



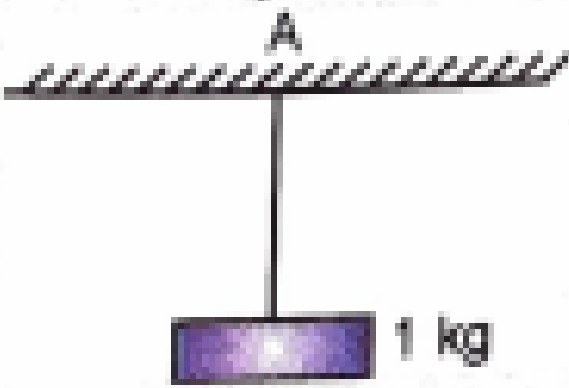
PHYSICS

BOOKS - MODERN PUBLICATION

FORCE AND LAWS OF MOTION

Exercise

1. A mass of 1 is tied to a string as shown in the figure. Find.



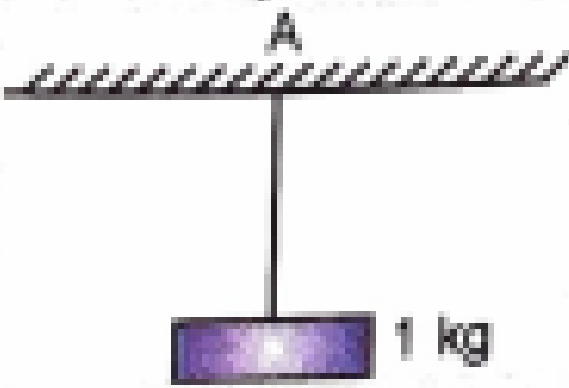
the

force exerted on the mass by the Earth.



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2. A mass of 1 is tied to a string as shown in the figure. Find.



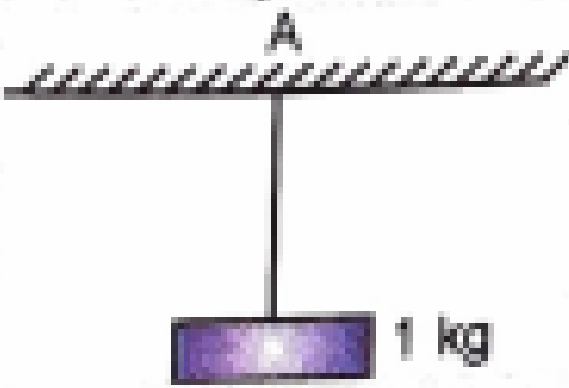
the

force exerted by the mass on the string.



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3. A mass of 1 is tied to a string as shown in the figure. Find.



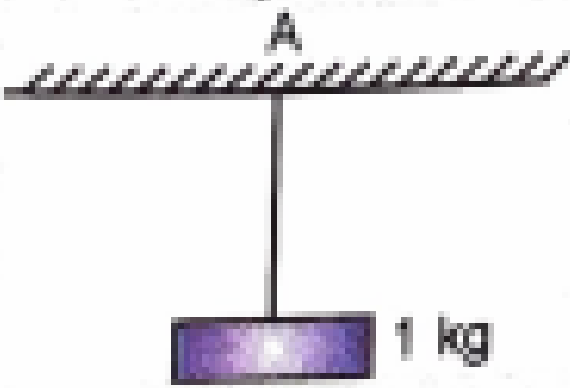
the

force exerted by the string on the mass.



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4. A mass of 1 is tied to a string as shown in the figure. Find.



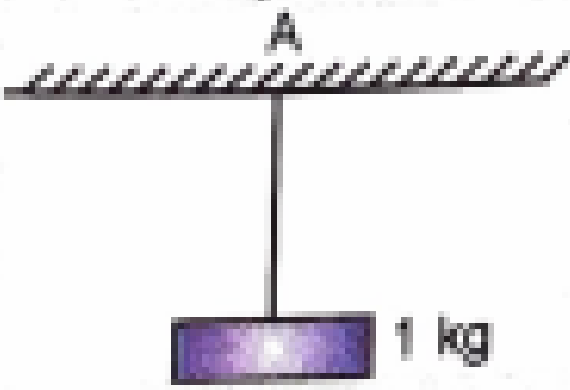
the

force exerted by the string on the support at
A.



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5. A mass of 1 is tied to a string as shown in the figure. Find.



the
force exerted by the rigid support on the
string.

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6. If an unbalanced force acts on a body, the
body must accelerate.

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7. If balanced force acts on a body, the body must be at rest.



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8. A body moves with a constant speed of 5 m/s. This shows that balanced forces are acting on the body.



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9. _____ causes acceleration in a body.



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10. A body in motion will remain in _____
if balanced force acts on it.(Uniform
motion/Retardation).



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11. Define Resultant force . Give an example for each



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12. Define Balanced forces. Give an example of each



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13. Define Unbalanced force . Give an example of each



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14. When a carpet is beaten with a stick, the dust comes out of it ? Explain.



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15. Galileo's experiments show that a constant unbalanced force is required to keep a body moving in uniform motion.



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16. Newton's first law and Galileo's law of inertia have the same meaning.



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17. When you apply a force on a body, it must move.



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18. A heavier body has less inertia.



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19. A body is said to be in uniform motion when its _____ remains constant.



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20. Resistance to change in the state of motion is called _____.



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21. A long jumper runs for a while before taking long jump so that the inertia of _____ helps him in taking a long jump.



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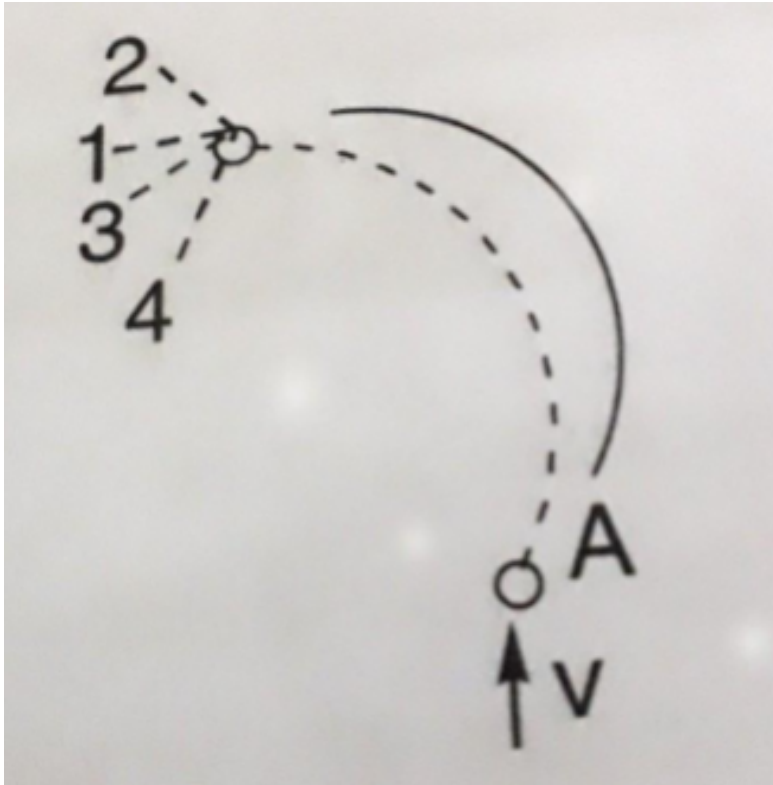
22. Which of the following has more inertia :
rubber ball and a stone of the same size ?



