensible wires, each of length 1m and having linear mass density 0.2 kg/m. Find the tension at the mid-point of each wire as the arrangement gets an upward acceleration of $2m/s^2$. **(62.54 N, 24.78 N)**

32. A rocket with a lift off mass 20,000kg is blasted upwards with an initial acceleration of $5.0\ m/s^2$. Calculate the initial thrust (force) of the blast. **(2.96×10^5 N)**

33. Three blocks are connected as shown on a horizontal frictionless table, and pulled to the right with a force of T_3=60N

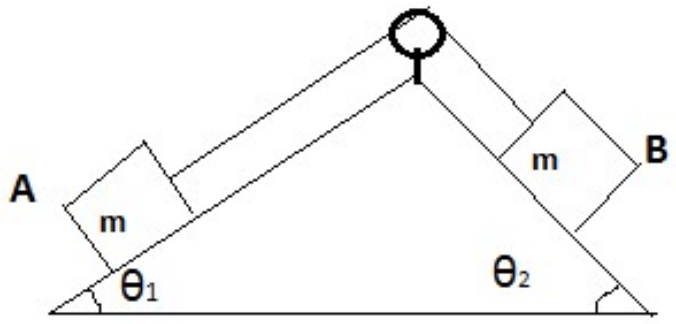


If m_1=10kg, m_2=20kg and m_3=30kg. Prove that $T_1/T_2 = 1/3$

34. A motor car is travelling at 30 m/s on a circular road of radius 500m. It is increasing its speed at the rate of $2m/s^2$. What is the acceleration? **($2.7\ m/s^2$)**

35. A rubber ball of mass 50g falls from a height of 1m and rebounds to a height of 0.5m. Find a) impulse and b) average force between the ball and the ground if the time for which they are in contact was 0.1s. **(0.378 Ns, 3.78N)**

36. In fig. a body A of mass m slides on plane inclined at an angle $\theta_1$to the horizontal and μ is the coefficient of friction between A and the plane. A is connected by a light string passing over a frictionless pulley to another body B, also of mass m, sliding on frictionless plane inclined at angle θ_2 to the horizontal. What is the value of coefficient of friction μ ?



37. A rope of mass 0.5kg is pulling a block of mass 10kg. under the action of a force of 31.5N If the block is resting on a smooth horizontal surface, calculate the force of reaction exerted by the block on the rope. **(30N)**

38. A monkey is sitting on a tree limb. The limb exerts a normal force of 48N and a frictional force of 20N. Find the magnitude of the total force exerted by the limb on the monkey. **(52N)**

39. A force produces an acceleration of 16 m/s^2 in a body of mass 0.5 kg and an acceleration of 4 m/s^2 in another body. If both the bodies are fastened together, then how much acceleration will be produced by this force? **(3.2 m/s)**

40. Consider the bodies of mass m_1 and m_2 in contact placed on a frictionless table as shown. When force F is applied on mass m_1, Calculate the acceleration produced, and the force of contact between the bodies. What will be the force of contact when the force F is applied on mass m_2

(Ans. $a = \frac{F}{m_1 + m_2}$, $f = \frac{m_2 F}{m_1 + m_2}$, $f_1 = \frac{m_1 F}{m_1 + m_2}$)

41. A bullet of mass 0.01kg is fired horizontally in a 4 kg wooden block at rest on a rough horizontal surface of friction coefficient 0.25. The bullet remains embedded in the block & the combination moves 20 m before coming to rest. Find velocity of bullet. **(4010 m/s)**