



PHYSICS

BOOKS - SAI PHYSICS (TELUGU ENGLISH)

LAWS OF MOTION

MCQ

1. A man running at a speed of 5 kmph finds that the rain falls vertically. When he stops

running, he finds that the rain is falling at an angle of 60° with the horizontal. The velocity of rain with respect to running man is

A. $\frac{5}{\sqrt{3}}$ kmph

B. $\frac{5\sqrt{3}}{2}$ kmph

C. $\frac{4\sqrt{3}}{5}$ kmph

D. $\frac{5}{3}$ kmph

Answer: D



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2. Sum of magnitude of two forces is 25 N. The resultant of these forces is normal to the smaller force and has a magnitude of 10 N. Then the two forces are

A. 14.5 N, 10.5 N

B. 16 N, 9 N

C. 13 N, 12 N

D. 20N, 5N

Answer: A



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3. Hammer of mass M strikes a nail of mass ' m ' with a velocity $20m/s$ into a fixed wall. The nail penetrates into the wall to a depth of 1 cm. The average resistance of the wall to the penetration of the nail is

A. $\left(\frac{M^2}{M+m}\right) \times 10^3$

B. $\left(\frac{2M^2}{M+m}\right) \times 10^4$

C. $\left(\frac{M}{M^2}\right) \times 10^2$

D. $\left(\frac{M^2}{M+m}\right) \times 10^2$

Answer: B



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4. A wheel which is initially at rest is subjected to a constant angular acceleration about its axis. It rotates through an angle of 15° in time t sec. The increase in angle through which it rotates in the next $2t$ sec is

A. 90°

B. 120°

C. 30°

D. 45°

Answer: B



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5. A bus moving on a level road with a velocity v can be stopped at a distance of x , by the application of a retarding force E . The load on the bus is increased by 25% by boarding the passengers. Now, if the bus is moving with the

same speed and if the same retarding force is applied, the distance travelled by the bus before it stops is

A. $1.25x$

B. x

C. $5x$

D. $2.5x$

Answer: A



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6. Two wooden blocks of masses M and m are placed on a smooth horizontal surface as shown in figure. If a force P is applied to the system as shown in figure such that the mass m remains stationary with respect to block of mass M , then the magnitude of the force P is

A. $(M + m)g \tan p$

B. $mg \cos p$

C. $g \tan P$

D. $(M + m)g \cos ecp$

Answer: A



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7. A mass of 2.9 kg is suspended from a string of length 50 cm and is at rest. Another body of mass 100 g, which is moving horizontally with a velocity of 150 m/s strikes and sticks to it. Subsequently when the string makes an angle of 60° with the vertical, the tension in the string is ($g = 10\text{ m/s}^2$)

A. 140 N

B. 135 N

C. 125 N

D. 90 N

Answer: B



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8. The upper half of an inclined plane with an angle of inclination 4 , is smooth while the lower half is rough. A body starting from rest

at the top of the inclined plane comes to rest at the bottom of the inclined plane. Then the coefficient of friction for the lower half is

A. $2 \tan \phi$

B. $\tan \phi$

C. $2 \sin \phi$

D. $2 \cos \phi$

Answer: A



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9. Assertion (A) The Moment of inertia of a steel sphere is larger than the Moment of inertia of a wooden sphere of same radius.

Reasons (R) Moment of inertia is independent of mass of the body. The correct one is

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true, and (R) is not the correct explanation of (A)

C. (A) is true but (R) is wrong

D. (A) is wrong but (R) is true

Answer: C



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10. Choose correct statement

(A) The position of centre of mass of a system is dependent on the choice of coordinate system.

(B) Newton's second law of motion is applicable to the centre of mass of the system

(C) Internal forces can not change the state of centre of mass

(D) Internal forces can change the state of centre of mass.

A. Both (A) and (B) are correct

B. Both (B) and (C) are wrong

C. Both (A) and (C) are wrong

D. Both (A) and (D) are wrong

Answer: D



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11. A ball A of mass m moving along positive x -direction with kinetic energy K and momentum p undergoes elastic head on collision with a stationary ball B of mass M after collision the ball A moves along negative x -direction with kinetic energy $K/9$, final momentum of B is

A. p

B. $y-p$

C. $\frac{4p}{3}$

D. 4p

Answer: C



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12. A police party is moving in a jeep at a constant speed v . They saw a thief at a distance x on a motorcycle which is at rest. The moment the police saw the thief, the thief started at constant acceleration a . Which of

the following relations is true if the police is able to catch the thief?