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23. A ball is given some velocity at a and moves along a semicircular ring fixed on a smooth horizontal table the dotted line shows the path of the marble.the marble will leave the ring in which direction 1,2 or 3 the marble will

leave the ring?



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24. Describe Galileo's experiment. What was the result of this experiment?



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25. Define Newton's first law



Watch Video Solution

26. Define Inertia.



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27. Give two examples each of Inertia of rest



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28. Give two examples each of Inertia of motion.



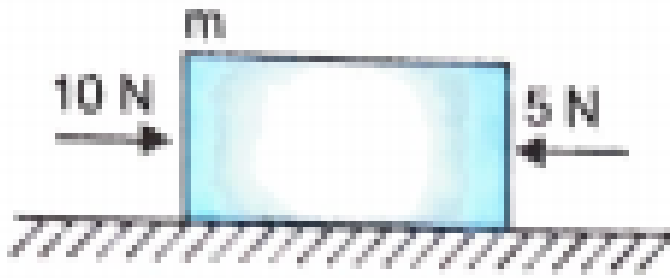
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29. Give two examples each of Inertia of direction.



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30. Two forces are applied on a block of mass $m = 2 \text{ kg}$. How much force should be applied and in which direction to produce an acceleration of $1 \text{ m} / \text{s}^2$. The surface is smooth.



towards

right?



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31. Linear momentum does not have direction

(True of False).



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32. Dyne is a unit of _____ in _____ system of units.



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33. $1\text{N} = \text{_____ dyne.}$



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34. $1\text{ kgf} = \text{_____ N.}$



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35. $p = m \times$ _____.



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36. The direction of acceleration is same as that of _____.



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37. The direction of linear momentum is same as that of _____.



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38. A body moves with constant velocity of 20ms^{-1} . The mass of body is 2 kg. The unbalanced force acting on the body is _____.



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39. Define linear momentum. Write its formula. Give its SI unit. Is it a scalar or a vector quantity?



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40. What is Newton's second law of motion? How can the force be measured using second law of motion?



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41. Why a cricket player lowers his hand while taking of catch of cricket ball ?



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42. A constant force of 15 N acts on a body of mass 5 kg. Find the acceleration produced.



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43. What force is required to produce an acceleration of $2ms^{-2}$ on a body of mass 10

kg?



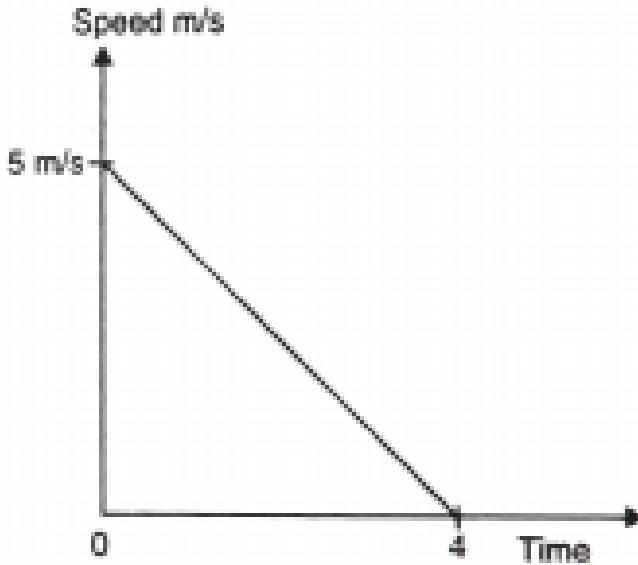
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44. A car is moving with a velocity of 72km/h . By applying brakes a negative acceleration of 0.4m/s^2 is produced. the distance covered by the car before it stops?



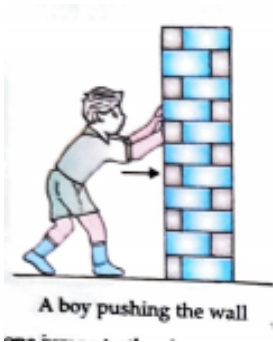
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45. The graph shows the retardation of a car of mass 1000 kg. Find the retarding force.



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46. A body is standing on a horizontal surface wearing skates. What will the boy experience if he pushes the wall?



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47. If someone jumps to the shore from a boat, the boat moves in opposite direction. Explain

why.



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48. Explain why is it difficult for a fire man to hold a hose, which ejects large amount of water at a high velocity



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49. If the earth attracts a body with a force of 20 N what force is exerted on the earth by the

body?



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50. Action and reaction act on the same body.

(T or F)



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51. Any two forces which are equal and opposite an action-reaction pair. (T or F).



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52. $a \propto \frac{1}{m}$ when _____ is constant.



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53. An isolated force is _____.

(possible/impossible)



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54. Action and reaction are _____ and _____ and act on _____ bodies.



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55. What is Newton's third law? Give some example where this law can be applied.



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56. A large truck and a car, both moving with a velocity of magnitude v , have a head-on collision after which both of them come to a halt. Which vehicle experience the greater force of impact?



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57. A large truck and a car, both moving with a velocity of magnitude v , have a head-on collision after which both of them come to a

halt. Which vehicle experiences the greater momentum change?



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58. A large truck and a car, both moving with a velocity of magnitude v , have a head-on collision after which both of them come to a halt. Which is vehicle experiences the greater acceleration?



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59. A large truck and a car, both moving with a velocity of magnitude ' V ' have a head-on collision and both of them come to a halt after that. If the collision lasts for 1 s:

Why is the car likely to suffer more damage than the truck?



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60. Newton's laws are universal. (T or F).



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61. Conservation of linear momentum for a system is applicable only when the external forces acting on a system are zero. (T or F).



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62. Internal forces are the forces which bodies exert on each other when the bodies are a part of the system.



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63. External forces are the which act from outside the system. (T or F)



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64. Linear momentum has _____ and _____.



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65. Conservation of linear momentum means that initial momentum is _____ to the final momentum.



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66. Body A collides with a body B. A exerts a 10 N on B. The force which B exerts on A is.



