

Class 9 Science Chapter 6 – Important Questions

How Forces Affect Motion

 **New NCERT *Exploration* | 2026–27**

This chapter covers **force, balanced and unbalanced forces, friction, inertia, Newton's three laws of motion, momentum, $F = ma$, gravitational force and systems of objects.**

SECTION A – VERY SHORT ANSWER QUESTIONS

1. What is force?
2. What is the SI unit of force?
3. Is force a scalar or vector quantity?
4. What are balanced forces?
5. What are unbalanced forces?
6. What is net force?
7. What is friction?
8. In which direction does friction act?
9. What is inertia?
10. What is momentum?

11. Write the formula for momentum.
 12. What is the SI unit of momentum?
 13. State Newton's first law of motion.
 14. State Newton's second law of motion.
 15. State Newton's third law of motion.
 16. What is acceleration?
 17. What is the relation between force, mass and acceleration?
 18. What is gravitational force?
 19. What is the approximate value of acceleration due to gravity near Earth's surface?
 20. What is an action-reaction pair?
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SECTION B – FORCE & ITS EFFECTS

21. What is meant by a push or pull?
22. How can a force change the state of motion of an object?
23. Can force change the direction of a moving object?
24. Can force change the shape of an object? Give an example.
25. Give three effects of force.
26. Why is force described as a vector quantity?
27. Why is the direction of force important?
28. Give two examples where force changes the speed of an object.

29. Give two examples where force changes the direction of motion.

30. Give an example where force changes the shape of an object.

The chapter introduces force through its ability to **change motion or shape**, including examples such as kicking a ball and squeezing a lemon.



SECTION C – BALANCED & UNBALANCED FORCES

31. What are balanced forces?

32. What are unbalanced forces?

33. What happens when the net force on an object is zero?

34. What happens when the net force is non-zero?

35. Can balanced forces change the shape of an object?

36. Can an object be moving when the net force on it is zero?

37. Why does an object accelerate when an unbalanced force acts on it?

38. Two equal forces act in opposite directions on an object. Find the net force.

39. Two forces of 20 N and 5 N act in the same direction. Find the net force.

40. Forces of 30 N east and 20 N west act on an object. Find the net force and its direction.



SECTION D – FRICTION

- 41. What is friction?**
- 42. Why does friction arise between surfaces?**
- 43. In which direction does friction act?**
- 44. What factors affect friction?**
- 45. Why does a rough surface generally provide more grip?**
- 46. Give three advantages of friction.**
- 47. Give three disadvantages of friction.**
- 48. Why do vehicle tyres have treads?**
- 49. Why are soles of shoes made with patterns or grooves?**
- 50. Why do we sometimes use lubricants?**
- 51. Why does a bicycle gradually slow down when we stop pedalling?**
- 52. Why is friction necessary for walking?**
- 53. Why would it be difficult to walk on a very slippery surface?**
- 54. How can friction be reduced?**
- 55. How can friction be increased?**

The chapter's activities examine friction using a block and spring balance and connect friction with everyday grip and motion.



SECTION E – INERTIA

- 56. What is inertia?**
- 57. State Newton's first law in terms of inertia.**

- 58. What is inertia of rest?**
 - 59. What is inertia of motion?**
 - 60. What is inertia of direction?**
 - 61. Why do passengers move forward when a moving bus suddenly stops?**
 - 62. Why do passengers fall backward when a stationary bus suddenly starts?**
 - 63. Why does dust come out when a carpet is beaten?**
 - 64. Why does a coin fall into a glass when the card below it is flicked?**
 - 65. Why are seat belts important in a moving car?**
 - 66. Why does a person tend to move sideways when a car takes a sharp turn?**
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SECTION F – NEWTON'S FIRST LAW OF MOTION

- 67. State Newton's first law of motion.**
- 68. Why is Newton's first law also called the law of inertia?**
- 69. What happens to an object at rest when no net force acts on it?**
- 70. What happens to a moving object when no net force acts on it?**
- 71. Why does a moving ball eventually stop on the ground?**
- 72. Is a force always necessary to keep an object moving at constant velocity?**
- 73. Explain Newton's first law using a moving bus.**

