PHYSICS

BOOKS - R G PUBLICATION

FORCE AND LAWS OF MOTION

Example

1. Which of the following has more inertia: a rubber ball or a stone of the same size?

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2. Which of the following has more inertia: a bicyle and a train?

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3. Which of the following has more inertia: a five rupees coin and a one- rupee coin?

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4. Explain why some of the leaves may get detached from a tree if we vigorously shake its branch.

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5. Why do you fall in the forward direction when a moving bus brakes to a stop and fall backwards when it accelerates from rest?

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6. If action is always equal to the reaction, explain how a horse can pull a cart.

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7. Explain, why is it difficult for a fireman to hold a hose, which ejects large amounts of water at a high velocity.

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8. From a rifle mass 4kg a bullet of mass 50g is fired with an initia, velocity of $35ms^{-1}$. Calculate the initial recoil velocity of the rifle.

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9. Two objects of masses 100 g and 200 g are moving along the same line and direction with velocities of 2 m/s and 1 m/s, respectively. They collide and after the collision, the first object

moves at a velocity of 1.67 m/s. Determine the velocity of the second object.

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10. When a carpet is beaten with a stick, dust comes out of it. Explain.

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11. Why is it advised to tie any luggage kept on the roof of a bus with a rope?

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12. A batsman hits a cricket ball which then rolls on a level ground. After covering a - short distance, the ball comes to rest, the ball slows to a stop because

A. (a) the batsman did not hit the ball hard enough

B. (b) velocity is proportional to the force exerted on the ball.

C. (c) there is a force on the ball opposing the motion.

D. (d) there is no unbalanced force on the ball, so the ball would want to come to rest.

Answer:

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13. A truck starts from rest and rolls down a hill with a constant acceleration. It travels a distance of 400 m in 20 s. Find its.acceleration. Find the force acting on it if its mass is 7 tonnes (Hint: 1 tonne = 1000 kg.)

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14. A stone of 1 kg is thrown with a velocity of $20ms^{-1}$ across the frozen surface of a lake and comes to rest after travelling a distance of

50 m. What is the force of friction between the stone and the ice?

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15. A 8000kg engine pulls a train of 5 wagons, each of 2000kg, along a horizontal track. If the engine exerts a force of 40000N and the track offers a friction force of 5000N, then calculate the net accelerating force.

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16. A 8000 kg engine pulls a train of 5 wagons, each of 2000 kg, along a horizontal track. If the engine exerts a force of 40000 N and the track offers a friction force of 5000 N, then calculate : the acceleration of the train.

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17. A 8000 kg engine pulls a train of 5 wagons, each of 2000 kg, along a horizontal track. If the engine exerts a force of 40000 N and the

track offers a friction force of 5000 N, then calculate : the force of wagon 1 on wagon 2.

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18. An automobile vehicle has a mass of 1500 kg. What must be the force between the vehicle and road if the vehicle is to be stopped with a negative acceleration of $1.7ms^{-2}$?

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19. What is the momentum ?

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20. What is the momentum ?

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21. Using a horizontal force of 200 N, we intend to move a wooden cabinet across a floor at a constant velocity. What is the

frictional force that will be exerted on the cabinet?

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22. Two objects, each of mass 1.5 kg, are moving in the same straight line but in opposite directions. The velocity of each object is $2.5ms^{-1}$ before the collision during which they stick together. What will be the velocity of the combined object after collision?

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23. A hockey ball of mass 200 g travelling at $10ms^{-1}$ is struck by a hockey stick so as to return it along its original path with a velocity at $5ms^{1}$. Calculate the change of momentum occured in the motion of hockey ball by the force applied by the hockey stick.

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24. A bullet of mass 10 g travelling horizontally with a velocity of $150ms^{-1}$ strikes a stationary

wooden block and comes to rest in 0.03 s. Calculate the distance of penetration of the bullet into the block.

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25. A bullet of mass 10 g travelling horizontally with a velocity of $150ms^{-1}$ strikes a stationary wooden block and comes to rest in 0.03 s. Calculate the force exerted by the wooden block

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26. An object of mass 100 kg is accelerated uniformly from a velocity of $5ms^{-1}$ to $8ms^{-1}$ in 6 s. Calculate the initial and final momentum of the object. Also, find the magnitude of the force exerted on the object.