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67. What do we mean by conservation of linear momentum. Under what conditions do we apply this connect.



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68. Give two examples where conservation of momentum can be applied?



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69. A 15 g bullet is fired from a gun of mass 3 kg speed of bullet just after firing is 300m.s^{-1} .

The recoil speed of gun.



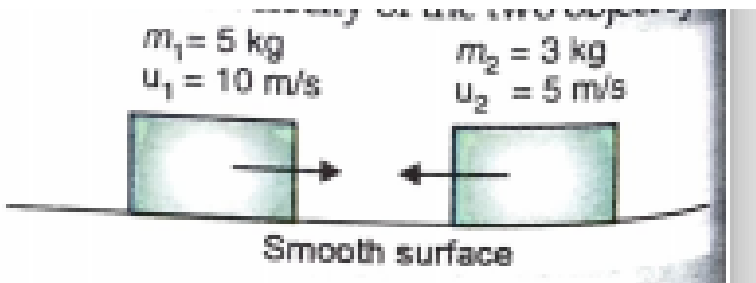
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70. An empty rail car of mass 100 kg is at rest railway track. A boy of mass 40 kg running speed of 5m/s jumps on the rail car. The speed (car + boy) system is how much?



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71. The initial situation of two moving objects is the the figure. Suppose, after collision the two object. What will be the velocity of the two object system.



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72. A bullet of mass 20 g is fired horizontally with a velocity of 100m.s^{-1} from a pistol of mass 1.5 kg. Calculate the recoil velocity of the pistol.



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73. A boy of mass 50 kg running at 5m.s^{-1} jumping a trolley of 20 kg travelling in the same direction 1.5m.s^{-1} . Find their common velocity.



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74. Newton's second law gives the measure of

A. acceleration

B. force

C. momentum

D. displacement

Answer:



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75. Swimming can be explained by

A. Newton's law of gravitation

B. First law of motion

C. second law of motion

D. Third law of motion

Answer:



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76. Which has more inertia

A. a pencil

B. a book

C. your friend

D. a car

Answer:



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77. The principle of conservation of linear momentum states that the linear momentum of a system

A. can be changed by internal forces.

B. can be changed by internal forces

C. can be changed only when internal force is extremely high

D. always remains conserved.

Answer:





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78. Weight of a body due to the Earth acts

A. vertically downwards

B. vertically upwards

C. horizontal

D. in any direction

Answer:



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79. A body is said to be in equilibrium

- A. if odd number of forces are acting on it
- B. even number of forces are acting on it
- C. if its speed is constant
- D. if its acceleration is zero

Answer:



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80. Frictional force

A. always oppose motion of a body

B. always opposes relative motion between
the surfaces of contact

C. always in the opposite direction of
motion

D. always in the direction of motion

Answer:



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81. An athlete runs some distance before taking a long jump. This is because

A. his body warms up

B. his potential energy increases

C. he loves running.

D. the run before jump helps him take a longer jump due to inertia of motion

Answer:



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82. A force is known completely by knowing its

A. magnitude only

B. direction only

C. magnitude and direction

D. none

Answer:



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83. A unit of force is

A. joule

B. joule-m

C. Newton-m

D. kg f

Answer:



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84. The physical quantity which is equal to the rate of change of momentum is

A. impulse

B. energy

C. force

D. velocity

Answer:



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85. The action-reaction forces

- A. act on same bodies
- B. act in the same direction
- C. act on different bodies
- D. cancel out the affect of each other

Answer:



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

A. using oil between contact surfaces

B. Using grease between contact surfaces

C. Using ball-bearing

D. Making scratches on the contact surfaces

Answer:



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87. Impulse is

A. $F \text{ or } ce \times \text{Distance}$

B. $\frac{F \text{ or } ce}{\text{Time}}$

C. $\frac{f \text{ or } ce}{\text{Distance}}$

D. Change in momentum

Answer:



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88. A constant retarding force of 50 N is applied to a body of mass 20 kg moving initially with a speed of 15ms^{-1} . How long does the body take to stop ?

A. 300 kg-m

B. 300 kg-s

C. 300kgms^{-1}

D. None

Answer:



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89. A body of mass 5 kg moving with a velocity 10 m/s collides with another body of the mass 20 kg at rest, and comes to rest. The velocity of the second body due to collision is

A. 1m/s

B. 2m/s

C. 0.5 m/s

D. Can't say

Answer:



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90. Engine of a car can produce a maximum acceleration $2m/s^2$ and its brakes can produce a maximum retardation $3m/s^2$. Minimum time in which the car can travel a distance 6 km is:

A. $120s$

B. $100s$

C. 80s

D. none

Answer:



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91. Two bodies of masses 1 kg and 5 kg are dropped gently from the top of a tower. At a point 20 cm from the ground, both the bodies will have the same

A. momentum

B. kinetic energy

C. velocity

D. total energy

Answer:



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92. The passenger feels a jerk forward when a bus moving at a high speed suddenly stops.

This happens due to

A. inertia of passenger

B. inertia of bus

C. gravitational pull of the Earth

D. none

Answer:



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93. Water drops fall at regular intervals from a tap 5 m above the ground. The third drop is leaving the tap, the instant the first drop

touches the ground. How far above the ground is the second drop at that instant.

$$(g = 10ms^{-2})$$

A. 1.25 m

B. 2.5 m

C. 3.75 m

D. 4.0 m

Answer:



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94. A body is released from a great height and falls freely towards the earth. Exactly one sec later another body is released. What is the distance between the two bodies 2 sec after the release of the second body ?

A. 48 m

B. 9.8 m

C. 24.5m

D. 50 m

Answer:





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95. Essential characteristic of equilibrium is

- A. momentum equals zero
- B. acceleration equals zero
- C. kinetic energy equals zero
- D. none

Answer:



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96. Is force a scalar quantity? Why?



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97. Define a contact force.



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98. Give an example of non-contact force.



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99. What is a resultant force?



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100. Define force from Newton's first law of motion.



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101. Define Inertia.



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102. What is the measure of inertia of a body?



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103. Define linear momentum. Write its formula. Give its SI unit. Is it a scalar or a vector quantity?



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104. What is the direction of linear momentum?



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105. What is the SI unit of linear momentum?



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106. What is Newton's second law?



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107. Define one newton.



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108. What is the direction of acceleration?



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109. State and explain Newton's third Law of motion.



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110. An apple falls towards the earth due to attraction of the earth. Does apple also attract the earth.



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111. What is a system?



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112. What is head-on collision?



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113. List two effects of force.



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114. A moving body comes to stop without an application of force. Comment.



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115. Write differences between balanced and unbalanced forces.



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116. Give two examples each of Inertia of rest



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117. An athlete runs some distance before taking a long jump. This is because



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118. What are the S.I. and C.G.S units of force?
Give a relationship between them.