74. Explain Newton's first law using a ball rolling on the ground.



SECTION G – NEWTON'S SECOND LAW

75. State Newton's second law of motion.

76. Write the mathematical form of Newton's second law.

77. What is the relation between force and acceleration?

78. How does mass affect acceleration for a given force?

79. What happens to acceleration if the applied force is doubled while mass remains constant?

80. What happens to acceleration if mass is doubled while force remains constant?

81. Why does a lighter object accelerate more than a heavier object when the same force acts on both?

82. What is the SI unit of force?

83. Show how the unit newton is related to kg, m and s.

84. Why is net force used rather than just one individual force?

The chapter develops the relationship $F = ma$ and uses it to connect force, mass and acceleration.



SECTION H – NUMERICAL QUESTIONS

85. A force of 20 N acts on a mass of 5 kg. Find the acceleration.

86. A force of 50 N produces an acceleration of 5 m/s^2 . Find the mass.
87. A mass of 10 kg accelerates at 3 m/s^2 . Find the net force.
88. A force of 60 N acts on a 20 kg object. Calculate its acceleration.
89. A 4 kg object accelerates at 3 m/s^2 . Calculate the force acting on it.
90. A force of 50 N acts on a 10 kg body. Find its acceleration.
91. Two opposite forces of 55 N and 50 N act on a 25 kg object. Find:
- a) Net force
 - b) Acceleration
92. Two forces of 18 N and 8 N act in opposite directions on a 2 kg object. Find its acceleration.
93. A 1500 kg car accelerates from 0 to 10 m/s in 5 s. Find:
- a) Acceleration
 - b) Net force
94. A 1500 kg car slows from 10 m/s to 0 in 5 s. Find the acceleration and net force.
95. A force of 30 N acts on an object and produces an acceleration of 6 m/s^2 . Find its mass.
96. A 2 kg object is acted upon by a net force of 10 N. Find its acceleration.
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SECTION I – MOMENTUM

97. What is momentum?
98. Write the formula for momentum.
99. What factors determine momentum?

100. What is the SI unit of momentum?
101. Is momentum a scalar or vector quantity?
102. What is the direction of momentum?
103. Calculate the momentum of a 4 kg object moving at 3 m/s.
104. Calculate the momentum of a 10 kg object moving at 5 m/s.
105. A body has a momentum of 50 kg m/s and mass 10 kg. Find its velocity.
106. How does momentum change if the velocity of an object is doubled?
107. How does momentum change if the mass of an object is doubled?

The chapter's practice includes momentum calculations and identifies its SI unit as **kg m/s**, with momentum directed along velocity.



SECTION J – NEWTON'S THIRD LAW

108. State Newton's third law of motion.
109. What are action and reaction forces?
110. Why do action and reaction forces not cancel each other?
111. On how many objects do action and reaction forces act?
112. Explain Newton's third law using walking.
113. Explain Newton's third law using swimming.
114. Explain Newton's third law using a rocket.
115. Explain Newton's third law using recoil of a gun.

116. Why does a swimmer push water backwards?

117. Why does a rocket move upwards when gases are expelled downwards?

118. Why does a person move forward when they push the ground backwards?

119. Why does a canoe move forward when the canoeist pushes water backwards?

The chapter emphasises that action-reaction forces are **equal and opposite but act on two different objects**.



SECTION K – GRAVITATIONAL FORCE

120. What is gravitational force?

121. Why do objects fall towards Earth?

122. What is acceleration due to gravity?

123. What is the approximate value of g near Earth's surface?

124. Does the gravitational acceleration of an object depend on its mass in ideal conditions?

125. Calculate the weight of a 30 kg object if $g = 9.8 \text{ m/s}^2$.

126. Calculate the gravitational force acting on a 50 kg object near Earth's surface.

127. Differentiate between mass and weight.

128. Why do objects of different masses fall with the same acceleration when air resistance is neglected?



SECTION L – SYSTEMS OF OBJECTS

- 129. What is meant by a system of objects?**
- 130. Why can connected objects sometimes be treated as a single system?**
- 131. What are internal forces?**
- 132. What are external forces?**
- 133. Why can internal forces cancel when considering the entire system?**
- 134. Two boxes are connected and pulled together. Why can they be treated as one system?**
- 135. How do you calculate the acceleration of a system of connected objects?**
- 136. Why is it useful to consider the total mass of a system?**

The chapter specifically introduces systems of connected objects and explains that internal forces can cancel when the whole system is considered.



