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Newton's laws of Motion and friction

1. When a force of 1 N acts on a 1 kg body that is able to move freely ,the body recilves
(a)a speed of 1m/s
(b)an acceleration of 1m/s²
(c)an acceleration of 980 cm/s²
(d) None

2.A ship of 3X10^7 kg, initially at rest ,is pulled by a force of 5 x10^4 N through a distance of 3m.Assuming that the resistance due to water is negligible ,the speed of the ship is
(a)1.5m/s **(b)**60m/s **(c)**0.1m/s **(d)**5m/s

3. A block of mass M is pulled along a horizontal frictionless surface by a rope of mass m by applying a force at one end of the rope. The force which the rope exerts on the block is
(a)$\frac{P}{M-m}$ **(b)**$\frac{PM}{M+m}$
(c)$\frac{Pm}{M+m}$ **(d)**Pm(M+m)

4. An elevator is moving vertically up with an acceleration a. The force exerted on the floor by a passenger of mass m is
(a)mg **(b)**ma
(c)mg-ma **(d)**mg+ma

5. The minimum acceleration with which a fireman can slide down a rope of breaking strength two-third of his weight is
(a)zero **(b)**g/3 **(c)**2g/3 **(d)**g

6. A cricket ball of mass 150 g is moving with a velocity of 12m/s and is hit by a bat so that it is turned back with a velocity of 20m/s .The force of blow acts for 0.01s. The average force exerted by the bat on the ball is
(a)120N **(b)**240N **(c)**480N **(d)**960N

7. A body takes n times as much time to slide down a 45° rough incline as takes to slide down a smooth 45° incline .The coefficient of friction is
(a)$1-\frac{1}{n^2}$ **(b)**$\frac{1}{1-n^2}$
(c)$\sqrt{1-\frac{1}{n^2}}$ **(d)**$\frac{1}{\sqrt{1-n^2}}$

8. A block of mass 2kg rests on a rough inclined plane making an angle of 30° with the horizontal. The coefficient of static friction between the block and the plane is 0.7. The frictional force on the block is
(a)9.8N **(b)**0.7x9.8N
(c)$9.8\sqrt{3}$N **(d)**0.7 x 9.8x$\sqrt{3}$N

9. A 40 kg slab rests on a friction less floor. A 10kg block rests on the slab .The coefficient of static friction between the block and the slab is 0.6 while the kinetic coefficient is 0.4 .The 10 kg block is acted upon by a horizontal force of 100N .If g=9.8m/s² the resulting acceleration of the slab will be
(a)0.98 m/s² (b)1.47m/s²
(c)1.52m/s² (d)1.96m/s²

10.A body is projected up a 45° rough incline .If the coefficient of friction is 0.5 ,then the retardation of the block is
(a)$\frac{g}{2\sqrt{2}}$ **(b)**$\frac{g}{\sqrt{2}}$ **(c)**$\frac{3g}{2\sqrt{2}}$ **(d)**$\frac{g}{2}$

11. A 1000 kg lift is supported by a cable that can support 2000kg .The shortest distance in which the lift can be stopped when it is descending with a speed of 2.5 m/s is (g=m/s²)
(a)$\frac{5}{16}m$ **(b)**$\frac{5}{32}$ **(c)**1 m **(d)**2m

12. A particle of mass 100g is suspended from a light string .The string is moved (i) upwards and (ii) downwards with an acceleration of 5m/s². If T_u *and* T_d are the tensions in the

string during upward and downward motions respectively ,then $T_u - T_a$ is equal to

(a)1 N **(b)**0.5N **(c)**0.98N **(d)**1.96N

13. A weight W can be just supported on a rough inclined plane by a force P either acting along the plane or horizontally .If ϕ is the angle of friction then P/W is

(a)tanϕ **(b)**secϕ **(c)**sinϕ **(d)**None

14. A body of 6kg rests in limiting equilibrium on an inclined plane whose slope of 30°.If the plane is raised to a slope of 60°,the force in kg-wt along the plane required to support it is (g=10m/s²)

$(\boldsymbol{a})3$ $(\boldsymbol{b})2\sqrt{3}$ $(\boldsymbol{c})\sqrt{3}$ $(\boldsymbol{d})3\sqrt{3}$