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119. Which physical quantity has unit kg-f? Give its relationship with the S.I unit of that physical quantity?



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120. What is the general name given to the force which do not produce motion in a body but only change its shape.



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121. If the velocity of a body is doubled, how much should the mass be reduced so that the linear momentum remains the same? Explain.



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122. Name the principle on which a rocket works.



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123. Sparks fly off tangentially when a knife is rubbed on a hard rotating disc. How can account for .



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124. In a tug of war, two teams are pulling the rope that the ribbon of the rope is not moving. The magnitude of the resultant force on the . Explain.



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125. A person is holding a briefcase. Draw the acting on the briefcase when the briefcase is at rest



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126. It is difficult to balance our body when we accidentally on a peel of banana. Explain why?



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127. Explain why:- a cricketer moves his hands backwards while holding a catch.



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128. Discuss the effects a force can produce.



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



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130. Why are accidents at high speeds more fatal accidents at low speeds?



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131. If the mouth of an inflated ballon is untied, will you observe? Explain your observation.



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132. Why is it difficult to walk on slippery road?



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133. What is the relationship between mass and inertia. Discuss.



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134. Why does a boxer move his head backwards his opponent blows a punch?





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135. What do we mean by conservation of linear momentum. Under what conditions do we apply this connect.



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136. What are internal and external forces?



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137. "Forces always occur in pair". From which do we conclude the above statement. Give examples to support your answer.



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138. Action and reaction are equal and opposite their resultant is not zero. Explain.



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139. Place a waterfilled tumbler on a tray. Hold the and turn around as fast as you can. WE observed the water spills. Why?



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140. Two friends on roller-skates are standing 5m apart facing eachother. One of them throws a ball of 2kg towards the other, who catches it. How will this activity affect the position of the two? Explain your answer.





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141. State the action and reaction in the following moving rocket.



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142. State the action and reaction in the following firing of a bullet from a gun.



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143. State the action and reaction in the following a person walking on the floor.



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144. Describe the experiment of Galileo and what conclusion can be drawn from that experiment.



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145. Give two examples each of Inertia of rest



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146. Give two examples each of Inertia of motion.



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147. Give two examples each of Inertia of direction.



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148. Prove the conservation of linear momentum for a head-on collision of two bodies with the help of Newton's second law.



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149. A car of mass 1000 kg moving with a velocity of 36 km/h comes to rest in 5 seconds.

What is the force exerted on the car?



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150. What will be the acceleration of a body of mass 5 kg if a force of 200 N is applied on it?



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151. m_1 and m_2 are the masses of two bodies.

When a force of 5 N is applied on each body,

m_1 gets an acceleration of

$10m/s^2$ and $m_2, 20m/s^2$. If the two bodies

are tied together and the same force is

applied, find the acceleration of the combined

system.



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152. A bomb of mass 0.5 kg kept at rest, explodes, one part of mass 0.2 kg moves towards east with a velocity of 10 m/s . What is the speed and direction of the other part?



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153. A car of mass 1000 kg starts from rest and comes down an inclined slope. If it travels a

distance of 300 m in 30 seconds, calculate acceleration



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154. A car of mass 1000 kg starts from rest and comes down an inclined slope. If it travels a distance of 300 m in 30 seconds, calculate force acting on the bus



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155. A bullet of mass 60 g is fired from a gun of mass 10 kg with a velocity of 60 m/s. Calculate the velocity of recoil of the gun.



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156. Find the acceleration of 3 kg mass when acceleration of 30 kg mass is $3ms^{-2}$



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157. A force of 7 kg-wt acts on a body of mass 9.8 kg. Calculate the acceleration produced.



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158. The quantity of motion contained in a body is 50 kg m/s. If the body moves with a speed of 5m/s. What is the mass of the body?



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159. A 2 metric ton body is moving with a velocity of 54kmh^{-1} . Find the change in momentum of the body when it stops. If it stops in 15 seconds, calculate the retarding force.



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160. Which of the following statement is not correct for an object moving along a straight path in an accelerated motion?

- A. Its speed keeps changing
- B. Its velocity always changes
- C. It always goes away from the earth
- D. A force is always acting on it.

Answer:



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161. According to the third law of motion, action and reaction

A. always act on the same body

B. always act on different bodies in
opposite directions

C. have same magnitude and directions

D. act on either body at normal to each
other.

Answer:



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162. A goalkeeper in football game pulls his hands backwards after holding the ball shot at the goal. This enables the goal keeper to

A. exert larger force on the ball

B. reduce the force exerted by the ball on hands

C. increase the rate of change of momentum

D. decrease the rate of change of momentum

Answer:



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163. The inertia of an object tends to cause the object

A. to increase its speed

B. to decrease its speed

C. to resist any change in its state of motion

D. to decelerate due to friction

Answer:



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164. A passenger in a moving train tosses a coin which falls behind him. It means that motion of the train is

A. accelerated

B. uniform

C. retarded

D. along circular tracks

Answer:



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165. An object of mass 2kg is sliding with a constant velocity of 4ms^{-1} on a frictionless horizontal table. The force required to keep the object moving with the same velocity is

A. 32 N

B. 0 N

C. 2 N

D. 8 N

Answer:



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166. Rocket works on the principle of conservatin of:

A. mass

B. energy

C. momentum

D. velocity

Answer:



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167. A water tanker filled up to $\frac{2}{3}$ of its height is moving with a uniform speed. On sudden

application of the brake, the water in the tank would

- A. move backward
- B. move forward
- C. be unaffected rise upwards
- D.

Answer:



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168. A force acting on a object of mass 500 gm changes its speed from 200 cm/s to 0.2 m/s.

The change in momentum is

- A. increased by 0.90 Ns
- B. decreased by 0.90 Ns
- C. increased by 1.8 Ns
- D. decreased by 1.8 Ns

Answer:



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169. A body of mass 2 kg is moving on a smooth floor in straight line with a uniform velocity of 10 m/s. Resultant force action on the body is

A. 20N

B. 10 N

C. 2N

D. zero

Answer:



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170. In which of the following cases the net force is NOT zero?