A. $v^2 < ax$

B. $v^2 < 2ax$

C. $v^2 > ax$

D. $v^2 = ax$

Answer: C



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13. The maximum tension a rope can withstand is 60 kg.wt. The ratio of maximum acceleration with which two boys of masses 20 kg and 30 kg can climb up the rope at the same time is

A. 1 : 2

B. 2 : 1

C. 4 : 3

D. 3 : 2

Answer: D



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14. A circular disc of radius R is removed from a bigger circular disc of radius $2R$ such that the circumferences of the discs touch. The centre of mass of the new disc is at a distance aR from the centre of the bigger disc. The value of a is

A. $\frac{1}{2}$

B. $\frac{1}{3}$

C. $\frac{1}{4}$

D. $\frac{1}{6}$

Answer: B



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15. An athlete completes one round of a circular track of radius R in 40 s. What will be his displacement at the end of 2 min 20 s?

A. $7R$

B. $2R$

C. $2\pi R$

D. $7\pi R$

Answer: B



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16. A bullet of mass 0.02 kg travelling horizontally with velocity 250 ms^{-1} strikes a block of wood of mass 0.23 kg which rests on a rough horizontal surface. After the impact, the block and bullet move together and come to

rest after travelling a distance of 40 m. The coefficient of sliding friction of the rough surface is ($g = 9.8ms^2$)

A. 0.75

B. 0.61

C. 0.51

D. 0.3

Answer: C



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17. A rifle of 20 kg mass can fire 4 bullets / s. The mass of each bullet is 35×10^{-3} kg and its final velocity is 400 m s^{-1} . Then, what force must be applied on the rifle so that it does not move backwards while firing the bullets?

A. 80 N

B. 28 N

C. -112N

D. -56N

Answer: D



18. An object of mass $2m$ is projected with a speed of $100ms^{-1}$ at an angle, $\theta = \sin^{-1}\left(\frac{3}{5}\right)$ to the horizontal. At the highest point, the object breaks into two pieces of same mass m and the first one comes to rest. The distance between the point of projection and the point of landing of the second piece (in metre) is (Given, $g = 10ms^{-2}$).

A. 3840

B. 1280

C. 1440

D. 960

Answer: C



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19. A man slides down on a telegraphic pole with an acceleration equal to one-fourth of acceleration due to gravity. The frictional force

between man and pole is equal to in terms of
man's weight w

A. $\frac{w}{4}$

B. $\frac{w}{2}$

C. $\frac{3w}{4}$

D. w

Answer: C



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20. A man of 50 kg is standing at one end on a boat of length 25 m and mass 200 kg. If he starts running and when he reaches the other end, he has a velocity 2ms^{-1} with respect to the boat. The final velocity of the boat is (in ms^{-1})

A. $\frac{2}{5}$

B. $\frac{2}{3}$

C. $\frac{8}{5}$

D. $\frac{8}{3}$

Answer: A



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21. The machine gun fires 240 bullets / min . If the mass of each bullet is 10 g and the velocity of the bullet is 600 m s^{-1} , the power (in kW) of the gun is

A. 43200

B. 432

C. 72

D. 7.2

Answer: D



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22. A body of mass m is suspended to an ideal spring of force constant K . The expected change in the position of the body due to an additional force F acting vertically downwards is,

A. $\frac{3F}{2K}$

B. $\frac{2F}{K}$

C. $\frac{5F}{2K}$

D. $\frac{4F}{K}$

Answer: B



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23. Consider the following statements A and B and identify the correct answer.

A. When a person walks on a rough surface the direction of frictional force exerted by the

surface on the person is opposite to the direction of his motion.

B. When a cycle is in motion, the force of friction exerted by the ground on the front wheel is in the backward direction.

A. A and B are correct

B. A is correct, B is wrong

C. A and B are wrong

D. A is wrong, B is correct

Answer: A



24. The horizontal acceleration that should be given to a smooth inclined plane of angle $\sin^{-1}\left(\frac{1}{l}\right)$ to keep an object stationary on the plane, relative to the inclined plane is

A. $\frac{g}{\sqrt{l^2 - 1}}$

B. $g\sqrt{l^2 - 1}$

C. $\left(\frac{\sqrt{l^2 - 1}}{g}\right)$

D. $-\frac{g}{\sqrt{l^2 + 1}}$

Answer: A



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25. A body of weight 64 N is pushed with just enough force to start it moving across a horizontal floor and the same force continues to act afterwards. If the coefficients of static and dynamic friction are 0.6 and 0.4 respectively, the acceleration of the body is (acceleration due to gravity = g)

A. $\frac{g}{6.4}$

B. 0.64 g

C. $\frac{g}{32}$

D. 0.2 g

Answer: D



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26. Bullets of 0.03 kg mass each, hit a plate at the rate of 200 bullet / s, with a velocity of 50 $m s^{-1}$ and reflect back with a velocity of