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27. How much momentum will a dumb-bell of mass 10 kg transfer to the floor if it falls from

a height of 80 cm? Take its downward acceleration to be $10ms^{-2}$.

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28. The following is the distance-time table of an object in motion:

Time in seconds	Distance in metres
0	0
1	1
2	8
3	27
4	64
5	125
6	216
7	343

What conclusion can you draw about the

acceleration? Is ti constant, increasing, decreasing, or zero?

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29. The following is the distance-time table of an object in motion:

Time in seconds	Distance in metres
0	0
1	1
2	8
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4	64
5	125
6	216
7	343

What do you infer about the forces acting on the object?

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30. Two persons manage to push a motorcar of mass 1200 kg at a uniform velocity along a level road, the same motorcar can be pushed by three persons to produce an acceleration of $0.2ms^{-2}$. With what force does each person push the motorcar? (Assume that all persons push the motorcar with the same muscular effort.)

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31. A hammer of mass 500 g, moving at $50ms^{-1}$, strikes a nail. The nail stops the hammer in a very short time of 0.01 s. What is the force of the nail on the hammer?

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32. A motorcar of mass 1200 kg is moving along a straight line with a uniform velocity of 90 km/h. Its velocity is slowed down to 18 km/h in 4 s by an unbalanced external force.

Calculate the acceleration and change in momentum. Also calculate the magnitude of the force required.

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33. If the masses of two bodes A and B are 5 kg and 10 kg respectively, then which one of the following is true?

A. Inertia of A is greater than that of B.

B. Inertia of B is greater than that of A.

C. Inertia of A and B are equal

D. Neither A nor B has any inertia.

Answer:

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34. When there is acceleration in a body:

A. Its speed always increases

B. Its velocity always increases

C. Its direction always changes

D. None of the above

Answer:

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35. If the mass of body and the force acting on it are known, then from Newton's laws of motion, we can get :

A. the weight of the body

B. the velocity of the body

C. the acceleration of the body.

D. None of the above

Answer:

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36. If a force of 2 Newton is applied on a body of mass 2 kilogram,

A. the velocity of the body will be 1 meter.sec.

B. the acceleration of the body will be $1 meter / \sec^2$

C. the velocity of the body will be 1 kilogram/sec

D. None of the above

Answer:

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37. Which has the unit kg m/s

A. Momentum

B. Force

C. acceleration

D. Velocity

Answer:

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38. Which one is unit fo force?

A. g m/s

B. kg m/s

C. kgm/s^2

D. m/s^2

Answer:

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39. Which relation is correct?

A. acceleration = Force x mass

B. mass = acceleration x force

C. mass = acceleration/force

D. Force = mass x acceleration

Answer:

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40. Which does not change under the action of force

A. mass of a body

B. velocity of a body

C. direction of motion of a body

D. shape of a body

Answer:

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41. What is the relation for momentum if mass of a body is m and velocity is v

A. $\frac{m}{v}$

B. $\frac{v}{m}$

C. mv

D. m^2v^2

Answer:

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42. Two froces F_1 and F_2 act on two bodies of mass m_1 and m_2 respectively and produce acceleration a_1 and a_2. If $F_1 = F_2$ and $m_1 < m_2$ then which one is correct?

A. $a_1 > a_2$

B. $a_1 < a_2$

C. $a_1 = a_2$

D. $\frac{a_1}{a_2} < 1$

Answer:

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43. Write Newton's first law.

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44. What is inertia?

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45. On which inertia of a body depends?

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46. Which law of motion is known as law of inertia?

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47. What type of inertia are there? What are they?

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48. What is inertia of rest?

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49. What is inertia of motion?

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50. Write Newton's second law of motion.

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51. What is momentum ? What is its unit ?

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52. What is the S.I unit of momentum?

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53. What is the C.G.S. unit of momentum?

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54. Is momentum a scalar quantity?

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55. There is a tennis ball and a cricket ball of equal volume. Which one has greater inertia and why?