- A. A kite skillfully held stationary in the sky
- B. A ball freely falling from a height
- C. An aeroplane rising upwards at an angle of 45° with the horizontal with a constant speed
- D. A cork floating on the surface of water

Answer:



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171. Two stones of masses in the ratio of 3:4 fall from heights in ratio 4:9. The ratio of their momenta on reaching the ground is

A. 1

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

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

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

Answer:



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172. The average resisting force that must act on a 5 kg mass to reduce its speed from 65cm s^{-1} in 0.15m s^{-1} in 0.2 sec is

A. 12.5N

B. 25 N

C. 50 N

D. 100 N

Answer:



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173. A cricket catches a ball of mass 150 g in 0.1 s moving with a speed of 20ms^{-1} . Then the experiences a force of

A. 300 N

B. 30 N

C. 3 N

D. 0.3 N

Answer:



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174. A bullet of mass 0.1 kg is fired with the speed of 100ms^{-1} , the mass of the gun being 50 kg. The velocity of recoil is

A. 0.05ms^{-1}

B. 0.5ms^{-1}

C. 0.2ms^{-1}

D. 0.1ms^{-1}

Answer:



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175. Swimming is based on the principle of

- A. Newton's 1st law
- B. Newton's 2nd law
- C. Newton's 3rd law
- D. none

Answer:



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176. A force of 100 N acts on a body of 2 kg for 10s. The change in momentum of the body is

A. 10 N-s

B. 200 N-s

C. 500N-s

D. 1000 N-s

Answer:



177. Identify the equivalent of 1N

A. 10^9 dyne

B. 10^7 dyne

C. 10^5 dyne

D. 10^{11} dyne

Answer:



178. A bullet of mass 100 g is fired from a gun of 20 kg with a velocity of 100ms^{-1} . Identify the velocity of the recoil of gun

A. -0.5ms^{-1}

B. 0.1ms^{-1}

C. -0.15ms^{-1}

D. -0.2ms^{-1}

Answer:



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179. A machine gun of mass 10 kg fires 20 g bullets at the rate of 10 bullets per second with a speed of 500ms^{-1} . What force is required to hold the gun in position ?

A. 100 N

B. 12.5N

C. 50 N

D. 75 N

Answer:



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180. The acceleration of a particle is plotted on the Y-axis while the time(t) elapsed is plotted along the X-axis. What does the a - t graph give?

- A. The distance covered
- B. The difference in velocities
- C. The difference in acceleration
- D. The difference in force

Answer:



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181. A force of 20 N acting on a body of mass 10 kg is found to double its velocity in 8 s. Find its initial velocity

A. 4 m/s

B. 8 m/s

C. 32 m/s

D. 16 m/s

Answer:



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182. What is the impact of balanced forces on an initially stationary object?

- A. The object remains at rest
- B. The object moves with uniform speed
- C. The object moves in the direction of frictional force acting on it

D. The object moves in a direction perpendicular to the surface of contact.

Answer:



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183. A rocket burns 0.4 kg of fuel per second ejecting it as gases with a velocity of 8 km s^{-1} relative to the rocket . How much force is exerted on the rocket ?

A. $2 \times 10^4 N$

B. 50N

C. 32kN

D. 3.2 kN

Answer:



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184. Define the term force.



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185. On what factors does inertia depend?



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186. Why is landing pit in the long jump event made loose with a bed of sand?



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187. When are the forces acting on a body said to be balanced? Give an example. What type of

change can balanced forces bring about in an object?



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188. Out of two bodies of masses 10 kg and 50 kg, which one has more inertia? Also calculate the ratio of the inertia of the two bodies.



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189. Why is no force required to move an object which is in motion with a constant velocity?



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190. A cricket player lowers his hands while catching a fast moving ball. Explain why?



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191. Two similar buses are moving with the same velocity on the road. One of them is empty and the other is with passengers. Which of the two will be stopped by the application of lesser force? Explain why?



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192. Although action and reaction are equal and opposite they do not cancel each other. Explain why?





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193. A girl of mass 50 kg jumps out of a boat of mass 300 kg with horizontal velocity of 3ms^{-1} . With what velocity does the boat begin to move backwards?



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194. State and verify law of conservation of momentum.



[Watch Video Solution](#)

195. The physical quantity which is the product of mass and velocity of a body known as

- A. inertia
- B. Momentum
- C. Force
- D. None

Answer:



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196. The linear momentum of an object of mass 2 kg is $10 \text{ kg } ms^{-1}$. The velocity of the object is

A. $2ms^{-1}$

B. $20s^{-1}$

C. $5ms^{-1}$

D. $10ms^{-1}$

Answer:



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197. While doing an experiment to find the relationship between the weight of a rectangular wooden block lying on a horizontal table and the minimum force requirement to just move it using a spring balance, it is observed that

- A. more the inertia lesser is the force
- B. lesser the inertia more is the force
- C. more the inertia more is the force

D. no relationship between inertia and force.

Answer:



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198. Forces acting on a body are said to be balanced if

A. sum of forces is zero

B. direction of forces is the same

C. magnitude and direction of force is same

D. gravitational force acts on it

Answer:



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Example

1. A motorcycle is moving with a velocity of 90 km//h and it takes 5 second to stop after the

brakers are applied. Calculate the force exerted by the brakers on the motorcycle if its mass alongwith the rider is 200 kg



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2. A cricket ball of mass 0.2 kg moves with a velocity of 20 m/s and is brought to rest by a player in 0.1 s. Calculate the impulse of the ball and average force applied by the player.



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3. A constant force of 5N is applied continuously on a body of mass 10kg for 4 seconds. The body moves 800cm along a straight line. What is the velocity of the body when the force was applied initially?



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4. A bullet of mass 25 g moving with a speed of 100 m/s pierces a bag full of sand kept adjacent to a wall. The bullet stops in the bag

after 0.05 second. Find The acceleration of the bullet (assuming uniform).



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5. A bullet of mass 25 g moving with a speed of 100 m/s pierces a bag full of sand kept adjacent to a wall. The bullet stops in the bag after 0.05 second. Find The force exerted by the sandbag on the bullet.



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6. A bullet of mass 25 g moving with a speed of 100 m/s pierces a bag full of sand kept adjacent to a wall. The bullet stops in the bag after 0.05 second. Find The acceleration of the bullet (assuming uniform).



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7. A body of mass 25 kg is dragged on a horizontal rough road with a constant speed of 20kmh^{-1} . If the coefficient of friction is 0.5, find the heat generated in one hour. If 50% of

the heat is absorbed by the body, find the rise in temperature. Specific heat of the material of the body is $0.1 \text{ cal g}^{-1} \cdot ^\circ \text{C}^{-1}$.



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8. The velocity-time graph of a ball moving on a horizontal surface is shown in the diagram. The mass of the ball is 30 g. Calculate the force acting on the ball.



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9. Which would require a greater force-accelerating a 2 kg mass at $5ms^{-2}$ or a 4 kg mass at $2ms^{-2}$?



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10. A force of 5N gives a mass m_1 , an acceleration of $10m/s^2$, and a mass m_2 , an acceleration of $20m/s^2$. What acceleration would it give if both the masses were tied together?



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11. A motorcar of mass 1200 kg is moving along a straight line with a uniform velocity of 90km/h. its velocity is slowed down to 18 km/h in 4 seconds by an unbalanced external force. Calculate the acceleration and change in momentum . Also calculate the magnitude of the force required.