30ms^{-1} . The average force acting on the plate, in Newton is,

A. 120

B. 180

C. 300

D. 480

Answer: D



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27. An iron block of sides $50\text{ cm} \times 8\text{ cm} \times 15\text{ cm}$ has to be pushed along the floor. The force required will be minimum when the surface in contact with ground is

A. $8\text{ cm} \times 15\text{ cm}$ surface

B. $5\text{ cm} \times 15\text{ cm}$ surface

C. $8\text{ cm} \times 5\text{ cm}$ surface

D. Force is same for all surfaces

Answer: D



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28. A car of mass 400 kg and travelling at $72\text{km} - \text{h}^{-1}$ crashes into a truck of mass 4000 kg and travelling at $9\text{km} - \text{h}^{-1}$, in the same direction. The car bounces back at a speed of $18\text{km} - \text{h}^{-1}$. The speed of the truck after the impact is

A. $9\text{km} - \text{h}^{-1}$

B. $18\text{km} - \text{h}^{-1}$

C. $27\text{km} - \text{h}^{-1}$

D. $36km - h^{-1}$

Answer: B



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29. The relation $F = ma$, cannot be deduced from Newton's second law, if

- A. Force depends on time
- B. Momentum depends on time
- C. Acceleration depends on time

D. Mass depends on time

Answer: D



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30. If a body is in equilibrium under a set of non-collinear forces, the minimum number of forces has to be

A. Four

B. Three

C. Two

D. Five

Answer: B



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31. The weight of a man in a lift moving upwards is 608 N while the weight of the same man in the lift moving downwards, with the same acceleration is 368 N. His normal weight in Newton is

A. 488

B. 588

C. 480

D. 240

Answer: A



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32. A body of mass 10 kg lies on a rough horizontal surface. When a horizontal force of F newtons acts on it, it gets an acceleration of

$5m/s^2$. And when the horizontal force is doubled, it gets an acceleration of $18m/s^2$.

The coefficient of friction between the body and the horizontal surface is

A. 0.2

B. 0.8

C. 0.4

D. 0.6

Answer: B



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33. A body of weight 50 N is placed on a smooth surface. If the force required to move the body on the rough surface is 30 N the coefficient of friction is

A. 0.6

B. 1.2

C. 0.3

D. 1.67

Answer: A



34. Two forces of equal magnitude F act at a point. If the angle between them is θ , then the magnitude of the resultant force is

A. $F\sqrt{2(l - \sin \theta)}$

B. $F\sqrt{2(l + \sin \theta)}$

C. $2F\frac{\sin(\theta)}{2}$

D. $2F\frac{\cos(\theta)}{2}$

Answer: D



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35. A motor car of mass 300 kg is moving with a velocity of 25 m s^{-1} , by applying brakes the car was brought to rest in a distance of 15 m.

The force of retardation in Newton is

A. 2500

B. 4500

C. 6250

D. 7500

Answer: C



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36. A gun is aimed at a target in line with its barrel. The target is released and allowed to fall under gravity, at the instant, the gun is fired. The bullet will

A. Pass above the target

B. Pass below the target

C. Hit the target

D. Certainly hit the target

Answer: C



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37. A gun fires 50 g bullets with velocity 1000 m s^{-1} each. The soldier holding the gun can exert an average force of 180 N against the gun. The maximum number of bullets, he can fire per minute is

A. 216

B. 300

C. 156

D. 276

Answer: A



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38. if μ_s , μ_k and μ_r are coefficients of static friction, sliding friction and rolling friction, then.

A. $\mu_s < \mu_k < \mu_r$

B. $\mu_r < \mu_k < \mu_s$

C. $\mu_k < \mu_s < \mu_r$

D. $\mu_r < \mu_k = \mu_s$

Answer: B



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39. A ball of mass 100 g is moving with a velocity of 10 ms^{-1} . On being hit with bat rebounds with a velocity of 10 ms^{-1} . The

force of the ball by the bat acts for 0.01 s, then
the force exerted on the ball by the bat is

A. 50 N

B. 100 N

C. 200 N

D. 400 N

Answer: C



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40. The average force that is necessary to stop

a hammer with $25 \text{ N}\cdot\text{s}$ momentum in 0.05 s is

A. 500 N

B. 125 N

C. 50 N

D. 25 N

Answer: A



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41. In deriving Newton's formula for velocity of sound, the changes in volume of air are assumed to be

A. Isobaric

B. Adiabatic

C. Isothermal

D. Isochoric

Answer: C



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