SECTION M – FORCE & MOTION GRAPHS

- 137. What information can a velocity-time graph provide?**
- 138. What does the slope of a velocity-time graph represent?**
- 139. What does a horizontal velocity-time graph indicate?**
- 140. What does a velocity-time graph at zero velocity represent?**
- 141. How can a velocity-time graph help determine acceleration?**

142. Why does an object at rest have a horizontal line along zero velocity on a velocity-time graph?

The chapter's revision questions include interpreting the **slope of a velocity-time graph as acceleration**.

SECTION N – APPLICATION-BASED QUESTIONS

143.  A bus suddenly stops.

- a) Why does a standing passenger move forward?
 - b) Which law explains this?
 - c) What safety device reduces the risk of injury?
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144.  A car takes a sharp turn.

- a) Why does the passenger tend to move sideways?
 - b) Which property of matter is involved?
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145.  A person walks forward.

- a) In which direction does the foot push the ground?
 - b) In which direction does the ground exert force on the foot?
 - c) Which law explains this?
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146.  A rocket ejects gases downward.

- a) What force acts on the gases?
 - b) What force acts on the rocket?
 - c) Which law explains the rocket's motion?
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147.  **A stretched rubber band launches a stack of coins.**

- a) What force initially moves the coins?
 - b) What force later slows them down?
 - c) Why does the motion change?
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148.  **A bicycle slows down after the rider stops pedalling.**

- a) Which force causes the slowing?
 - b) In which direction does it act?
 - c) What happens to the bicycle's acceleration?
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SECTION O – COMPETENCY-BASED QUESTIONS

149.  **Case Study – Balanced Forces**

A box is pushed with 40 N to the right while another person pushes it with 40 N to the left.

- a) What is the net force?
 - b) Are the forces balanced or unbalanced?
 - c) What is the acceleration if the box was initially at rest?
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150.  **Case Study – Car Acceleration**

A 1000 kg car experiences a net force of 3000 N.

- a) Calculate its acceleration.
 - b) What happens to acceleration if the net force becomes 6000 N?
 - c) What happens if the mass is doubled while the force remains 3000 N?
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151.  **Case Study – Momentum**

A 50 kg student runs at 4 m/s.

- a) Calculate the student's momentum.
 - b) What happens to momentum if the speed doubles?
 - c) What happens if the mass doubles?
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152. Case Study – Rocket

A rocket pushes exhaust gases downward.

- a) Which law explains its upward motion?
 - b) Identify the action force.
 - c) Identify the reaction force.
 - d) Why do these forces not cancel for the rocket?
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153. Case Study – Connected Boxes

Two boxes of masses 2 kg and 3 kg are connected and pulled by an external force of 20 N.

- a) What is the total mass?
 - b) If friction is neglected, calculate the acceleration of the system.
 - c) Why can the two boxes be treated as one system?
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SECTION P – HIGHER-ORDER THINKING QUESTIONS

154. Why does a force not always cause an object to move?

155. Why can an object continue moving even when the net force is zero?

156. Why is friction both useful and harmful?

157. Why does a heavier object have greater inertia?

158. Why are seat belts necessary even though the car itself has stopped?
159. Why do action and reaction forces not cancel each other?
160. Why does a person need friction to walk?
161. Why does doubling force double acceleration when mass remains constant?
162. Why does doubling mass reduce acceleration when force remains constant?
163. Why does a rocket move forward even though it pushes gases backward?
164. Why can a small force produce a large acceleration for a small-mass object?
165. Why is it useful to treat connected objects as a single system?
166. A student says, "If an object is moving, there must always be a force acting in the direction of motion." Is this correct? Explain.
167. A student says, "Action and reaction cancel each other." Explain why this statement is incorrect.
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SECTION Q – LONG ANSWER QUESTIONS

168. Explain the effects of force on an object with suitable examples.
169. Explain balanced and unbalanced forces with examples.
170. Explain friction, its advantages, disadvantages and methods of controlling it.

