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Biomechanics and Sports — CBSE Class 12 Physical Education Chapter Test

FREE CHAPTER TEST · CLASS XII · PHYSICAL EDUCATION (048) · PATTERN OF THE CBSE SAMPLE QUESTION PAPER 2026-27

TIME ALLOWED	MAXIMUM MARKS	QUESTIONS	NAME / ROLL NO.
1½ hours	35	17 (A 9 · B 3 · C 2 · D 1 · E 2)	

GENERAL INSTRUCTIONS

Read the following instructions very carefully and strictly follow them:

1. This question paper contains 17 questions. All questions are compulsory.
2. This question paper is divided into five sections: A, B, C, D and E.
3. Section A (Q1–9) contains multiple choice questions of 1 mark each, including assertion-reason and match-the-following questions.
4. Section B (Q10–12) contains very short answer questions of 2 marks each; answer in about 60–90 words.
5. Section C (Q13–14) contains short answer questions of 3 marks each; answer in about 100–150 words.
6. Section D (Q15) contains a case study based question of 4 marks, with four sub-parts of 1 mark each; an internal choice is given in the last sub-part.
7. Section E (Q16–17) contains long answer questions of 5 marks each; answer in about 200–300 words. Each has an internal choice: attempt only one of the alternatives.
8. Draw neat diagrams wherever required.
9. This chapter test follows the section structure, question types and marks per question of the CBSE Class XII Physical Education (048) Sample Question Paper 2026-27, at half the length of the 70-mark board paper: 35 marks in 1½ hours. (In the board paper you attempt any 5 of 6 questions in Section B, any 5 of 6 in Section C and any 3 of 4 in Section E; here every question is compulsory.)
10. The answer key and the marking scheme are at the end of this booklet. Attempt the paper in 1½ hours before you look at them.

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Chapter: Biomechanics and Sports · **Topics:** Newton's laws of motion · Levers · Equilibrium and centre of gravity · Friction · Projectiles

SECTION A

This section comprises 9 multiple choice questions (MCQs) of 1 mark each, including assertion-reason and match-the-following questions.

1. Newton's first law of motion is also called the law of 1

(A) acceleration (B) inertia

(C) reaction (D) gravitation

2. A shot of mass 4 kg is given an acceleration of 15 m/s². The force applied is 1

(A) 60 N (B) 19 N

(C) 11 N (D) 3.75 N

3. In a third class lever, 1

(A) the fulcrum is between the effort and the load (B) the load is between the fulcrum and the effort

(C) the effort is between the fulcrum and the load (D) the fulcrum, effort and load are at one point

4. The most common type of lever in the human body is the 1

(A) third class lever (B) first class lever

(C) second class lever (D) none of these

5. When a hockey ball moves forward by rolling on the ground after being hit, the friction acting on it is 1

(A) static friction (B) sliding friction

(C) fluid friction (D) rolling friction

6. The stability of a body increases with 1

(A) a narrower base of support (B) a higher centre of gravity

(C) a wider base of support (D) the centre of gravity near the edge of the base

7. Match each principle in List I with a sports example in List II. 1

List I	**List II**
A. Law of inertia	(i) A swimmer pushes the wall backwards to move forwards
B. Law of acceleration	(ii) A cricket ball slows down as it rolls on the outfield
C. Law of action and reaction	(iii) A ball stays at rest until it is kicked
D. Rolling friction	(iv) A harder kick makes the ball go faster

Choose the correct option:

(A) A-(iii), B-(iv), C-(i), D-(ii) (B) A-(iv), B-(iii), C-(i), D-(ii)

(C) A-(iii), B-(iv), C-(ii), D-(i) (D) A-(i), B-(iv), C-(iii), D-(ii)

8. Which of the following does NOT affect the path of a projectile such as a javelin? 1

(A) angle of release (B) colour of the javelin

(C) height of release (D) speed of release

9. **Assertion (A):** A wrestler bends the knees and spreads the feet to avoid being thrown. 1
Reason (R): A lower centre of gravity and a wider base of support make a body more stable.

(A) A is true, but R is false.

(B) A is false, but R is true.

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

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

SECTION B

This section comprises 3 very short answer questions of 2 marks each (answer in about 60–90 words).

10. State Newton's third law of motion and give one example of its use in sports. 2

11. Give two examples of how friction helps a player in sports. 2

12. Differentiate between static and dynamic equilibrium, with one example of each. 2

SECTION C

This section comprises 2 short answer questions of 3 marks each (answer in about 100–150 words).

13. Explain the three classes of levers with one example of each from the human body or sports. 3

14. Explain any three principles of stability, with a sports example of each. 3

SECTION D

This section comprises 1 case study based question of 4 marks, with four sub-parts of 1 mark each.

15. In the long jump, Neha sprints down the runway, plants her take-off foot firmly on the board and flies through the air before landing in the pit. Her shoes have spikes.

(i) Which law of motion explains how pushing down on the board sends her upwards? [1]

(ii) What is the path of her body in the air called? [1]

(iii) Name two factors at take-off that decide the length of her jump. [1]

(iv) Why do her shoes have spikes? [1]

OR

(iv) Neha's mass is 60 kg. Find the force she needs to accelerate at 5 m/s² on the runway. [1]

SECTION E

This section comprises 2 long answer questions of 5 marks each (answer in about 200–300 words).

16. (a) State Newton's three laws of motion and explain the application of each in sports. 5

OR

(b) What is friction? Explain its types, and its advantages and disadvantages in sports.

17. (a) What is a projectile? Explain the factors that affect the trajectory of a projectile in sports. 5

OR

(b) What is the centre of gravity? Explain equilibrium and the principles of stability, with examples.