15. A body is on the point of sliding down an inclined plane under its own weight .If the inclination of the plane to the horizon is 30°,then the angle of friction is

(a)30° **(b)**60° **(c)**45° **(d)**15°

16. The mechanical advantage of a system of pulleys is four. The force needed to lift a mass of 100kg will be

(a)20kg wt **(b)**25kgwt

(c)5 kg wt **(d)**15kg wt

17. A body of mass 2 kg is acted upon by two forces, each of magnitude 1 N, making an angle of 60 ° with each other .The net acceleration of the body in m/s² is

$(\boldsymbol{a})0.5$ $(\boldsymbol{b})1.0$

$(\boldsymbol{c})\sqrt{3}/2$ **(d)**$\sqrt{2}/3$

18. The average force necessary to stop a hammer with 25 N-s momentum in 0.05 s is

$(\mathbf{a})500$ $(\mathbf{b})125$ $(\mathbf{c})50$ $(\mathbf{d})25$

19. A scooter of mass 120kg is moving with a uniform velocity of 108km/h.The force required to stop the vehicle in 10s is

$(\mathbf{a})360N$ $(\mathbf{b})720N$ $(\mathbf{c})180N$ $(\mathbf{d})120X$ 10.8N

20. An impulse is supplied to a moving object with the force at an angle of 120° with the velocity vector. The angle between the impulse vector and the change in momentum vector is

$(\mathbf{a})120°$ $(\mathbf{b})0°$ $(\mathbf{c})180°$ $(\mathbf{d})240°$

21. A man is at rest in the middle of a horizontal plane of perfectly smooth ice .He can move himself to the shore by making use of Newton's

$(\mathbf{a})$first law $(\mathbf{b})$second law

(c)third law **(d)**all the laws

22. A body of mass 2 kg is placed on a horizontal surface having coefficient of kinetic friction 0.4 and coefficient of static friction 0.5 .If a horizontal force of 2.5 n is applied on the body the frictional force acting on the body will be (g=10m/s²)

$(\mathbf{a})8N$ $(\mathbf{b})10N$ $(\mathbf{c})20N$ $(\mathbf{d})2.5N$

23. A body of mass 2 kg collides with a wall with a speed of 100m/s and rebounds with the same speed .If the time of contact is 1/50s,the force exerted on the walls is

$(a)8N$ $(b)2x10^4N$ $(c)4N$ $(d)10^4N$

24. A block placed on an inclined plane of slope angle θ slides down with a constant speed. The coefficient of kinetic friction is equal to

(a)sinθ **(b)**cos θ **(c)**tanθ **(d)**cotθ

25. A monkey is descending from the branch of a tree with a constant acceleration .If the breaking strength of the branch is 75% of the weight of the monkey. The minimum acceleration with which the monkey can slide down without breaking the branch is

(a)g **(b)**3g/4 **(c)**g/2 **(d)**g/4

26. Two blocks A(20kg)and B(50kg) lying on a frictionless table are connected by a light string. The system is pulled horizontally with an

acceleration of 2m/s² by a force F on B. The tension in the string is

(a)40N **(b)**100N **(c)**35N **(d)**140N

27. The linear momentum P of a body moving in one dimension varies with time according to the equation $P=a+bt^2$, where a and b are positive constants. The net force acting on the body is

(a)proportional to t^2

(b) proportional to t

(c)a constant

(d)inversely proportional to t

28. A monkey sits on the pan of a spring scale kept in an elevator .The reading of the spring scale will be maximum when the elevator

(a)is stationery

(b)cable breads and it falls freely towards the earth

(c)accelerates downwards

(d)accelerates upwards

29. A block of mass 50 kg can slide on a rough horizontal surface. The coefficient of friction between the block and the surface is 0.6. The least force of pull acting at 30° to the upward drawn vertical which causes the block to just slides is ($g=9.8m/s^2$)

(a)29.42kg wt. **(b)**219.6N

(c)21.96 kg wt. **(d)**294.2N

30. A man is standing on a weighing machine placed in a lift. When stationary, his weight is recorded as 40 kg. If the lift is moved upwards with an acceleration of $2m/s^2$,then the weight recorded in the machine will be ($g=10m/s^2$)

(a)32kg **(b)**40kg **(c)**42kg **(d)**48kg