171. State and explain Newton's first law of motion with everyday examples.
172. Explain Newton's second law of motion and derive the relation $F = ma$.
173. Explain Newton's third law of motion with three everyday examples.
174. Explain inertia and its different types with examples.
175. Define momentum and explain its relationship with mass and velocity.
176. Explain gravitational force and acceleration due to gravity.
177. Explain how a system of connected objects can be analysed using net external force and total mass.
178. Compare Newton's three laws of motion and give one example for each.
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MOST IMPORTANT QUESTIONS FOR EXAM

If students have limited time, prepare these **first**:

- ★ 1. Define force and explain its effects.
- ★ 2. Differentiate between balanced and unbalanced forces.
- ★ 3. Explain friction and its advantages and disadvantages.
- ★ 4. What is inertia? Explain with everyday examples.
- ★ 5. State and explain Newton's first law of motion.
- ★ 6. State Newton's second law and derive $F = ma$.
- ★ 7. Solve numericals based on $F = ma$.
- ★ 8. Define momentum and solve numerical problems using $p = mv$.

- ★ 9. State and explain Newton's third law with examples.
 - ★ 10. Explain why action and reaction forces do not cancel each other.
 - ★ 11. Explain the role of friction in walking and vehicle movement.
 - ★ 12. Explain gravitational force and calculate weight using $W = mg$.
 - ★ 13. Explain motion of a rocket using Newton's third law.
 - ★ 14. Explain why passengers move forward when a moving bus suddenly stops.
 - ★ 15. Solve problems involving connected objects as a system.
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IMPORTANT FORMULAS

⚡ Newton's Second Law

$$F = ma$$

🏃 Acceleration

$$a = F / m$$

⚖ Force

$$F = m \times a$$

⤵ Momentum

$$p = mv$$

🌍 Weight

$$W = mg$$

🔤 Symbols

$$F = \text{Force}$$

$$m = \text{Mass}$$

a = Acceleration

p = Momentum

v = Velocity

W = Weight

g = Acceleration due to gravity

QUICK REVISION BOX

 **Force** → Push or pull

 **Balanced forces** → Net force = 0

 **Unbalanced forces** → Net force $\neq 0$

 **Friction** → Opposes relative motion between surfaces

 **Inertia** → Resistance to change in state of motion

 **Newton's First Law** → Law of inertia

 **Newton's Second Law** → $F = ma$

 **Newton's Third Law** → Equal and opposite forces on different objects

 **Momentum** → $p = mv$

 **Weight** → $W = mg$

 **Gravitational force** → Attractive force due to mass

 **System** → Group of objects considered together

 **Velocity-time graph slope** → Acceleration

The chapter's revision material also highlights force, friction, inertia, Newton's laws, momentum, action-reaction pairs, systems and motion graphs as the core concepts.



TOP NUMERICALS TO PRACTISE

1. ⚡ **$F = ma$**
2. 🏃 **Finding acceleration**
3. ⚖️ **Finding mass from force and acceleration**
4. 🚗 **Momentum = mass $\times$ velocity**
5. 🌐 **Weight = mg**
6. ➡️ **Net force in the same direction**
7. ⬅️ **Net force in opposite directions**
8. 🚗 **Car acceleration and braking**
9. 📦 **Connected objects/system**
10. 🔄 **Comparing acceleration when force or mass changes**

★ Exam Tip

For every numerical, use:

Given $\rightarrow$ Formula $\rightarrow$ Substitution $\rightarrow$ Calculation $\rightarrow$ Answer with unit

For force problems, always calculate the **net force first** when more than one force acts on an object. The supplied chapter practice includes exactly this type of calculation, such as opposite forces of 55 N and 50 N acting on a 25 kg object.