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56. What is the S.I. unit of force?

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57. Define 1 Newton.

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58. Write Newton's 3rd Law of motion.

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59. Write the law of conservation of momentum.

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60. What is balanced force?

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61. What is unbalanced force?

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62. Force can change the velocity of a body. Give one example.

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63. Force can change the direction of motion of a body. Give one example.

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64. Force can change the shape of body. Give one example.

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65. The force which causes only change in shape of a body does not cause motion in the body is balanced or unbalanced?

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66. What are the conditions under which a body can stay in a state of rest.

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67. Which force opposes motion when a body is being pulled or pushed?

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68. What type of forces-balanced or unbalanced-act on a rubber ball when we press it between our hands?

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69. When pedalling is stopped the velocity of a bicyle in motion gradually decreases. Why?

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70. Under what condition a moving body will continue to be in the state of motion even when no unbalanced force acts on it?

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71. Describe the effect on passenger when a moving bus suddenly changes its direction of motion.

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72. What is the relation between applied force and momentum produced in a body?

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73. What do you mean by conservation of momentum?

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74. When a, bullet leave a gun, the gun presses on the shoulder of the person firing the gun. Explain why.

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75. When a Carpet is beaten with a stick, dust comes out of it. Explain

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76. If the mass of a body is halved and its velocity doubled, its momentum will not change. Explain.

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77. A five-rupee coin is put on a thick smooth card and place it on a glass tumbler. Now flick the card horizontally striking it hard with your finger at one of its corners. Explain what you observe.

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78. Why is it dangerous to jump out of a moving bus?

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79. Mention three effects of force on a body.

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80. Prove that F = ma

Where, F $\rightarrow$ applied force

m $\rightarrow$ of the body

a $\rightarrow$ acceleration produced in the body.

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81. Prove the law of conservation of momentum.

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82. Forces F_1 and F_2 and applied on two bodies of mass m each. The acceleration produced in them are a and 2a respectively. Find the relation between F_1 and F_2

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83. A body of mass 150 kg is moving with a velocity 20 m/s and it takes 5 sec. to stop after the brakes are applied. Find the.acceleration and applied force.

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84. The mass, of a body at rest is 3 kg. How much force has to be applied on it so that after 2 seconds its velocity may become 40 m/sec?

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85. For how long a force of 100 Newton has to be applied on a body at rest of mass 20kg so that its velocity becomes 100 m/sec?

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86. If a force of 30 Newton is applied on a body of mass 15 kg. What will be its acceleration?

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87. A body of mass 10 kg is moving with a velocity 10/sec. When a force is applied on it, after 25 seconds its velocity become 30m/sec. Find the magnitude of the force applied.

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88. The velocity of a motor car of mass 120 kg in increased from 36km/ hour to 72 km/hour. Find the change in momentum.

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89. A ball of mass 150 gm is thrown vertically upward with a velocity of 10m/sec. What is its initial momentum?

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90. A ball of mass 150 gm is thrown vertically upward with a velocity of 10m/sec. What is the momentum at its highest point of ascend?

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91. What is the momentum of a body of mass 10kg when it is at rest?

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92. An acceleration fo $5m/s^2$ is produced by applying a force of 50 N on a body. Find the mass of the body.

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93. Find the force needed to produce an acceleration of 6 m/s2 in a ball of mass 4kg.

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94. Two forces of 40 Newton and 72 Newton are applied separately on a body of mass 8 kg. Find the acceleration produced in each case.

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95. A force of 10 N is applied to a body at rest for 3 sec. The velocity of the body becomes 2 m/s. Find the mass of the body.

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96. A scooter of mass 75 kg is moving with a.Velocity 72 km/h. Calculate the force necessary to stop the scooter at a distance of 100 m.

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97. A body of mass 15 kg is moving with a velocity 20 m/s. Calculate the distance travelled by the body before stopping, if a force of 30 N is applied on the body in the direction opposite to the direction of motion.

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98. A body of mass 2kg moving with velocity 10 m/s collides another body of mass 500 g and moving with velocity 4 m/s. After collision if

the 2nd body attains velocity of 8m/s, what will be the velocity of first body?

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