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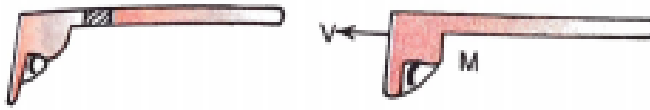
12. A constant force acts on object of mass 5 kg for a duration of 2s It increases the object's velocity from 3m/s to 7m/s Find the magnitude of the applied force. Now if the force were applied for a duration of 5s what would be the final velocity of object?



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13. A rifle of mass 3 kg fires a bullet of mass 0.03 kg. The bullet leaves the barrel of the rifle

at a velocity of 100 m/s. If the bullet takes 0.003 second to move out of the barrel, calculate the force experienced by the rifle due to its recoil.



Initially

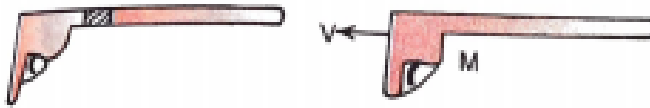
rifle+Bullet system at rest



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14. A rifle of mass 3 kg fires a bullet of mass 0.03 kg. The bullet leaves the barrel of the rifle at a velocity of 100 m/s. If the bullet takes

0.003 second to move out of the barrel, calculate the force experienced by the rifle due to its recoil.



Bullet

fired from the rifle



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15. A bullet of mass 10g is fired from a rifle. The bullet takes 0.003 seconds to move through its barrel and leaves with a velocity of 300m/s.

What is the force exerted on the bullet by the rifle?



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16. Two bodies A and B of mass 5 kg and 10 kg contact with each other rest on a table against a rigid wall. The coefficient of friction between the bodies and the table is 0.15. A force of 200 N is applied horizontally on A. What are the action and reaction forces between A & B? What happens when the wall is removed?

? Does the answer to (b) Change , when the bodies are in motion ? Ignore difference between μ_s and μ_k



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17. Two bodies A and B of mass 5 kg and 10 kg contact with each other rest on a table against a rigid wall. The coefficient of friction between the bodies and the table is 0.15. A force of 200 N is applied horizontal on A. What are the reaction of the wall?



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18. A 40kg skatter moving at 4m/sec eastwards colloid head on with a 60kg scatter travelling at 3m/sec westward. if the two skatter remain in contact after collision. what is there final velocity.



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19. Two bodeis A and B of masses 2.00 kg and 10.0 kg respectively moving in opposite

directions with velocities 4.00 m/s and 0.50 m/s respectively make head-on. . What is the final velocity if the two blocks stick after colliding?



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



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21. Which of the following has more inertia : a bicycle and a train ?



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



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23. In the following example, try to identify the number of times the velocity of the ball changes : "A football player kicks a football to another player of his team who kicks the football towards the goal-keeper. The goal-keeper of opposite team collects the football and kicks it towards a player of his own team". Also identify the agent supplying the force in each case.



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



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



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



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27. Explain why is it difficult for a fire man to hold a hose, which ejects large amount of water at a high velocity



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28. From a rifle of mass 4 kg, a bullet of mass 50g is fired with an initial velocity of 35m.s^{-1} .

Calculate the initial recoil velocity of the rifle.



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29. 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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30. An object experiences a net zero external unbalanced force. Is it possible for the object to be Travelling with a non-zero velocity? If yes, state the conditions that must be placed on the magnitude and direction of velocity. If no, provide a reason.



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31. When a carpet is beaten with a stick, the dust comes out of it ? Explain.



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



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33. 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



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34. A truck starts from rest and rolls down a hill with a constant acceleration. It travels a distance of 400m in 20 s. Find its acceleration.

Find the force acting on it if its mass is 7 metric tonnes (Hint.1 metric tonne=1000kg)



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35. 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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36. A 8000 kg engine pulls a train of 5 wagons each of 200 kg, along a horizontal track. If the engine exerts a force of 40,000 N and the track offers friction force of 5000 N, then calculate :
the net accelerating force



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37. 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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38. 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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39. An automobile vehicle has mass of 1,500 kg. What must be the force between vehicle and the road if vehicle is to be stopped with negative acceleration of $1.7ms^{-2}$?



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40. What is the momentum of an object of mass m moving with velocity v ?

A. (mv^2)

B. mv^2

C. $\frac{1}{2}mv^2$

D. mv

Answer:



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41. Two objects, each of mass 1.5 kg, are moving in the same straight line but in the 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 combined object after collision ?



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42. According to the third law of motion when we push on an object, the object pushes back on us with an equal and opposite force. If the object is a massive truck parked along the roadside, it will probably not move. A student justifies this by answering that the two opposite and equal forces cancel each other.

Comment on this logic and explain why the truck does not move.



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43. 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 in momentum occurred in the motion of hockey ball by the force applied by hockey stick.



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44. A bullet of mass 10 kg travelling horizontally with a velocity of 150ms^{-1} strikes a stationary wooden block and come to rest in 0.03 s. Calculate the distance of penetration of the bullet into the block. Calculate the magnitude of force exerted by the wood in block in the bullet.



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45. An object of mass 1 kg travelling in straight line with a velocity of 10ms^{-1} collides with it and sticks to a stationary wooden block of mass 5 kg. Then both move off together in the same straight line. Calculate the total momentum before the impact and just after the impact. Also calculate the velocity of combined object.



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



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47. Akhtar, Kiran and Rahul were riding in a motorcar that was moving with a high velocity on an expressway when an insect hit the

windshield and got stuck on the windscreen. Akhtar and Kiran started pondering over the situation. Kiran suggested that the insect suffered a greater change in momentum as compared to the change in momentum of the motorcar (because the change in the velocity of the insect was much more than that of the motorcar.) Akhtar said that since the motorcar was moving with a larger velocity, it exerted a larger force on the insect. As a result, the insect died. Rahul, while putting an entirely new explanation, said that both the motorcar and insect experienced the same force and a

change in their momentum. Comment on these suggestions.



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48. 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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49. There are three solids made up of aluminum, steel and wood, of the same shape and same volume. Which of them would have highest inertia?



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50. Two balls of the same size but different materials, rubber and iron are kept on the smooth floor of a moving train. The brakes are applied suddenly to stop the train . Will

the balls start rolling? If so, in which direction?

Will they move with the same speed? Give reasons for your answers.



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51. Two identical bullets are fired one by a light rifle and another by a heavy rifle with the same force. Which rifle will hurt the shoulder and why?



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52. A horse continues to apply a force in order to move a cart with a constant speed. Explain why?



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53. Suppose a ball of mass m is thrown vertically upward with an initial speed v , its speed decreases continuously till it becomes zero. Thereafter, the ball begins to fall downward and attains the speed v again before striking the ground. It implies that the

magnitude of initial and final momentums of the ball are same. Yet, it is not an example of conservation of momentum. Explain why?



