

CBSE Test Paper 04
CH- 10 Biomechanics and Sports

1. What do you mean by vertical axis?
2. Why is friction necessary for movement?
3. What do you mean by soft tissue injuries?
4. What do you mean by flexion?
5. Explain, what is 'dynamic friction'?
6. How does angle of projection help as a factor athletes in games and sports?
7. What are the major muscles involved in jumping & throwing?
8. How Newton's second law and third law of motion can be applied in sports.
9. What is friction? Is it advantageous and disadvantageous in the field of games and sports?
10. Describe different types of movements.

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Answer

1. Vertical axis: The vertical axis passes vertically from inferior to superior. It passes straight through the top of the head down between feet. It is formed by the intersection of sagittal and frontal plane. It is also known as longitudinal axis. It is the longest axis.
2. Friction is a force which is applied in a opposite direction and helps in maintaining the balance of body
3. Soft tissue injury is the damage of muscles, ligaments, and tendons throughout the body. Soft tissue injury includes sprain, strain, contusion, abrasion, and bruises.
4. Bending parts at a joint so that the angle between them decreases and parts come closer together (bending the lower limb at the knee).
5. Dynamic Friction aka Kinetic Friction is the friction between surfaces which move relative to one another. Another kind of friction is the static friction which is the friction between stationary surfaces.
6. The optimum projectile angle for achieving maximum horizontal range in throwing events is considerably less than 45° . This because an athlete can generate a greater projection velocity at low projectile angle than at high angles. The range of projectile is strongly dependent on projectile speed. In sports, the fact is that the projection speed of implement decreases when you throw within the higher projection angle. Shotput has a projectile angle from 26° to 42° . Every athlete has a unique speed, angle curve that depends on his/her stature, strength and throwing technique. The flight of discus is greatly affected by aerodynamic forces acting upon it. The aerodynamic forces come from the movement of the discus through the air. When in flight, the discus is affected by force of gravity, aerodynamic lift and aerodynamic drag. The stability of discus flight comes from the spine of the discus. Discus has a projectile angle from 27° - 43° for maximum range. To achieve maximum distance in javelin the athlete will have to balance three components-speed, strength and technique. After approach – run of 13 – 17 strides the releasing angle for javelin has to take into consideration aerodynamic lift and drag. Distance achieved in Javelin depends upon

height of release, angle of release and speed of release of Javelin. The optimum angle of release 26° to 40°.

7. The leg, feet and gluteus muscle groups are used in jumping. Specific muscles which are involved in jumping are gluteus maximus, hamstrings, quadriceps and soleus. In fact, jumping occurs in three stages. The first stage is the preparatory stage where ankle muscles calf muscles and soleus tense to prepare launching. The second phase is the launch phase, where hip extensors, the hamstrings and gluteus maximus combine and the knee extensors extend the knees to allow the body to launch into the air. In the last stage is the landing phase where all the muscles embrace impact and allow the body to return to a resting position. The major muscles are pectorials, major, latissimus dorsi, anterior deltoid and teres major are involved in throwing. These muscles are comparatively responsible for velocity during the throw. The pectorials major is the large muscle in the chest and latissimus dorsi are the large muscles on each side of the back. Deltoid, biceps, triceps are also involved in throwing a javelin in athletics.
8.
 1. **Law of acceleration:** According to this law, A change in motion is directly proportional to the force producing it and inversely proportional to its mass. If two unequal forces are applied to objects of equal mass, the object that has greater force applied will move faster. Conversely, if two equal forces are applied to objects of different masses, the lighter mass will travel at a faster speed.eg. In hammer throw, a thrower who is stronger will throw the hammer farther than a thrower who is less strong.
 2. **Law of reaction:** According to this law 'For every action there is an equal and opposite reaction.' There are so many examples in sports where this law is applied. e.g., In swimming a swimmer pushes the water backwards (action) and the water pushes the swimmer forward (reaction) with the same force. In swimming, a swimmer pushes the water backwards (action). The water pushes the swimmer forward(reaction) with the same
9. Friction is the force acting along two surfaces in contact which opposes the motion of one body over the other It has very importance in sports. For example, when a cricket ball or hockey ball is hit, It moves very fast in the direction of force in the ground. After sometimes Its motion becomes less and ultimately it comes in static position.
Advantages: Friction has a great significance in the field of sports. Many sports

require more friction and other need lesser friction. In some sports we can not give a better performance without friction, For example, in athletics, the shoes are designed to increase function so that better speed can be generated. The spikes have small nails to create the friction. Gymnasts sometimes use lime on their palms to perform on horizontal bar, uneven bars to increase friction. In these sports, friction is necessary thus regarded as advantageous.

Disadvantages: On the other hand, some games do not require friction. For example, the games like snow skiing. the skins are designed to have minimum friction. In cycling, there should not be more function between road and tyres of the cycle. Thus the tyre should be fully inflated to reduce the force of friction If there is more friction. It will be more wastage of energy of the cyclist Moreover, the cyclists use pointed helmets, silk body fitted costume and bend their bodies while cycling to reduce air friction. Swimmers use goggles, cap and full body swimsuit to reduce the force of friction caused by water In roller skating, less friction is also needed for better performance. Thus in these games friction is regarded as disadvantageous.

10. Physical activity is made possible by movements and motions. Every movement takes place in one plane and around one axis.

They are categorised by movement type as follows

- i. **Flexion** It takes place when the angle decreases between the two bones attached to a joint
 - ii. **Extension** It takes place when the angle between the two bones attached to a Joint increase. Both flexion and extension occur in the sagittal plane about the frontal axis.
 - iii. **Adduction** It is a movement laterally toward the middle of the body.
 - iv. **Abduction** It is a movement laterally away from the middle of the body. Both adduction and abduction occur in the frontal plane about the sagittal axis
- Flexion and extension are movements that take place within the sagittal plane and involve anterior or posterior movements of the body or limbs. Abduction and adduction motions occur within the coronal plane and involve medial-lateral motions of the limbs, fingers, toes, or thumb. Abduction moves the limb laterally away from the midline of the body, while adduction is the opposing movement that brings the limb toward the body or across the midline.