END OF THE QUESTION PAPER

ANSWER KEY — SECTION A

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
(B)	(A)	(C)	(A)	(D)	(C)	(A)	(B)	(C)

MARKING SCHEME AND WORKED SOLUTIONS

Marks for each step are shown in brackets, as in the CBSE marking scheme. Any correct alternative method earns full marks.

Q1. Answer (B). A body stays at rest or in uniform motion unless an external force acts: the law of inertia.

Q2. Answer (A). F = ma = 4 × 15 = 60 N.

Q3. Answer (C). Third class: effort in the middle (for example the biceps flexing the elbow).

Q4. Answer (A). Most muscles work as third class levers.

Q5. Answer (D). One body rolling over another produces rolling friction.

Q6. Answer (C). Stability rises with a wider base, more weight, a lower centre of gravity and the line of gravity near the centre of the base.

Q7. Answer (A). Inertia — ball at rest until kicked (iii); acceleration — harder kick, faster ball (iv); action-reaction — push the wall (i); rolling friction — ball slowing on the outfield (ii).

Q8. Answer (B). The flight depends on the angle, speed and height of release, gravity, air resistance and spin — not on colour.

Q9. Answer (C). Bending lowers the centre of gravity and spreading the feet widens the base, which increases stability: R explains A. Option (c).

Q10. (2 marks) Answer: equal and opposite reaction; for example starting blocks.
To every action there is an equal and opposite reaction. [1]
Example, any one [1]: a sprinter pushes back against the starting blocks and is pushed forward; a swimmer pushes the wall backwards to turn; a high jumper pushes down on the ground at take-off and is pushed up.

Q11. (2 marks) Answer: for example spikes for grip and chalk on the hands.
Any two [1 + 1]: spikes and studs increase the grip of shoes on the track or field; gymnasts and weightlifters apply chalk (magnesium carbonate) to the hands for a firm grip; a grip on the badminton or tennis racket handle stops it slipping; rubber soles help basketball players stop and turn; friction between the tyres and the road helps a cyclist control and brake.

Q12. (2 marks) Answer: static — at rest (handstand); dynamic — in motion (cycling).
Static equilibrium: the body is at rest — all forces and turning effects balance (for example a gymnast holding a handstand, a shooter in the aiming position). [1]
Dynamic equilibrium: the body is in motion at constant speed and direction while staying balanced (for example a cyclist riding steadily, a skater gliding). [1]

Q13. (3 marks) Answer: fulcrum, load and effort in the middle, with examples.
First class [1]: the fulcrum is between the effort and the load — for example nodding the head (atlanto-occipital joint), or the triceps extending the elbow in throwing.
Second class [1]: the load is between the fulcrum and the effort — for example rising on the toes (plantar flexion) in jumping, or the push-up.
Third class [1]: the effort is between the fulcrum and the load — for example the biceps flexing the elbow, or kicking (knee joint); the commonest lever in the body.

Q14. (3 marks) Answer: for example lower centre of gravity, wider base, line of gravity within the base.
Any three, 1 mark each: **lower centre of gravity** - the lower the centre of gravity, the more stable the body (a wrestler bends the knees); **wider base of support** - a wider base gives more stability (a sprinter's four-point crouch start); **line of gravity within the base** - the body is stable while the line of gravity falls within the base of support (a gymnast balancing on the beam); **greater mass** - a heavier body is harder to move (a sumo wrestler); **base widened in the direction of the force** - a goalkeeper spreads the feet towards the expected shot.

Q15. (4 marks) Answer: (i) third law; (ii) projectile; (iii) speed and angle of take-off; (iv) more friction, or 300 N.
(i) Newton's third law (action and reaction). [1]
(ii) A projectile (parabolic) path. [1]
(iii) Any two: speed of take-off, angle of take-off, height of the centre of gravity at take-off. [1]
(iv) To increase friction (grip) between the shoes and the runway, so that she does not slip. [1]
OR (iv) $F = ma = 60 \times 5 = 300$ N. [1]

Q16. (5 marks) Answer: the three laws with sports applications.
First law (inertia) [1½]: a body remains at rest or in uniform motion in a straight line unless an external force acts on it — a football stays still until kicked; a sprinter needs force to start and to stop.
Second law (acceleration) [2]: the acceleration is proportional to the force and inversely proportional to the mass ($F = ma$) — a harder hit sends the ball faster; a lighter ball goes faster for the same force.
Third law (action and reaction) [1½]: to every action there is an equal and opposite reaction — starting blocks, the swimmer's turn, the jumper's take-off.
OR Friction is the force that opposes the motion of one surface over another. [1] Types [2]: **static** (no movement yet), **sliding** (skating, a pole sliding into the box), **rolling** (a rolling ball, roller skates), **fluid** (air or water resistance on a cyclist or swimmer). Advantages [1]: grip and traction for running, stopping and turning; control of rackets and bats. Disadvantages [1]: heat and wear of equipment, waste of energy, risk of injury (burns, falls).

Q17. (5 marks) Answer: an object moving under gravity alone; angle, speed, height of release, gravity, air resistance, spin.
A projectile is an object thrown or projected into the air which, after release, moves under gravity alone (air resistance aside) along a parabolic path — for example a shot, javelin, ball or the body of a jumper. [1]
Factors [4]: angle of release; speed of release; height of release; gravity; air resistance (more with a larger, rougher or faster object, less with a heavier one); spin — each explained with an example.
OR The centre of gravity is the point where the whole weight of the body is considered to act. [1] **Static equilibrium** - a body at rest with all forces balanced (handstand); **dynamic equilibrium** - a body in motion at constant speed and direction (cycling). [2] Principles of stability [2]: a wider base of support; a lower centre of gravity; the line of gravity near the centre of the base; a greater body weight — for example the crouch of a wrestler or a goalkeeper.

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