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54. A truck of mass M is moved under a force F . If the truck is then loaded with an object equal to the mass of the truck and the driving force is halved, then how does the acceleration change?



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55. Two friends on roller-skates are standing 5m apart facing each other. One of them throws a ball of 2kg towards the other, who catches it. How will this activity affect the position of the two? Explain your answer.



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56. Water sprinkler used for grass lawns begins to rotate as soon as the water is

supplied. Explain the principle on which it works.



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57. Using second law of motion, derive the relation between force and acceleration. A bullet of 10g strikes a sand-bag at a speed of 10^3ms^{-1} and gets embedded after travelling 5cm. Calculate the resistive force exerted by the sand on the bullet.



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58. Using second law of motion, derive the relation between force and acceleration. A bullet of 10g strikes a sand-bag at a speed of 10^3 m s^{-1} and gets embedded after travelling 5cm. Calculate the time taken by the bullet to come to rest.



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59. Derive the unit of force using the second law of motion. A force of 5N produces an acceleration of $8ms^{-2}$ on a mass m_1 and an acceleration of $24ms^{-2}$ on a mass m_2 . What acceleration would the same force provide if both the masses are tied together?



Watch Video Solution

60. What is momentum? Write its SI unit. Interpret force in term of momentum.

Represent of the following graphically

momentum versus velocity when mass is fixed.



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61. What is momentum? Write its SI unit.

Interpret force in term of momentum.

Represent of the following graphically

momentum versus velocity when mass is fixed.



[Watch Video Solution](#)

62. Explain why a glass pane of a window is shattered when a flying pebble hits it?



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63. What happens when you shake a wet piece of cloth? Explain your observation.



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64. Javelin throw is marked foul if athlete crosses over the line for throw explain why why the athlete often fail to stop themselves before line.



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65. A man falling on a cemented floor receives more injuries than a man falling on a sandy floor. Why?



Watch Video Solution

66. Which of the following has more inertia : a bicycle and a train ?



Watch Video Solution

67. Define 1 kg weight and express it in Newton.



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



Watch Video Solution

69. Name the physical quantity which is determined by the rate of change of linear momentum.



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70. What is the mass of an object whose weight is 196 N?



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71. Have you ever experienced that the train in which you are sitting appears to move while it is actually at rest ? Discuss.



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72. Two similar vehicles are moving with the same velocity on the road such that one of them is loaded and the other one is empty. Which of the two vehicles will require larger force to stop it? Give reasons?



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73. Which has greater inertia. A stone of mass 1 kg or a stone of mass 5 kg?



Watch Video Solution

74. A bullet of mass 50 g is fired from a gun. If the bullet acquires a velocity of 100ms^{-1} in 0.1 second, what is the recoil force on the gun?



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75. State and explain Newton's third Law of motion.



Watch Video Solution

76. In collision between a heavier body and a lighter body, which body experiences greater force?



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77. Which has higher value of momentum bullet of mass 10 g moving with a velocity 10m s^{-1} or a cricket ball of mass 400 g thrown a speed of 90km h^{-1}



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78. 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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79. It is dangerous to jump out of a moving bus. Explain why?



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80. In the diagram a student given the card a fast horizontal flick with a finger. What will happen to the coin?

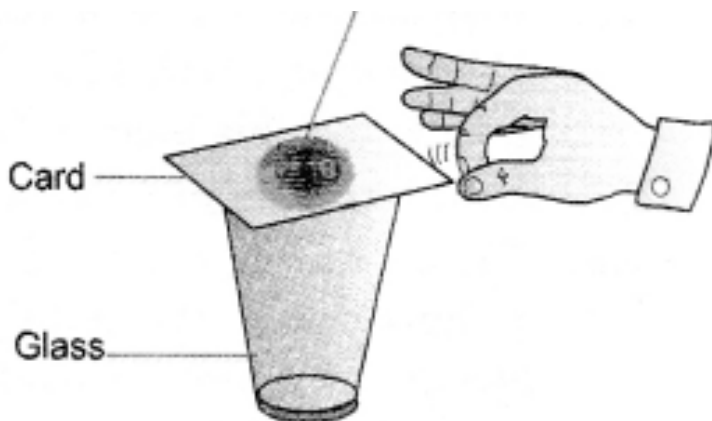


Figure B



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81. In the diagram a student given the card a fast horizontal flick with a finger. What will happen to the coin?

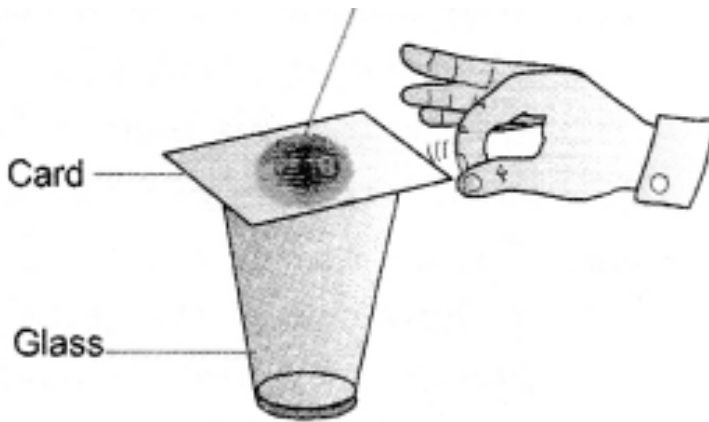


Figure B



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82. A man pushes a box of mass 50kg with a force of 80N . What will be the acceleration of the box? What would be the acceleration if the mass were halved?



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83. Two balls A and B of masses ' m ' and ' $2m$ ' are in motion with velocities $2v$ and v respectively compare their. Inertia.



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84. Two balls A and B of masses ' m ' and ' $2m$ ' are in motion with velocities $2v$ and v respectively compare their. Their momentum.



Watch Video Solution

85. Two balls A and B of masses ' m ' and ' $2m$ ' are in motion with velocities $2v$ and v respectively compare their. The force needed to stop them in the same time.



Watch Video Solution

86. State Newton's second law of motion. Write its mathematical expression. How can you state first law from it?



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87. Name the force that is responsible for change in position or state of an object.



Watch Video Solution

88. Name the factors on which momentum of a body depends.



Watch Video Solution

89. What is the relation between force and acceleration?



Watch Video Solution

90. An object is thrown vertically upwards.

What is its momentum at the highest point?



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91. Name the principle on which a rocket works.



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92. If someone jumps to the shore from a boat, the boat moves in opposite direction. Explain why.



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93. A passenger in a moving car slips to one side of the seat when the car takes a sharp turn. Give reason.



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94. When a bullet is fired, it exerts an equal and opposite force on the gun, yet hurt caused by recoil of the gun is much less than that by bullet. Give reason.



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95. why are wheels of vehicles provided with mudgurads?



Watch Video Solution

96. When two bodies X and Y collide with each other, X exerts a force of 5 N on Y towards the East. What is the force exerted by Y on X ? Justify your answer stating the law.



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97. Define one unit of force.



Watch Video Solution

98. Action and reaction forces do not balance each other. Why?



Watch Video Solution

99. Cars are provided with seat belts. Give reason.



Watch Video Solution

100. A ball of mass 100 g moving with a velocity of 10ms^{-1} is stopped by a boy in 0.25sec. Calculate the force applied by the boy to stop the ball.



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101. A body of mass 'm' is moving with velocity u. When a force is applied on it for time t its velocity increases to v. Write expressions for

initial and final momentum. Also write SI unit of each.



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102. A body of mass ' m ' is moving with velocity u . When a force is applied on it for time t its velocity increases to v . Write expressions for Change in momentum. Also write SI unit of each.



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103. A body of mass 'm' is moving with velocity u . When a force is applied on it for time t its velocity increases to v . Write expressions for rate of change of momentum. Also write SI unit of each.



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104. Total momentum of two bodies remains unchanged before and after the collision. Justify this statement.



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105. A constant force acts on object of mass 5 kg for a duration of 2s It increases the object's velocity from 3m/s to 7m/s Find the magnitude of the applied force. Now if the force were applied for a duration of 5s what would be the final velocity of object?



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106. During arm wrestling, participants put arms on the table, and wrestle with the putting the force exerted by both the players is equal where are balanced forces acting?



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107. During arm wrestling, participants put arms on the table, and wrestle with the putting the force exerted by both the players is equal where is the action reaction force pair.

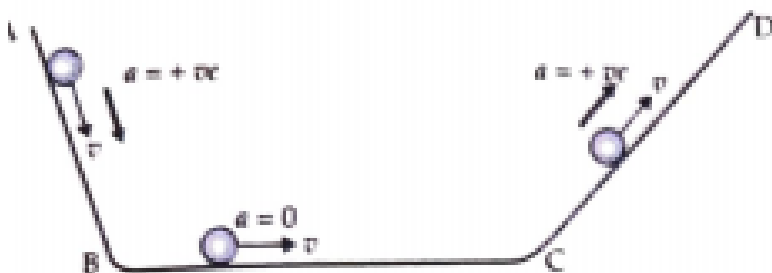




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108. A body is left from the point A and allowed to move along the path ABCD which is smooth. The thin arrow represents velocity and the thick arrow represents acceleration.

What is wrong with one of the arrows?



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109. The following is the distance-time table on an object in motion:

<i>Time in seconds</i>	<i>Distance in metres</i>
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 it constant, increasing decreasing, or zero?



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110. The following is the distance-time table on an object in motion:

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

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



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111. Two persons manage to push a motor car of mass 1,200 kg at uniform velocity on the road. The same motor can be pushed by three persons to produce an acceleration of $0.2m.s^{-2}$. With what force does each person

push the motor car ?(Assume that all persons push motor car with same muscular effort.)



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112. 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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113. A motorcar of mass 1200 kg is moving along a straight line with a uniform velocity of 90km/h. its velocity is slowed down to 18 km/h in 4 seconds by an unbalanced external force. Calculate the acceleration and change in momentum . Also calculate the magnitude of the force required.



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114. Air is thrown on the sail of a stationary boat by an electric fan kept on it. The boat will



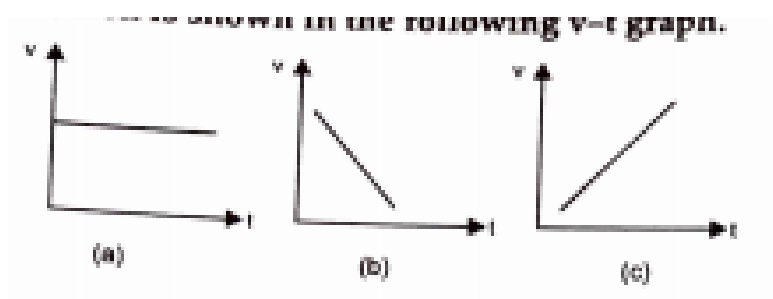
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115. Can a rocket propel itself in vacuum. Explain.



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116. What type of force is acting on the body whose motion is shown in the following v - t graph.



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117. Rahul and his friends decided to prepare themselves for long jump event taking place along annual sport day. They went to school

ground and marked a line from where the long jump was to be measured. Before starting the game, Rahul discussed with his friends that the ground is hard. So, they needed sand beyond the marked line on which the jumping students will fall. They went to the sports teacher. The sports teacher appreciated their idea and promised to arrange sand by the next day. Rahul and his friends decided to postpone their practice for one day. What values were displayed by Rahul?



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118. Rahul and his friends decided to prepare themselves for long jump event taking place along annual sport day. They went to school ground and marked a line from where the long jump was to be measured. Before starting the game, Rahul discussed with his friends that the ground is hard. So, they needed sand beyond the marked line on which the jumping students will fall. They went to the sports teacher. The sports teacher appreciated their idea and promised to arrange sand by the next day. Rahul and his friends decided to

postpone their practice for one day. How can you explain the answer in (i) by the principles of physics.



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119. Rahul and his friends decided to prepare themselves for long jump event taking place along annual sport day. They went to school ground and marked a line from where the long jump was to be measured. Before starting the game, Rahul discussed with his friends that

the ground is hard. So, they needed sand beyond the marked line on which the jumping students will fall. They went to the sports teacher. The sports teacher appreciated their idea and promised to arrange sand by the next day. Rahul and his friends decided to postpone their practice for one day. What values were displayed by Rahul?



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120. Vijay sat on the front seat of his car which was driven by his dad. Vijay did not wear the seat belt. His dad asked him to wear seat belt as it was very necessary in case of emergency when brakes have to be applied suddenly. He explained him to reason and Vijay got convinced. What other arrangements are given in high end cars in case of a bang.



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121. Viajy sat on the front seat of his car which was driven by his dad. Vijay did not wear the seat belt. His dad asked him to wear seat belt as it was very necessary in case of emergency when brakes have to be applied suddenly. He explained him to reason and Vijay got convinced. Why are seat belts necessary?



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122. Vijay sat on the front seat of his car which was driven by his dad. Vijay did not wear the seat belt. His dad asked him to wear seat belt as it was very necessary in case of emergency when brakes have to be applied suddenly. He explained him to reason and Vijay got convinced. What are the values shown by Vijay's dad?



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123. Karan had gone to purchase a car for his mother. He had already set his mind to purchase a car with good shockers so that her mother could enjoy a comfortable ride. He knew that such cars are costly. How do shockers help in comfortable side?



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